

SOCIO- ECOLOGICAL- ECONOMIC REFLECTIONS ON THE IMPACTS OF COVID-19 IN AFRICA

**Edited by
Willie Chinyamurindi & Philani Moyo**



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Willie Chinyamurindi & Philani Moyo

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Peer-review declaration

The publisher (AOSIS) endorses the South African 'National Scholarly Book Publishers Forum Best Practice for Peer-Review of Scholarly Books'. The book proposal form was evaluated by our Social Sciences, Humanities, Education and Business Management editorial board. The manuscript underwent an evaluation to compare the level of originality with other published works and was subjected to rigorous two-step peer review before publication by two technical expert reviewers who did not include the volume editor and were independent of the volume editor, with the identities of the reviewers not revealed to the editor(s) or author(s). The reviewers were independent of the publisher, editor(s) and author(s). The publisher shared feedback on the similarity report and the reviewers' inputs with the manuscript's editor(s) or author(s) to improve the manuscript. Where the reviewers recommended revision and improvements, the editor(s) or author(s) responded adequately to such recommendations. The reviewers commented positively on the scholarly merits of the manuscript and recommended that the book be published.

Research justification

The book, *Socio-ecological-economic reflections on the impacts of COVID-19 in Africa*, brings forth the insights of young scientists from South Africa, the African continent and globally around their reflections on the impact of the COVID-19 pandemic across a variety of disciplines in order to generate a holistic view on this impact that transcends disciplinary boundaries. This reflection takes the form of knowledge generation around how COVID-19 has affected various spheres of life from which these young scientists claim expertise.

Further, the young scientists contributing to this book make predictions of how science will look in a post-COVID-19 world. In essence, the chapters in this book heighten our collective thought for future pandemic preparedness, learning from the experiences during the COVID-19 pandemic. From all this, readers can reflect and propose vistas that allow for preparation towards a future that is not only uncertain but also still in need of the contribution of science (and young scientists).

The chapters in this book offer a mixture of methodological paradigms based on original research conducted by the submitting authors, with many chapters based on literature reviews. The chapters in the book cover all realms of science with equal participation between male and female scientists. In each of the chapters, the contributions try to not only diagnose the problems meted out by the COVID-19 pandemic but also propose innovative solutions to these problems. All this is done from a multi-disciplinary context covering all disciplines of science. In this regard, the book will be appealing to various stakeholders.

The authors of the book adhered to strict compliance around issues related to academic writing and ethical guidelines. Further, all the contributions to the chapter were subjected to rigorous peer review. All the chapters were also subjected to similarity checking via iThenticate with authors giving confirmation that the submitted work was not plagiarised. The following chapter has an acknowledgement of the author's previously published work: 'Access to information is crucial to people with disabilities: A case of COVID-19 in South Africa' by Lieketseng Ned.

The book's intended target audience is scholars and professionals specialising in research on pandemic preparedness and impact and the nature of science in regard to interdisciplinary and multidisciplinary research.

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List of abbreviations and acronyms

4IR	Fourth Industrial Revolution
ACE2	angiotensin-converting enzyme 2
AEO	African Economic Outlook
Africa CDC	Africa Centres for Disease Control and Prevention
AIDS	acquired immunodeficiency syndrome
APC	article processing charge
ASSAf	Academy of Science of South Africa
ATM	automated teller machine
AU	African Union
AUDA	African Union Development Agency
BA	Bachelor of Arts
BAdmin	Bachelor of Administration
BCG	Boston Consulting Group
BCom	Bachelor of Commerce
BDOM	Diocesan Office of Medical Works (DRC)
BEd	Bachelor of Education
BMZ	Federal Ministry for Economic Cooperation and Development (Germany)
BRICS	Five major emerging economies: the Federative Republic of Brazil, the Russian Federation, the Republic of India, the People's Republic of China and the Republic of South Africa
BTech	Bachelor of Technology
CEMAC	Central African Economic and Monetary Community
CEO	chief executive officer
CFR	case fatality rate
CGTN	China Global TV Network
CIPD	Chartered Institute of Personnel Development
COMESA	Common Market for Eastern and Southern Africa
COVID-19	coronavirus disease caused by SARS-CoV-2 virus

CQ	chloroquine
CRPD	UN Convention on the Rights of Persons with Disabilities
CSPC	Canadian Science Policy Centre
CT	computerised tomography
DBE	Department of Basic Education
DEA	Department of Environmental Affairs (South Africa)
DFG	German Research Foundation
DHET	Department of Higher Education and Training (South Africa)
DoH	Department of Health (South Africa)
DPO	disabled persons' organisation
DRC	Democratic Republic of the Congo
EAC	East African Community
EBHC	evidence-based health care
ECDC	European Centre for Disease Prevention and Control
ECMs	early-career mothers
ECOWAS	Economic Community of West African States
ERIC	Education Resources Information Center
ESDO	Environment and Social Development Organization
EU	European Union
Eurofound	European Foundation for the Improvement of Living and Working Conditions
FAIMER	Foundation for Advancement of International Medical Education and Research
FAO	Food and Agriculture Organization of the United Nations
FDI	foreign direct investment
FSIN	Food Security Information Network
GDP	gross domestic product
H1N1	swine flu
HCQ	hydroxychloroquine
HCRW	health care risk waste
HEA	Higher Education Academy (UK)
HEI	higher education institution
HIV	human immunodeficiency virus
Hons	honours
HPCSA	Health Professions Council of South Africa
HRDC	Human Resource Development Council of South Africa
ICT	information and communication technology
IFAD	International Fund for Agricultural Development

IISD	International Institute for Sustainable Development
ILO	International Labour Organization
IMPM	Institute of Medical Research and Medicinal Plants Studies (Cameroon)
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPE	interprofessional education
ITC	International Trade Centre
JICA	Japan International Cooperation Agency
JRC	European Commission's Joint Research Centre
KZN	KwaZulu-Natal (South Africa)
LIMC	low- and middle-income countries
LMS	learning management system
MBA	Master of Business Administration
MEC	Member of the Executive Council
MEd	Master of Education
MERS	Middle East respiratory syndrome
MoH	Ministry of Health and Childcare (Zimbabwe)
MRSIT	Minister of Scientific Research and Technological Innovation (DRC)
MUBS	Makerere University Business School (Uganda)
NATED	National Accredited Technical Education Diploma (South Africa)
NCDC	Nigeria Centre for Disease Control
NEET	not in employment, education or training
NEMA	<i>National Environmental Management Act 107 of 1998</i> (South Africa)
NEMWA	<i>National Environmental Management: Waste Act (NEMWA) 59 of 2008</i> (South Africa)
NEPAD	New Partnership for Africa's Development
NGO	non-governmental organisation
NHA	<i>National Health Act 61 of 2003</i> (South Africa)
NIH	National Institutes of Health (USA)
NIHSS	National Institute for the Humanities and Social Sciences (South Africa)
NIPORT	National Institute of Population Research and Training (Bangladesh)
NISR	National Institute of Statistics of Rwanda
NPO	non-profit organisation
NRF	National Research Foundation (South Africa)

NSFAS	National Student Financial Aid Scheme (South Africa)
PhD	Doctor of Philosophy
PPE	personal protective equipment
Pr Sci Nat	Professional Natural Scientist (South Africa)
R&D	research and development
RCT	randomised controlled trial
REACT-EU	Recovery Assistance for Cohesion and the Territories of Europe
RNA	ribonucleic acid
RSA	Republic of South Africa
SA	South Africa
SADC	Southern African Development Community
SAFRI	Southern Africa-FAIMER Regional Institute
SANS	South African National Standards
SAQA	South African Qualifications Authority
SARChI	South African Research Chairs Initiative
SARS	severe acute respiratory syndrome
SAYAS	South African Young Academy of Science
SDG	sustainable development goal
SETA	Sector Education and Training Authority (South Africa)
SME	small and medium enterprises
Stats SA	Statistics South Africa
STEM	science, technology, engineering and mathematics
SUN	Stellenbosch University (South Africa)
TIPS	Trade and Industrial Policy Strategies
TVET	Technical Vocational Education and Training
TWAS	The World Academy of Sciences
UCT	University of Cape Town (South Africa)
UIF	Unemployment Insurance Fund
UK	United Kingdom
UKZN	University of KwaZulu-Natal (South Africa)
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization

UNFPA	United Nations Population Fund
UN-Habitat	United Nations Human Settlement Programme
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
Unisa	University of South Africa (South Africa)
USA	United States of America
UWC	University of the Western Cape (South Africa)
WEF	World Economic Forum
WFP	World Food Programme
WHO	World Health Organization
Wits	University of the Witwatersrand (South Africa)
ZCTU	Zimbabwe Congress of Trade Unions

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The author, Anshumali Padayachee, passed away during the review process of the book, and her name appears on the chapter posthumously.

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Forewords



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It takes courage to look difficult subjects in the eye and tackle them head-on, without resorting to euphemisms and platitudes to explain away phenomena that may be difficult to face. The editors and contributors to this book have shown admirable courage in dealing with challenging material without flinching.

Socio-ecological-economic reflections on the impacts of COVID-19 in Africa is a brave book. It sounds the alarm over dangers that society would prefer not to dwell on too deeply but which the COVID-19 pandemic has made impossible to avoid. It is these dangers that all of us must confront if we are to succeed in fashioning a post-pandemic world worth living in – an inclusive world, above all.

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What are the lessons to be mindful of from a holistic perspective when refining urban planning or adapting approaches to ecology, habitat loss and future zoonotic pandemics? Moving forward, how will our economy rebound, and what are the implications for higher education from universities to technical education? How are women, including early-career mothers in academia, impacted by the remote working model during the pandemic?

These questions speak to a fraction of the urgent issues that are intensified by the world we now find ourselves in – issues that are unlikely to be resolved through a monodisciplinary lens. The contributors hail from academic disciplines across the social and natural sciences and beyond our borders across the African continent, offering reflections that are multidisciplinary in their approaches to problem solving. Diverse and seemingly divergent perspectives and approaches, as contained in this book, are necessary for robust conversations about solutions – a compilation of multidisciplinary approaches that broaden the toolset, as it were.

The toolset, to continue that analogy, is greatly in need of expansion given the complexity of the challenges the pandemic has amplified. *Socio-ecological-economic reflections on the impacts of COVID-19 in Africa* reflects on the plight of the youth who, already marginalised, have now been pushed further into precarity and whose prospects post-pandemic are poor. The book includes another typically excluded segment of society, people with disabilities, left to their own devices and overlooked in COVID-19 information campaigns. It firmly sets out what needs to be done to ensure disability-inclusive pandemic responses. Furthermore, the book considers the crisis of misinformation during the pandemic in Africa and engages in a much-needed reimagining of knowledge production in the digital world that has become an integral aspect of learning, living and working.

What is arguably most compelling about this book is that it contains solutions to the problems that COVID-19 has exposed, solutions such as opportunities to ‘circularise’ economies and new ways to fund scientific research. I appreciate that the book itself is built on a transdisciplinary endeavour, using the tools of the human and natural sciences.

Collective vision is what is needed. Across the higher education landscape, universities have undertaken various research initiatives to address aspects of the impacts of the pandemic. During my tenure at the National Institute for the Humanities and Social Sciences (NIHSS), the institute was a part of this, having launched its research on aspects of the effects of COVID-19 and subsequent lockdowns on communities during the height of the pandemic while also overseeing a group of research clusters across the universities. Not stopping there, the NIHSS provided

funding to the South African Young Academy of Science (SAYAS) as part of its support for professional research associations. The objectives of such funding were to promote the integrity, reputation and recognition of the humanities and social sciences within the higher education community, the science and technology community and society.

The book, aptly titled *Socio-ecological-economic reflections on the impacts of COVID-19 in Africa*, does exactly that – taking our understanding of ongoing challenges and their underlying causes, examining them through the current paradigm in which we find ourselves and pushing us to identify better ways of resolving, addressing and adapting to these challenges. There will always be challenges; there will always be crises in our society, country and the world. It is what we do with these moments and how we examine and resolve them that can take us to new heights and levels of excellence, ingenuity and resilience.

This is a book whose time has come, a book that could help our societies shape a post-pandemic future that is fair, just and inclusive.



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In this book, entitled *Socio-ecological-economic reflections on the impacts of COVID-19 in Africa*, the editors Willie Chinyamurindi and Philani Moyo, alumni of the South African Young Academy of Science (SAYAS), invited South Africans and contributors from other parts of the African continent to share their experiences on the COVID-19 pandemic. The World Health Organization (WHO) declared COVID-19 as a Public Health Emergency of International Concern on 30 January 2020 following outbreaks of SARS-CoV-2 virus in China at the end of 2019. This resulted in countries around the world implementing restrictions at varying degrees, which has had negative impacts on the the global economy following varying degrees of strict lockdown regulations.

The different chapters in the book not only highlight the under-preparedness of countries in managing pandemics but also exposed the fragility of their economies. In South Africa, the pandemic halted most economic activities for months and led to widespread job losses. These economic shocks are thought to be largely a consequence of the country's reliance on a linear, as opposed to circular, economy. The inefficiencies in value chains that have now been exposed by the crisis present opportunities to change mindsets, behaviours, systems and technologies as part of a transition to a circular economy.

Globally upheld mitigation measures were implemented to contain COVID-19, including social distancing, movement restriction and regular handwashing. However, the high concentration of people within limited spaces in cities is most obvious in slums and informal settlements (accounting for about a billion of the world's population), without access to sufficient basic amenities, among other conditions. In Nigeria, short-term interventions to fight COVID-19 included the provision of handwashing facilities at strategic points close to toilet facilities, the sensitisation of residents and the provision of alternative or temporary dwelling units were made, it is recommended that inclusive urban planning with slum dwellers is necessary to ensure the sustainability of the interventions in urban development.

Other health imperatives given consideration in this book are the role of oral health professionals. It is suggested that oral health professionals with expertise beyond the oral cavity to the whole person and community, integrate oral health more explicitly within overall health and locate the oral health professions as an integral part of the health sciences professions. Specifically, it is imperative that a post-COVID-19 programme adopt an alternative health care training model in oral health that is not only person-centred but also evidence-based and encompasses appropriate socio-political aspects using an interprofessional educational and collaborative approach.

It is suggested that zoonotic pandemics are expected to increase because of global change. Ecologists, who have a profound understanding of the connection between the ecosystem and humans, must be at the forefront of interventions in collaborations with health professionals to improve preparedness for future zoonotic pandemics.

The COVID-19 pandemic took the world by storm and developing countries with poor infrastructure were badly affected, especially university and research institutions. They had to adjust fast, with some shutting down completely while others continued timidly as they tried to work out how to address the situation. The transition to online education was problematic because of socioeconomic and technological factors.

From schools to technical and vocational education and training (TVET) colleges and universities, reports from South Africa and elsewhere on the continent reveal that most institutions of education and work have embraced the opportunities created by the COVID-19 pandemic in reviewing processes and practice within their institutions and redesigning approaches and learning to meet the ‘new normal’.

The socioeconomic conditions in general pushed the contemporary education system to explore the possibility of aligning the teaching and learning project with the demands of the Fourth Industrial Revolution (4IR). However, given pre-existing structural and systemic socioeconomic inequalities, this has also had varying degrees of success.

The COVID-19 pandemic caused major learning disruptions because of lockdowns and school closures in most African countries. In the Central African sub-region, some institutions were not ready to switch to online or distance modes of education or work because of poor information infrastructure. The poor socioeconomic status of students meant that they were unable to afford the necessary technological requirements for distance education, apart from the high cost of internet access and low bandwidth. Building back better information infrastructure as well as a sustainable emergency management plan to enhance teaching, learning

and research is an essential reform necessary to avert the disruption caused by the COVID-19 pandemic.

In Uganda, COVID-19 has exacerbated existing inequities in society and education by excluding vulnerable children from receiving a quality education. It is suggested that the Ugandan government should develop strategies that will allow learners from rural areas to interact with teachers, considering the challenges of online classes because of the lack of internet connectivity, phones and electricity, among others.

The COVID-19 pandemic has not only exposed the deficiencies in scientific and educational settings but has also offered an opportunity to review and adopt a flexible and personalised approach to scientific research, education and business as it supports affordable technology, student access and participation, business resilience and financial sustainability in higher education.

Several authors provided recommendations for policy interventions. There was a strong motivation for closer engagements between government, business, the labour movement and civil society. Given the high prevalence of people living in confined spaces and in informal settlements, future urban development planning should consider the inclusion of dwellers from such settlements and their representation in city administration and overall human development.

Women faced the major burden of the challenges during lockdown condition. In particular, early-career mothers in academia experienced challenges arising from remote working while trying to balance work and family responsibilities. They also had to adapt to sharing space with family, reorganise their homes and change their schedules. Mothers worked shifts, cooked, cleaned and played with and cared for their children.

People with disabilities did not always have access to disability-targeted information during the first hard lockdown of the pandemic. Key actions such as providing information in various accessible formats are integral to ensuring that the needs of people with disabilities are not neglected and contributing towards ensuring a disability-inclusive pandemic response.

There is a high prevalence of business within the informal sector in Africa. Some people who lose their jobs in the formal sector seek alternative form of employment in the informal sector to sustain their livelihoods. People who operate in the informal sector have no or limited savings or financial cushion, and they were severely affected by the impact of the COVID-19 pandemic. The situation created financial problems and raised issues of sustainability related mainly to working in the informal sector.

There were anecdotal reports of traditional recipes being used in low-income countries, with claims of reduced symptoms and some COVID-19 patients even being cured. In countries like the Democratic Republic of the Congo (DRC) where there is a wealth of naturally occurring plant species, it is possible that new therapeutic agents could be sourced. There is an urgent need to conduct further research on traditional African medicinal plants to realise their full potential; isolate the active ingredients; develop formulations and dosages; define the pharmacokinetics, toxicology and safety and evaluate their efficacy in controlled clinical trials.

One positive outcome of the widespread shutdown of schools, factories, churches, etc. the reduction of road traffic and flights and the curtailment of many other human activities was the reduction of air pollution. Air quality in many cities across the world improved substantially and mountain snows and glaciers resurfaced. Other activities, including thorough handwashing, maintaining one-metre social distancing, wearing of face masks and proper disposal of used masks, enhanced environmental hygiene. These behavioural changes reduced other opportunistic diseases; for example, the use of masks significantly reduced the occurrence of the usual seasonal coughs and common colds.

While there were temporary improvements in air quality, lower greenhouse gas emissions and lower levels of noise pollution, there was an increased use of single-use plastics. It is recommended that solutions arising from the pandemic should focus on reshaping unsustainable production and consumption systems to achieve long-term environmental benefits.

While social media offered a crucial communication tool and access to information vital for combating this novel virus, it also became a platform for fake news. In South, the government consistently used Twitter to communicate with the public about COVID-19, making use of unique content and retweets from various sources. The ubiquitous nature of Twitter was found to be beneficial, as tweets could be sent at all hours of the day. The government was also concerned about fake news and sent several tweets to dispel rumours and fake information about COVID-19.

Through the wide range of coverage of topics as outlined above, the contributors of the different chapters in this book draw the readers into revisiting the impact of the COVID-19 pandemic, remind us to be prepared for future pandemics, and that we are all vulnerable to disasters. It reminds us that our shared humanity is intertwined with the environment, and it's our collective duty to sustain the planet for future generations.



Moses Basitere & Natisha Dukhi

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The COVID-19 pandemic has left an indelible mark on the world, altering the socio-ecological and economic landscapes in profound ways. As the global community continues to navigate the ramifications of this unprecedented crisis, Africa has faced its own unique set of challenges and opportunities. This book, *Socio-ecological-economic Reflections on the Impacts of COVID-19 in Africa*, emerges as a critical contribution to understanding these complexities from the perspective of a continent rich in diversity, resilience and innovation.

This volume is a product of the collective efforts of scholars associated with the South African Young Academy of Science (SAYAS). It represents our commitment to advancing knowledge and fostering dialogue on issues that are central to the future of our continent. Through the diverse chapters, this book offers an in-depth examination of the varied impacts of the pandemic across the African continent, reflecting on how COVID-19 has not only disrupted lives but also prompted new ways of thinking and adaptation.

The contributors, each bringing their expertise from different fields, explore the far-reaching effects of the pandemic on key sectors. In Chapter 1, the precarity and uncertainty experienced by South African youth are analysed, highlighting the extended transitions exacerbated by the pandemic. Chapter 8 discusses the potential for South Africa to pivot towards a circular economy in response to the disruptions caused by COVID-19, underscoring the relevance of sustainability in economic recovery. Meanwhile, Chapter 11 underscores the significance of African traditional medicines in managing the pandemic, emphasising the value of indigenous knowledge systems in public health.

The chapters also explore the resilience and innovation that have surfaced in response to the crisis. For instance, Chapter 10 examines the digital transformation of business environments in Zimbabwe, and Chapter 7 reimagines knowledge production and dissemination in a post-pandemic world. The environmental implications, discussed in Chapter 9, and the challenges of managing personal protective equipment disposal,

as highlighted in Chapter 17, remind us of the interconnectedness of human activities and ecological systems and the need for sustainable solutions.

As current Co-Chairs of SAYAS, we wholeheartedly support this important work, which was edited by a former Co-Chair of SAYAS, Willie Chinyamurindi and Philani Moyo. This book not only reflects on the immediate impacts of the pandemic but also provides insights into the long-term socio-ecological-economic shifts that may shape Africa's future. It is a testament to the collaborative spirit of young African scholars, and we hope it serves as a valuable resource for policymakers, researchers and anyone interested in the future of Africa.

We trust that this contribution will inspire further dialogue and action towards building a more resilient, equitable and sustainable Africa in the wake of COVID-19.

Chapter 1

COVID-19 vaccine nationalism, hesitancy and misgovernance in South Africa

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■ Abstract

Background: South Africa's coronavirus disease caused by SARS-CoV-2 virus (COVID-19) response was marked by a complex combination of relative successes and a myriad of challenges. Some of these major challenges were centred around misgovernance, vaccine nationalism and hesitancy. Consequently, thousands of lives and livelihoods were lost.

Aim: This chapter examines the country's adaptation response guided by three questions: (1) To what extent did vaccine nationalism affect South Africa's vaccine access and equity? (2) What are the governance and supply chain challenges that derailed an effective vaccine roll out? (3) How can South Africa reimagine its research and development in its pharmaceutical and public health sectors for better pandemic preparedness in future?

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Methods: This chapter is based on a systematic review of relevant literature that includes academic, non-academic and grey literature sources.

Findings: It finds and argues that the high mortality statistics were initially because of the lack of safe, effective vaccines at a global level and later, their delayed national roll out because of regulatory and policy approval bottlenecks. Other primary drivers of the inadequate response include vaccine nationalism by the Global North, profiteering by multinational pharmaceutical companies, national vaccine hesitancy, misgovernance and corruption in different tiers of government responsible for public health emergencies.

Conclusion: Given this reality, it concludes by arguing that dependence on the Global North for vaccines, personal protective equipment and other medical supplies is an indictment on the country's scientific community, especially physicians and virology researchers. This must change. South Africa should invest more in organised vaccine research and development as well as public health care systems so that if, and when, there is a virological outbreak in future, the vaccine ecosystem will be adequately equipped and prepared for effective adaptation and resilience.

■ Introduction

When the first coronavirus disease caused by SARS-CoV-2 virus (COVID-19) case was diagnosed in Wuhan, China, in December 2019, no one would have predicted its rapid global transmission pace. As physicians, epidemiologists and policy makers were frantically investigating the pathogen's natural reservoir, it rampantly spread to all continents. Beginning with a few cases identified in Wuhan (Li, Liu & Ge 2020), by mid-June 2023, 'there were 767,984,989 confirmed cases of COVID-19' globally (World Health Organization [WHO] 2023, p. 1). This exponential increase in global infections from 2019 to 2020 as well as morbidity and mortality rates impelled the WHO to declare COVID-19 a global health emergency of international concern in early 2020 (Sohrabi et al. 2020). By the time, this WHO declaration was lifted in May 2023, COVID-19 had claimed the lives of 6,943,390 people worldwide (WHO 2023) of which 256,542 were Africans (Africa Centre for Disease Control and Prevention 2023). These high mortality statistics at a global level were because of the initial lack of safe, effective vaccines and later, their delayed roll out post-development because of regulatory and policy approval bottlenecks. There are, however, continental and country-level variations that explain delayed vaccine roll out and, in some cases, outright limited access. A case in point is South Africa, which I use as a reference point in this chapter to argue that thousands of lives and livelihoods were lost because of a complex combination of factors that include profiteering by big pharmaceutical

companies, vaccine nationalism, vaccine inequity, supply chain challenges, misgovernance and corruption. To arrive at these conclusions, and others further below, I examine South Africa's COVID-19 mitigation preparedness and adaptation response guided by three questions: (1) To what extent did vaccine nationalism affect South Africa's vaccine access and equity? (2) What are the governance and supply chain challenges that derailed an effective vaccine roll out? (3) How can South Africa reimagine its research and development in its pharmaceutical and public health sectors for better pandemic preparedness in future?

Before a critical engagement with the vaccine equity debate, it is important to step back and briefly reflect on African countries' overall COVID-19 preparedness and response. In many ways, the African continent's response and management of COVID-19 proved naysayers wrong. Many pessimists predominantly from the Global North had, without evidence about pandemic preparedness on the continent, constructed an image of Africa on the precipice of deaths in millions because of its historical failure in managing communicable and virological diseases like Ebola and HIV. The chief culprit in this misrepresentation was Western media, which constructed their own reality through predicting a pandemic catastrophe of unimaginable human deaths, decimation of livelihoods and collapse of African economies. This caricature by Western media, which is a manifestation of their ideological position and hegemonic articulation, is not new. It is a perpetuation of Western media's long-standing negative narrative that 'generally reproduces and perpetuates harmful stereotypes on Africa' (Ndlovu & Nikabs 2023, p. 179) without empirical evidence to support assertions. It consistently labels Africa as a 'dark continent' inhabited by 'Others' (Jarosz 1992) and regularly represents Africa in tropes of disaster (Myers 2001), poverty, instability, illiteracy and disease (Ogunyeni 2011). With the aid of predefined symbols, images and audio visuals from past health emergencies on the continent, a world view about how Africa will fail in its COVID-19 response was thus created, legitimised and naturalised as common sense in both Western traditional and social media. Through constructing negative concepts and images, Western 'media coverage of COVID-19 in Africa replicated the old tropes of 'the hopeless continent' in many ways ... [and] there was a frequent juxtaposition of the 'health crisis' with other 'crises' (Chambwera & Munoriyarwa 2023, p. 278). However, this imagination and reality constructed by Western media were not only wrong but banal. Instead, the African COVID-19 response was one of relative success. As Happi and Nkengasong (2022, p. 22) further explain: 'in the early months of the COVID-19 pandemic, Africa's rapid and coordinated response, informed by emerging data, was remarkable'. Later, notwithstanding socio-economic consequences of different interventions, there were relative successes in reducing the spread of the virus through

closing borders, lockdown measures, domestic travel restrictions, social and physical distancing, quarantining as well as vigorous testing (Ogunleye et al. 2020). Countries such as 'Botswana, Guinea and Togo had some dedicated local funding for the purchase of COVID-19 vaccines or to support operational roll out' (Masresha et al. 2022, p. 3). Overall, the continent's positive response to the pandemic resulted in 'relatively slower rates of infections and deaths' (Chambwera & Munoriyarwa 2023, p. 278). This was partly because previous health emergencies and pandemics (e.g. HIV) on the continent had prepared and allowed some African countries to develop and upscale their health care systems and infrastructure. For example, in South Africa, this entailed the construction of primary health care facilities in some poor rural, peri-urban and urban areas, equipping them with basic infrastructure, equipment and medical supplies as well as training and capacitation of frontline health workers. Hence, the COVID-19 outbreak happened at a time when South Africa and some African countries had relatively considerable basic primary health care systems and infrastructure in place, thus enabling them to respond in a relatively effective manner. Although not picture perfect, this level of preparedness partly explains why the pandemic did not result in the number of deaths and calamitous economic collapse predicted by pessimists of the North and their media.

The foregoing should not be read as a romanticisation of Africa's COVID-19 response but as an objective attempt to paint a more balanced and realistic picture. In that regard, it is well documented that some African countries did not adequately respond to the pandemic, especially in their vaccination roll out and administration. As explained further below, their vaccine distribution was hampered by poor planning and 'complex regulatory environments, among other challenges' (Kana et al. 2023, p. 288). In fact, Africa's population remains the least vaccinated worldwide (WHO 2023) because of several factors unrelated to vaccine nationalism and inequity. To begin with, while some countries in the North (e.g. the United States of America [USA], Canada, the United Kingdom [UK] and Switzerland) and others like China and Russia began vaccinating their citizens in December 2020, the vaccination programme in Africa only commenced later in February 2021. This late start by African countries was partly because of internal domestic problems such as limited funding for vaccine procurement, 'disorganized planning, inadequate medical infrastructure [...] in-country regulatory hurdles' (Ayenigbara et al. 2021, p. 429). Further, there was slow inexplicable distribution of vaccines once received under the COVID-19 Vaccine Global Access (COVAX) initiative, thus derailing the vaccination pace and rates across the continent. It is also lamentable that:

[D]uring the early periods of the vaccination exercise on the continent, only eight African countries exhausted their COVAX shots, nine nations administered

less than a quarter of their shots, and fifteen nations administered less than half of the COVID-19 shots received. (Ayenigbara et al. 2021, p. 429)

This indicates a failure of African leadership, at both political/policy and public health level, to guide and steer the vaccination drive in countries where vaccines were available. Two classical cases of this leadership failure are the Democratic Republic of Congo (DRC) and Malawi. In April 2021, 'the Democratic Republic of Congo returned 1.3 million shots donated by COVAX, the global jab-sharing scheme. In May, Malawi burned nearly 20,000 doses' (*The Economist* 2021, p. 1). Not to be outdone, 'at least seven other African countries had destroyed some 450,000 doses in all' (*The Economist* 2021, p. 1) by end of August 2021. This outright failure by some African governments demonstrates their programming disorganisation because at that material time less than 4% of the African population had been vaccinated. Their defence argument that jabs destroyed were because of expiry or already out-of-date because of their short shelf-life (*The Economist* 2021) is deflative and simultaneously instructive as it demonstrates they had no versatile programme of action to immediately administer them upon receipt. Consequently, vaccines went to waste at a time when their citizens were most in need.

Another major challenge in the pandemic response and vaccine roll out was pandemic populism (Meyer 2020) in parts of Africa. Although conceptualisations vary:

[P]andemic populism is often described as pitting the 'common sense' of a virtuous people against expert knowledge...Its arguments often oppose public health measures that are based on evidence from research. (Gugushvili et al. 2020, p. 721)

The spectrum of such populism strategies under COVID-19 includes, but is not limited to, 'simplification of the pandemic as a characteristic, including downplaying the virulence or severity of the outbreak', dramatisation of 'the pandemic itself as an exceptional threat as a pretext to gain emergency powers' and 'forging of divisions where the public is pit against 'others', which include 'powerful elites such as pharmaceutical companies' the medical establishment and 'dangerous others like migrants that are blamed for the crisis and cast as sources of contagion' (Lasco & Larson 2020 cited in Sabahelzain, Hartigan-Go and Larson 2021, pp. 93-84). This pandemic populism was tenacious in a few African countries for the better part of 2020 and 2021. For example, in Burundi, the government of late president Pierre Nkurunziza deliberately downplayed COVID-19, did not impose lockdown restrictions and allowed public gatherings, sporting events and political rallies to continue unabated. His government underreported confirmed cases to a paltry 83 citing divine protection with the presidential spokesperson absurdly claiming that Burundi 'has signed a special covenant

with God, whether you believe it or not', hence the low COVID-19 cases and deaths (Burke 2020, p. 1). Similarly, in Tanzania, the late president John Magufuli was 'one of Africa's most prominent COVID-19 deniers' who:

[D]enied the local spread of COVID-19 in Tanzania, discouraged the mention of the disease by health workers, and claimed without evidence that vaccines were dangerous, suggesting instead that people pray and inhale herb-infused steam. (Burke 2021, p. 1)

Because of his bizarre denialism policy, Tanzania¹ did not impose a hard lockdown and had no testing and quarantining programme yet hundreds of citizens were dying at the time. However, it is worth emphasising that this unscientific denialism was limited to very few African countries. The majority, including South Africa, adhered to scientific evidence and advice in their mitigation and adaptation response. South Africa's response is remarkable because even though the political fortunes of the ruling African National Congress (ANC) are waning, it did not seek to engage in pandemic populism to regain political traction and support. To their credit, at no point did the ANC-led government, or President Cyril Ramaphosa, attempt to deploy pandemic populism strategies for political ends.² Instead, as I argue further below, they were found wanting on vaccine supply, procurement corruption, vaccine access and distribution challenges, inequity and uncertainties in countering vaccine hesitancy.

■ Vaccine nationalism: Implications for South Africa

The gamut of pandemic response challenges countries such as South Africa faced includes vaccine nationalism. While conceptions vary, I define vaccine nationalism as 'the act of reserving millions of doses of new vaccines for domestic use during a transnational public health crisis' (Rutschman 2021, p. 9) driven by countries' competition 'for priority rights to monopolise limited-production doses' (Daoudi 2020, p. 2). Vaccine nationalism is a product of neoliberal market forces that enable high-income governments, usually of the North, to use Advance Purchase Agreements (APAs) with big pharmaceutical companies (Big Pharma) to reserve and secure candidate vaccines. In the open neoliberal market:

APAs are used to reduce demand uncertainty for product developers and manufacturers; to hedge against research and development and manufacturing risks; and to secure availability of products in the face of spiking demand. (Thornton, Wilson & Gandhi 2022, p. 1)

1. For a more in-depth discussion of Tanzania's stance, please refer to the Chatham House article, by Fergus Kell (2020).

2. For further information, please refer to Kotzé (2022, pp. 733–752).

While these APAs can achieve their intended purpose for manufacturers and some buyers within a global health crisis, they have inadvertent consequences for other potential buyers without financial resources to compete in an open market. This became apparent at the height of the COVID-19 pandemic. 'The widespread use of APAs by high-income countries contributed to striking inequities ... delaying access to vaccines and other supplies for low- and middle-income countries' (Thornton et al. 2022, p. 1). Despite their negative effects, APAs remained in force at the peak of the pandemic because in the current globalised neoliberal market, there is no internationally enforceable treaty or agreement that determines equitable and rational purchasing of vaccines. In the absence of such, well-resourced governments of the North regularly prioritise the health and wellbeing of their populations in times of health emergencies instead of committing to a globally fair and just system of vaccine purchases.

In addition, geostrategic interests also partly explain vaccine nationalism. This is the case in the context of US/EU-China relations and conflictual US/EU-Russia geopolitics. As Zhou (2022) adds:

[T]he dynamics of vaccine nationalism have been further complicated by changing US-China relations and [...] as a result, COVID-19 vaccine research and development has been a fierce geopolitical race between powerful countries. (p. 454)

A 'my country first' approach encapsulated in the former Trump administration 'America First' policy is a prime example of how geostrategic and national interest objectives drove vaccine nationalism with far-reaching consequences on global vaccine inequity. Further, vaccine nationalism 'exposed how easily international cooperation and multilateral agreements can dissolve, especially in the face of a global crisis – and just how vulnerable this dependence leaves Africa' (Happi & Nkengasong 2022, p. 22). It also demonstrated how fallible multilateral agreements and international protocols are when confronted by national interests in a context of a health emergency of transnational concern. This became apparent through a diametric debate that raged about the pros and cons of vaccine hoarding. For the North, APAs were a necessary legal procurement contract of national interest because they guaranteed access to vaccines for their citizens. They were thus an enabler for the protection of the lives of their nationals. On the other hand, for countries of the South, APAs were a legal barrier that prohibited them access to vaccines, which are a global public good. This means, as I emphasise here, that APAs were in fact a barrier to global health equity because they denied low-income countries access to a global public good that could have saved many lives in South Africa.

It is worth remembering that rapacious vaccine nationalism is not a new phenomenon during transnational health emergencies. Recently, 'during

the 2009 influenza AH1N1 pandemic many APAs held by high-income countries were used to secure their priority access to vaccine, making procurement in other countries more difficult' (Fidler 2010 cited in Phelan et al. 2020, p. 800). These APAs were used extensively in 2009 to a point where:

[M]ore than 56% of pandemic influenza vaccine manufacturers surveyed by WHO were unable to commit to guaranteeing 10% of real-time vaccine production for purchase by UN agencies due to pre-existing commitments under APAs. (Turner 2016 cited in Phelan et al. 2020, pp. 800–801)

In a way, this unpleasant history of APAs repeated itself from 2020 onwards as COVID-19 candidate vaccine development was taking shape. The modicum of vaccine procurement collaboration and alliance between high-income countries of the North and low-income countries of the South that was gaining momentum post the 2009 AH1N1 influenza APAs fracas was abruptly ended. High-income countries of the North went on an unprecedented vaccine hoarding spree using APAs. Months before any vaccine had been approved, a few countries of the North:

[T]hat account for only a fraction of the global population had already ordered more than half of the projected early supply of doses. By mid-August 2020 the United States had secured 800 million doses of at least 6 vaccines in development; the United Kingdom had purchased 340 million doses, with around five per capita; and the European Union and Japan had each ordered hundreds of millions of doses. (Callaway 2020 cited in Zhou 2021, p. 450)

This hoarding of vaccines did not only disrupt global supply chains in general but meant that low-income countries in the South, including South Africa, were structurally denied timely vaccine access. This lack of access resulted in lower inoculation rates, at the time, compared to the majority of countries in the North. Even as different variants of the virus later ignited new infection waves, this inequitable access persisted. Vaccine nationalism thus inadvertently became one of the drivers of transmission rates and increased deaths in countries of the South such as South Africa.

Even though the African Vaccine Acquisition Task Team (established in November 2020) – an African Union initiative supported by the Africa Centre for Disease Control and Prevention, African Export–Import Bank and the United Nations Economic Commission for Africa – managed to expedite access culminating in African countries obtaining '400 million doses of vaccines' in 2021 (Happi & Nkengasong 2022, p. 23), these were insufficient for the entire African population and were unevenly distributed inter-and intra-African countries. Inoculation rates remained low while transmission rates driven by new variants surged. For example, by late November 2021, while South Africa had 'achieved a 27% vaccination rate, its rural areas were often in single figures' (Brown 2021, p. 1). This further shows that the hoarding of vaccines by the North had direct impacts on the

poorest and marginalised, especially in far-flung rural areas. Efforts by South Africa to increase vaccination rates were impeded by inequitable access emanating from the inward-looking vaccine nationalism of the North that held on to vaccine surpluses.

In a belated 'half-hearted' attempt to be seen to address vaccine inequity the default mode for the North was to donate vaccines manufactured by their Big Pharma to the poor of Africa. Instead of offering African countries 'an intellectual property waiver which would allow the generic production of COVID-19 vaccines, tests and treatments' (Oxfam 2022, p. 1), EU member states insisted on donating their surplus vaccines. Their blockade of 'proposals tabled by South Africa and India and supported by the African Union and over 100 countries for an intellectual property waiver' (Oxfam 2022, p. 1) demonstrates the lengths to which they went to retain control and dominance of the global vaccine supply chain. Despite vociferous protests from global advocacy organisations such as the People's Vaccine Alliance – 'a coalition of over 100 non-governmental organisations and networks working together towards equitable access to medical technologies that help to prevent and respond to COVID-19 and future pandemics' (People's Vaccine Alliance 2023, p. 1) – the EU and their Big Pharma stood firm resisting the South's lobbying and efforts towards producing their own vaccine. This is despite the fact they were, at the time, failing to donate adequate doses to Africa. Statistics show that by November 2021 the USA had delivered only 25% of surplus vaccines it had pledged, the EU 19%, the UK just 11%, Australia 18%, Switzerland 12% and Canada just 5% (Brown 2021). The result was deepened vaccine inequity as less than 10% of people in the South were fully vaccinated while those vaccinated in the North 'exceeded 60% in both high-income countries and upper-middle-income countries' (Brown 2021, p. 1). This inequity in vaccine access – in other words the divide between North and South – prompted the WHO Director-General (Tedros Adhanom Ghebreyesus) to characterise it as 'vaccine apartheid' in an explicit comparison to the pre-1994 'South African system of institutionalised racial segregation' (Bajaj, Maki & Stanford 2022, p. 1452). By invoking this phrase – 'vaccine apartheid' – Tedros Adhanom Ghebreyesus was emphasising the scope of 'catastrophic moral failure' (Bajaj et al. 2022, p. 1453) in achieving vaccine equity. This 'vaccine apartheid', which cost millions of lives, can be interpreted in several ways. To begin with, retention of intellectual property meant Big Pharma continued to generate billions of dollars in super profits from vaccine sales, out of which the EU and USA reaped huge taxes. In fact, Germany alone 'received back over €3.2 billion in tax revenue from BioNTech the German pharmaceutical company behind the Pfizer vaccine' (Oxfam 2022, p. 1). In addition, the neo-colonial desire by the North to continue to dominate and control the vaccine

industry and supply chain explains this ‘vaccine apartheid’. At its centre is the use of vaccine research and development ‘soft power’ to determine who has access and who is denied. This politically motivated decision-making around vaccine access deepened the inequity divide between North and South. Politics, more than global public good considerations and fairness, was thus one of the driving forces behind ‘vaccine apartheid’ and is an embodiment of ethical and moral failure by some countries of the North.

It is important not to construe ‘vaccine apartheid’³ as an event or product of COVID-19 only. Rather, it is a product of historical processes. One of the enduring legacies of colonially engineered integration of Africa into the world system as a producer and supplier of primary products is its continued peripheral participation in the research, development and production of pharmaceutical products, consumables and equipment. Post-colonial geopolitical power, neoliberal economic dynamics and Big Pharma profiteering have reinforced this unequal and peripheral role of Africa in the pharmaceutical industry. Consequently, many African countries ‘largely depend on the outside world for its health-security commodities: diagnostics, therapeutics and vaccines, as well as personal protective equipment and other medical supplies’ (Happi & Nkengasong 2022, p. 22). In fact, ‘as much as 94 percent of the continent’s total stock of pharmaceuticals is imported’ (Mishra 2020, p. 12). This means that the position South Africa finds itself in is not entirely out of its failure to research and develop its own vaccines. Such research and development happens within a global political economy dominated by the North and their Big Pharma that largely determine vaccine safety, efficacy and confidence. Without their endorsement, the probability of a South African intellectual property-owned and produced vaccine meeting global standards, accepted by the North and the pharmaceutical conglomerates, remains slim. However, these historical facts about South Africa’s unequal and unfair integration into the global pharmaceutical industry should not be used to mask its post-independence failures to enhance vaccine production capacity and capabilities. Its vaccine research and development remain below average because there has not been organised and aggressive investment in the sector by the public and private sectors. As a result, vaccine development programmes are piecemeal, and research facilities are ill-equipped and inadequately funded to anchor any serious vaccine research.

3. see: United Nations Human Rights Office of the High Commission (2022).

■ Vaccine hesitancy

Beyond vaccine nationalism, vaccine hesitancy was also one of the determinants of inoculation rates in many communities of the South. According to the WHO (2015):

[V]accine hesitancy refers to delay in acceptance or refusal of safe vaccines despite availability of vaccination services. The issue is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as misinformation, complacency, convenience and confidence. (p. 1)

One of the prime examples of this hesitancy was towards Sinopharm produced by a Chinese pharmaceutical company, whereas there was a 'higher level of confidence in vaccines from Pfizer and AstraZeneca' (Paschoalotto et al. 2024, p. 1) among other Western Big Pharma. Low confidence in Sinopharm was widespread on the African continent. Ironically, this low public confidence was not because of evidence-based safety concerns or questionable efficacy. Instead, stereotypes about low-quality Chinese-manufactured products were the main reason for this. This erosion of trust in Sinopharm partly emanates from the historical fact that many non-pharmaceutical Chinese companies have flooded the global market with cheap imitations (so-called fake) of established brands. This history fed the misinformation narrative, unscientific as it was, that the vaccines did not go through robust and verifiable clinical trials, hence were typical 'fake Chinese products' with low or questionable efficacy. Some countries of the South fuelled this erroneous narrative. For example:

[T]he Food and Drug Authority (FDA) of Philippines granted the first Emergency Use Authorization to the Chinese vaccine Sinovac with stipulations that it not be used for health front liners, the elderly and those with comorbidities, effectively the top three categories of government prioritization. (Sabahelzain et al. 2021, p. 93)

Although the FDA later 'overturned this stipulation a few days later without explanation' (Sabahelzain et al. 2021, p. 93), its proclamation deepened mistrust of Sinovac without scientific evidence on its limited or lack of efficacy. To address this hesitancy towards Chinese vaccines, the WHO had to reiterate 'that two doses of Sinopharm administered at an interval of 21 days have an efficacy of 79%' against COVID-19 infection and the 'vaccine's efficacy against hospitalization was 79%' (WHO 2022, p. 1). This confidence-building intervention by the WHO was meant to reiterate that, from a scientific and epidemiological perspective, the efficacious of Chinese vaccines was never and is not in doubt.

Even though Chinese vaccines were not administered in South Africa, high rates of vaccine hesitancy were recorded in many communities. Various studies on vaccine confidence demonstrate that:

[W]illingness to get vaccinated by one of the approved COVID vaccines is dynamic, with ups and downs in willingness depending on the state of the pandemic threat and perceived risk, alongside various concerns around safety, and conspiracies propagating through social media. (Sabahelzain et al. 2021, p. 92)

This volatility around vaccine confidence is not new in the vaccination space as reluctance or refusal predates COVID-19. However, what differentiates COVID-19 vaccine hesitancy are its primary drivers. To begin with:

[N]ew vaccines by nature provoke more questions but, in the case of COVID-19 vaccines, the processes used to produce them are also new, having never been used for vaccines before. (Sabahelzain et al. 2021, p. 92)

In addition, 'COVID-19 vaccines were developed far more rapidly than expected and launched under an Emergency Use Authorization' (Sabahelzain et al. 2021, p. 92). This rapid pace of their development and rollout planted seeds of doubt among many as there was a general negative perception (although unscientific) of their safety and effectiveness. This perceived risk and safety considerations contributed to vaccine hesitancy in many South African communities. As Cooper, Van Rooyen and Wiysonge (2021) further explain:

[D]espite ample evidence of the safety and efficacy of COVID-19 vaccines that have received emergency use authorization ... about one-third of the adult population in South Africa is hesitant toward these vaccines. (p. 930)

These vaccine concerns and hesitancy predispositions are influenced by a number of factors. While individual factors and individual psychological models of decision-making behaviour remain relevant in explaining vaccine attitudes, empirical evidence demonstrates 'the inherently social nature of COVID-19 vaccination views in South Africa; influenced by factors such as age, race, education, politics, geographical location, and employment' (Cooper et al. 2021, p. 930). These social processes, including social media and public media misinformation and disinformation, thus largely influenced the extent of vaccine acceptance and hesitancy in different communities around South Africa. This suggests that for any future COVID-19 vaccine rollout or any other vaccine for that matter, to be universally accepted, there should be a concerted effort to develop and deploy targeted social strategies to address these uptake and hesitancy concerns in different communities.

Further, the role of social media in influencing public opinion on vaccine confidence and vaccination decision making cannot be ignored. A case in point was the widespread online discussion and public interest about the use of ivermectin (an anti-parasitic drug) for COVID-19 prevention and treatment in 2020. This public interest was stimulated by 'early evidence,

mostly from studies with a small number of patients and conducted with varying degrees of scientific rigour, [that] indicated some potential benefit in the management of COVID-19' (South African Health Products Regulatory Authority [SAHPRA] 2022, p. 1). This growing public interest was therefore not based on adequate empirical evidence about the prophylaxis properties, treatment safety and efficacy of ivermectin. The majority of the general population were oblivious of the fact that there are different types of ivermectin. There is a livestock formulation for preventing or treating parasites in animals, and for humans, there are ivermectin tablets for treating some parasitic worms (U.S. Food and Drug Administration 2021). Unaware of these fundamental formulation differences, a ballooning market of ivermectin products developed in South Africa. This is demonstrated by the fact that 'ivermectin utilisation increased from 1,090 total recorded units in 2019, to 1,516 units in 2020 and 8,100 units in 2021' (Schellack et al. 2022, p. 5). This trend 'may be an indication of public self-prescribing and purchasing the medication themselves' (Schellack et al. 2022, p. 5) in line with social media posts of some South Africans self-medicating with veterinary ivermectin products. Although the SAHPRA (2022, p. 1) reacted to this by belatedly dismissing the 'therapeutic role for ivermectin in COVID-19' and prohibited 'importation of unregistered ivermectin products' for prescription purposes, this was perhaps a little too late. The misinformation about ivermectin-containing products, which played out on various social media platforms, was allowed to trend for too long before the SAHPRA issued a definitive scientific advisory. This is a lesson for SAHPRA that in a global health emergency it should, and must, use its duty to invoke specific sections of the *Medicines and Related Substances Act* to mitigate misinformation similar to the ivermectin fiasco.

■ Misgovernance

It is well documented that 'the COVID-19 pandemic caught the world off-guard, with most nations being inadequately prepared to meet the challenges of the rapidly spreading virus' (Mishra 2020, p. 6). There were, however, disparities in lack of preparedness inter- and intra- continentally mediated by levels of national income, human development progress and previous investments in health care systems. Hence, even though the North – with its well-advanced, technologically innovative and superior health care system compared to the South – initially struggled in controlling, containing and governing the pandemic response, its systems were later refined and customised with noticeable adaptation success. The same cannot be said of many countries in the South, specifically those in Africa. One of the primary 'challenges for African countries is their fragile and strained public healthcare systems' (Akinola, Olawade & David-Olawade 2022, p. 1)

whose shortcomings became glaring at the height of the pandemic. Despite decades of political independence and liberation from hard colonialism, investment in public health care systems remains fragmented and inadequate. For example, while South Africa has been on a progressive public health infrastructure and health care systems roll out over the last two decades, this remains inadequate and where facilities exist are ill-equipped and short staffed. At its peak, COVID-19 exposed how the number of specialist medical practitioners, intensive care unit beds, general hospital beds, personal protective equipment and ventilators was drastically insufficient in South Africa. This means the country was ill-prepared to effectively respond to the pandemic. As demonstrated below, this dire state of the health care system is, however, not because of a lack of financial, human and technical resources but a direct result of bad governance and inability to prioritise the public health care system for the benefit of the citizenry.

At the outbreak of COVID-19, human mobility control measures to minimise the rapid spread of the virus were poorly managed across Africa (Akinola et al. 2022) with catastrophic consequences in South Africa. From detection of the first case in early March 2020, there was no clear mitigation national strategy or adaptation action plan resulting in acceleration of the infection rate across the rural-urban continuum. The uncontrolled movement of incoming travellers without screening protocols at national borders and airports as well as unrestrained domestic travelling within the country created an opportune environment for the exponential increase in the rate of infection. While there are various epidemiological explanations of this surge in infections, it is clear that the delayed gazettement, pronouncement and enforcement of a hard lockdown was one of the drivers of increasing infections across South Africa. Without undermining the fact that the hard lockdown curtailed a number of human freedoms, for example, freedom of movement, assembly and economic activity, the reality is allowing people to continue to exercise these freedoms unrestrained was an infection accelerator and a risk to the right to life.

In addition, corruption was also another factor that derailed the capacity of health institutions to effectively respond to the pandemic. 'While the government was preoccupied with the interventions for reducing the spread of COVID-19, some government officials saw this as an opportunity for self-enrichment' (Mlambo & Masuku 2020) through 'corruption within the procurement of COVID-19-related equipment and services' (De Villiers, Cerbone & Van Zijl 2020, p. 805). This brazen corruption, amidst widespread deaths and hospitalisations, was the work of some political and government leaders who looted millions of Rands budgeted for personal protective equipment, additional beds, consumables and other ancillary services.

Not only did this theft and misappropriation of public funds curtail the government's ability to contain the pandemic, it further 'exerted tremendous pressure on the country's dwindling public finances' (Mlambo & Masuku 2020) since additional public finances had to be diverted from other government spending commitments to cover the gaps created by corruption and looting.

Beyond corruption, there were other general vaccine supply and distribution challenges. The global supply chain system was heavily interrupted by lockdown measures that affected various air cargo receipt, delivery and collection nodes in different countries. These disruptions did not only disturb vaccine supply chains but also their crucial manufacturing ingredients (Sabahelzain et al. 2021), thus delaying production and compounding uneven delivery in different countries including South Africa. In addition, failure by the state-owned electricity utility Eskom to provide uninterrupted electricity in health care facilities is another governance and public service delivery issue that negatively affected patient care and the general pandemic response. At the height of surging infections and deaths in South Africa, there was recurrent load shedding in hospitals and clinics. Data by the Council for Scientific and Industrial Research (CSIR) of South Africa show that while the national grid 'system demand reduced notably in 2020 because of COVID-19 lockdown and resulting reduced economic activity', the year '2020 saw 859 hours of load shedding and seemingly the most intense' then (Calitz & Wright 2021, p. 1). This decline in electricity availability continued in 2021. As the CSIR adds: the energy availability factor (EAF):

[C]ontinued its declining trend in 2022, with an average EAF of 58.1%, compared to the EAF of 61.7% for 2021 and 65% for 2020. This was largely due to the increase of unplanned outages experienced by Eskom. (CSIR 2023, p. 1)

This intensive load shedding affected operational capacity and procedures of health care institutions nationally. Needless to say, this means electricity-powered emergency and intensive care equipment (e.g. ventilators and oxygen tanks) that are central in COVID-19 ameliorative and palliative care were always at risk of being redundant because of load shedding, thus compromising lives.

■ Conclusion

A gamut of factors affected South Africa's COVID-19 mitigation, preparedness and adaptation response. The primary ones include vaccine nationalism by the North, profiteering by pharmaceutical companies, vaccine hesitancy, inadequacies in the health care system, misgovernance and corruption. To begin with, using APAs, some countries in the North

pursued vaccine nationalism as a geostrategic and inward-looking public health strategy that prioritises the health and well-being of their citizens. This national interest motivated hoarding strategy was unfair and unjust for South Africa because it was structurally excluded from the vaccine global supply chain, thus delaying roll out of its inoculation programme with direct consequences on patient hospitalisation and death rates. Relatedly, vaccine nationalism also fed the profiteering agenda of Big Pharma in the context of a globalised neoliberal market. The 'invisible hand' of neoliberal markets that does not subscribe to equity standards, ethics or respect for human rights was glaring in vaccine hoarding. The pursuit of profits regardless of multiplying deaths of South Africans in their thousands at the time explains why Big Pharma was at liberty to allow the North to hoard vaccines without due care nor consideration for ensuring equitable access.

Given this reality, what lessons should South Africa (including other African countries) learn from vaccine nationalism and Big Pharma profiteering? The prime lesson is that dependence on the North for COVID-19 vaccines, personal protective equipment and other medical supplies is an indictment on their scientific community, especially physicians and virology researchers. Failure by these scientists to develop at least one internationally recognised and accepted COVID-19 vaccine is a symptom of the lack of scientific capacity and skills within the South African pharmaceutical research and development ecosystem. This suggests that the South African university and virology research spaces are not at the forefront of responding to current global challenges. This must change. Major African economies like South Africa should be investing more in organised vaccine research and development so that if, and when, there is a virological outbreak in future their vaccine ecosystem will be adequately equipped and prepared for an effective response.

Further, while South Africa has been on a relatively progressive public health infrastructure roll out over the last two decades, this remains inadequate. The pandemic exposed how misgovernance and corruption in the public health procurement and supply chain system compounded pre-existing inadequacies of the health care system. It further unmasked how intensive care unit facilities, hospital beds, personal protective equipment and other consumables are insufficient for a rapid emergency response. There is a historical lesson, perhaps a reminder, for South Africa here: the level of financial, technical and educational expertise injected into the HIV and AIDS pandemic response in the 1990s to early 2000s provides a valuable lesson and is the bare minimum yardstick of how the country should prepare for the next virological pandemic. For frontline workers to be effective in their duty of care in future, there is an urgent need to invest and equip health care facilities with modern and technologically advanced equipment and supplies.

Improving urban sustainability through slum intervention amidst COVID-19-related pandemics and thereafter

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■ Abstract

Background: Outbreaks of contagious diseases over the years have altered the social and economic systems of nations. In the 21st century, urbanisation or close concentrations of people were observed to promote the spread of the coronavirus disease caused by SARS-CoV-2 virus (COVID-19) virus. Globally upheld mitigation measures were implemented to contain COVID-19, including social distancing, movement restriction and regular handwashing. However, the high concentration of people within limited spaces in cities is most obvious in slums (accounting for about a billion of the world's population), without access to sufficient basic amenities, among other conditions.

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Aim: This chapter holds that it is difficult and impracticable for slum dwellers, unless they receive support, to cope with mitigation measures for COVID-19 and similar pandemic, mainly because of their deplorable environmental, social and economic status. The chapter proposes functional ways of helping residents to cope with the pandemic and reduce the dire implications that slum neglect could have on the overall urban populace.

Methods: The study employed a desktop research method to gather extensive online literature related to slum, urbanisation dynamic, urban sustainability and the COVID-19 pandemic. This included systematic search order outlined in previous studies: using relevant keywords and criteria. The literature was sourced from various databases and selected based on relevance to the study objectives. Ultimately, 49 references were considered for analysis and synthesis in the chapter.

Findings: The proposed measures that could be used in the short term to fight COVID-19 and other related pandemics as a common enemy might include the provision of handwashing facilities at strategic points in slums especially close to toilet facilities, the sensitisation of residents and the provision of alternative or temporary dwelling units and public conveniences, among others. Furthermore, the chapter also reveals the need for holistic rethinking and intervention while proposing measures to enhance urban sustainability in a post-COVID-19 world so as to ameliorate the general impact of such pandemic. Such interventions or measures should be able to address the environmental, social, economic and political aspects of slum dwellers. The chapter therefore proposes complete physical upgrading; economic empowerment (through subsidies, incentives, grants and loans); policies upholding the extension of urban facilities to all parts of the city without bias with respect to location in subsequent plans; social and political empowerment of slum dwellers and their representation and social inclusion in city administration and overall human development.

Implications: The proposed measures could be effectively achieved through inclusive urban planning with slum dwellers at the heart of such, to ensure the sustainability of the interventions in urban development. The study proffers the means of making cities more sustainable amidst the COVID-19 and related pandemics, measures for recovery from the negative impacts of the pandemic and ensures the reduction of the incidence of crime, social unrest, insecurity and severe economic hardship that are likely to affect the urban population after such pandemic.

Conclusions: Healthy and sustainable city development is only possible when every facet of society is accommodated in urban planning. Thus, because slums are the homes of most of the urban poor, they must not be neglected if we are to address the effects of COVID-19 and other related pandemics in cities.

■ Introduction

The outbreak of infectious diseases has been a recurring phenomenon in the past. Notable among them are the Spanish flu, human immunodeficiency virus (HIV), *Severe Acute Respiratory Syndrome* (SARS) and the present coronavirus disease caused by SARS-CoV-2 virus (COVID-19). The outbreak of infectious diseases over the years has led to reforms or changes in the social and economic systems of nations especially in areas with high population concentration. More than half of the population of the world lived in cities as of 2008, and it is projected that by 2050, this will increase to 70% (*Un-Habitat* 2009). Moreover, the urbanisation nature of developing economies, particularly sub-Saharan Africa, has experienced a notable revolution in the past decade (Onodugo et al. 2016, p. 95). More than half of the global population growth by the year 2050 will be in the African continent (Bolay 2020, p. 9).

The high concentration of people within a limited space in cities is most obvious in slums. Slum-dwellers lack access to sufficient basic amenities like health care and education and are also reputed for the easy spread of diseases. However, the challenge inherent in the slum environment and among its dwellers poses threat not only to the inhabitants but to those within the urbanscape. Thus, the effort at mitigating negative environmental issues in the present and for the future has been about the sustainability concept. The sustainability concept hinges on achieving a balance in the environment, equity and economy (Campbell 1996, p. 304), which may be difficult to achieve especially in developing countries. Thus, it could be deduced that sustainable development cannot be adequately achieved where there is lopsided development in cities especially as the need to address the impact of the COVID-19 pandemic becomes glaring.

The COVID-19 pandemic has brought about social and economic dysfunctions that need to be addressed if effort at city sustainability can be fostered. The former president of World Bank (1968–1981), Robert McNamara once stated that if cities do not address the challenges of slums constructively, that slums will destructively deal with the cities (Selja 2005 in Ayuba 2019, p.16). The general urban dwellers could be in jeopardy, especially in the face of COVID-19 and similar pandemics, if slums are neglected. Meanwhile, some scholars like Islam and Kibria (2020) and Muggah (2020) and Sampaio (2020) hold that it is difficult (if not impracticable) for slum dwellers (if not supported) to cope with COVID-19 and related disease mitigation measures mainly because of their deplorable environmental, social and economic conditions. Moreover, the analysis of Solymári et al. (2022) study in Kenya (Nairobi and Mombasa) shows that slum dwellers may have been more vulnerable to the negative effects of COVID-19, including worsening conditions related to health care, employment, gender-based violence, education, youth issues and human rights violations.

This chapter through secondary data (especially online database) proposes functional ways of supporting slum residents to cope during a COVID-19-related pandemics and afterwards to reduce the dire implications, such slum neglect could have on the overall urban populace and beyond. Life after the pandemic will not be the same, especially for slum dwellers; this chapter also reveals how the sustainability of urban areas can be enhanced in a post-COVID-19 world. This chapter brings to light the impact of slum neglect during the COVID-19 pandemic, on the health, economy and social setting of the dwellers and urban population in extension and also proffers useful suggestions on how a functional intervention can be carried out in slums in the fight against COVID-19-related global pandemic. The recommendations will enhance the making of a sustainable city in a bid to revive the economy and health of nations from the adverse impact of the pandemic.

■ Literature review

■ Sustainable development and urbanisation

The concept of sustainable development has been greatly promoted as a means of making for holistic development. Sustainable development is the 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (United Nations General Assembly 1987, p. 41). The sustainable development perception seeks to maintain economic improvement and growth, whereas guarding the long-term significance of the environment; it offers a framework for the integration of development plans and environmental policies (United Nations General Assembly 1987, p. 41). The basic principle of sustainable development essential in all is the integration of social, environmental and economic concerns into all facets of decision-making. The sustainability concept hinges on achieving a balance in the environment, equity and economy (Campbell 1996). Yet, with the current urbanisation trend, especially the subaltern urbanism (slums and informal settlements) and the COVID-19 and other related pandemics, much still needs to be done to achieve sustainable cities.

In history, urbanisation was birthed during the industrial revolution of the 18th century and industrialisation in the 19th century. The period experienced the liberation of urbanisation because factories and industries provided employment opportunities in cities. In the course of 1960, Ritchie, Samborska and Roser (2018) stated that twice the population of people in urban areas (1 billion) lived in rural settings (2bn). However, Ritchie et al. (2018) showed that in 2007, the population of people in rural and urban settings was about the same (at 3.33bn in each area). Meanwhile, urban

populaces increased to 4bn in 2016 (United Nations 2017 estimated the same to be 54%), while the rural population of the world had risen just slightly to 3.4bn (Ritchie et al. 2018). It has been reported that by 2050, 70% of the world population will live in cities (Un-Habitat 2009). However, Santamouris and Vasilakopoulou (2021) put this figure at 66% by the year 2050: showing additional 2.5bn people by 2050, while Ritchie et al. (2018) put this figure (for 2050) to be more than two-thirds of the world population. Different parts of the world have recorded urban population growth that is more quickly or less quickly; there is almost no region of the universe with a record of decline in urbanisation (UN-Habitat 2016a, as cited in Bolay 2020, p. 8). Nevertheless, urbanisation is happening fast in many developing nations. In developing regions, the yearly urban population increase between 2007 and 2025 is likely to be 2.27% (53 million), in contrast to a mere 0.49% (3m) in developed parts of the world (Un-Habitat 2009). Above half of the population growth of the world by the year 2050 will be in the continent of Africa (Bolay 2020, p. 9). Though the urban environment is somewhat a new occurrence in mans' history, urbanisation changes have altered the way we travel, work, live and build linkages (Ritchie et al. 2018), thus the incidence of slums in the urban fabric. About one out of every three persons in the world's urban areas live in a slum (Ritchie et al. 2018).

In Africa, 60% of the urban population on average is crammed in slums – a far greater number than the 34% average in other developing nations (United Nations 2015 as cited in World Bank 2017). Almost all cities of developing countries are reputed for having a high incidence of large slums (Ayuba 2019, p. 3). Amao (2012, p. 72) noted that the rapid growth in the population of city centres has occasioned an increase in living cost, because of the higher demand on urban commodities, which are getting smaller in supply as time progresses. Srinivas (2003) showed that generally it is assumed that urban populations grew quicker than the city's capacities to support them. There is then a shortage and high cost of land in cities as well as a high cost of housing, which is usually in short supply and beyond the economic reach of the large number of urban households that, by the way, fall into the category of low-income (Amao 2012, p. 72). Many of the poor urban households resort to erecting make-shift houses with all kinds of waste materials in illegally occupied land (Olotuah & Adesiji 2006, p. 5). Slums are reputed to have poor housing conditions and are usually constructed with make-shift materials. The buildings constructed from such sub-standard materials are poorly maintained and without sanitary facilities; even the air, light and privacy are inadequate (Olotuah & Adesiji 2006, p. 5). Informal settlements in a lower-middle-income nation like Nigeria house half of the country's urban residents (UN-Habitat 2016b). Some urban areas of the Third World countries have on their city peripheral slum environments where approximately 20% of the world populace resides

in crowded, unhygienic shantytowns ('Slums and Housing' n.d.). Often, slum areas are filled with garbage, animal dung or waste and poor sanitary facilities where individuals reside in a jammed room with gloomy environs under filthy surroundings without potable drinking water facilities ('Slums and Housing' n.d.).

■ The nature of slums and outbreak of diseases like COVID-19

A large part of the slum environment is generally deplorable. The houses in slums are usually overcrowded, and this affects the overall occupancy rate of the city, with a greater number of people residing in single rooms (Olotuah & Adesiji 2006, p. 6). A survey conducted in 2012 by the Participatory Slum Upgrading Programme's Implementing Countries demonstrates that the average room occupancy (number of persons per room) among slum households is four people (UN-Habitat 2016b). Thus, informal settlements are normally 10 times denser than adjoining areas of the same urban environment (Muggah 2020). Moreover, Tsenkova (2012, p. 295) showed that the vulnerability of informal settlements is amplified by the inadequate educational facilities and health care that result from the physical and legal marginalisation of the settlements from the formal city. Mirsaeed (2011, p. 106) also observed that the unsuitable handling of wastewater from homes and commercial/industrial areas in informal settlements creates a disease-prone environment, and this is usually because of a lack of safe collection and treatment of wastewater in these areas. Also, some informal settlements have community toilets that are generally unsatisfactory and most often require that people defecate in pits or the open or ditches, canals or rivers. Additionally, the condition of life in slums is a threat to the health of the dwellers and makes them more exposed to an outbreak of contagious disease, which has dramatic effects on slum inhabitants' life expectancy (UN-Habitat 2016b).

Meanwhile, about 3.4m people die yearly from avertible diseases connected with lack of access to pure and safe drinking water, insufficient cleanliness and poor sanitation (World Health Organization [WHO] 2020a) and around 1.8m people die each year from diarrhoea and other ailments associated with unclean water, with children usually below five years of age being the largest casualty – 90% (UNICEF 2008). This condition can be compounded as slum dwellers do not have enough knowledge or information on personal hygiene (Islam & Kibria 2020). Karn, Shikura and Harada (2003) cited in Ayuba (2019, p. 16) showed that the increased morbidity rate in slums was a result of the rife illiteracy, low earnings, absence of sanitation and personal hygiene. These health disasters demonstrate how terrible the effects of slum neglect can be, because the

absence of basic services, community engagements, household surveys and planning aided the spread of the disease (UN-Habitat 2016b). Finally, Sampaio (2020) has asserted that the global threats rooted in the unsanitary conditions and other let-downs in worldwide urbanisation patterns are presently coming back to inflict humanity – jointly, given how interrelated cities are through trade, air travel and investment streams. Places such as Lagos, Rio and Dhaka witness more diverse challenges in the fight against COVID-19 virus than places like New York City (Muggah 2020), possibly because of the population pressure and prevalence of slums in these areas. Sampaio (2020) observed that a 2015 article in the journal *Infection Ecology and Epidemiology* stated that the critical places for transmission of infections from animals to humans are usually connected with areas where the course of urbanisation is on the obvious rise. Besides SARS, MERS, Ebola and swine flu, the COVID-19 virus fits into a tendency of more global occurrence of infectious ailments in the 21st century that experts believe are partly connected to the uncontrolled number of people residing in cities (Sampaio 2020).

Plagues and pandemic outbreaks have majorly altered the political, economic and social facets of human existence, with their effects sometimes persisting for centuries (Huremović 2019). There have been facets of plagues that have shaped human history since 400 B.C. Most common ones include Spanish Flu (1918–1920), HIV Pandemic (started in the early 1980s till date), Smallpox (1972), the SARS (21st century), the Ebola outbreak of 2014–2016 (Huremović 2019) and then the latest COVID-19 pandemic. The COVID-19 virus was first observed on 31 December 2019, when 27 cases of the pneumonia-like health condition of unknown origin were reported in Wuhan City, Hubei Province, China (Lu, Stratton & Tang 2020 as cited in Sohrabia et al. 2020). The World Health Organization declared the Chinese COVID-19 outbreak a Public Health Emergency of Universal Concern being a big threat to nations with ineffective health care systems on 30 January 2020 (Sohrabia et al. 2020). The spread of the COVID-19 pandemic has altered the potency of many of the great cities of the globe such as Wuhan, Madrid, Milan, New York City and others (Sharif 2020). COVID-19 virus outbreak is a global pandemic that entails global reactions (Muggah 2020). Thus, the World Health Organization advised countries to localise the measures they outlined to help mitigate the spread of the virus (WHO 2020b). Such measures include movement restriction or lockdown; social distancing; avoiding touching the nose, mouth and eyes; covering nose and mouth with a bent elbow or tissue while coughing or sneezing, etc. (Islam & Kibria 2020). Moreover, self-isolation should be done by persons possibly exposed to COVID-19 infection (people with symptoms like headache, cough and mid-fever), which are important to prevent public transmission (Islam & Kibria 2020). Therefore, people must

stay in a distinct room during isolation or quarantine (WHO 2020c) and wear a face mask and avoid close contact with people if anyone must go to public settings. Furthermore, people should also practice constant and judicious hand washing with water and soap (Islam & Kibria 2020) or clean them with an alcohol-based sanitiser as this kills the viruses that may be on the hands. World Health Organization (WHO 2020d) further proposed that functional hand-washing equipment with soap and water should be accessible within 5m of toilets.

The outbreak of the COVID-19 pandemic showed that the initial response to the pandemic globally was varied. Many countries enforced movement restrictions, border closure in some cases, changes in the pattern of public and private transportation, among others. Some developed countries also put up some measures to help people cope better in the face of the global pandemic. Muggah (2020) opined that several governments are reacting to COVID-19 outbreaks in slums in one of two ways: with neglect or with a heavy fist. For example, the Nigerian government among other provisions released palliatives to 2.6m households (later increased to 3.6m households) in the form of food and money for the poorest in society (Eranga 2020, p. 221). This has been greatly criticised by the citizens as being politicalised and not allowed to reach the true intended beneficiaries. And in locations where food donations are provided, provisions are largely inadequate (Muggah 2020) because of the high population of the poor in society.

■ Slums amidst COVID-19: Impacts and implications

About 1bn estimated population of people worldwide live in slums or informal settlements, and it is obvious that the World Health Organization endorsed measures for the prevention of COVID-19 infection are virtually impossible to practice in these vicinities (Sharif 2020). For example, Muggah (2020) showed that combating the COVID-19 pandemic is proving tough in Lagos, the biggest city in Nigeria and the epicentre of Nigeria's COVID-19 outbreak. Almost three-quarters of Lagos residents live in one of her 100 slums (Muggah 2020). Furthermore, Muggah (2020) showed that the 2016 special edition of the *Lancet* on slums reported that people residing in informal settlements also suffer excessively from fundamental health conditions like diabetes, obesity and hypertension. He further stated that these health problems can worsen respiratory diseases like the COVID-19 virus (Muggah 2020).

However, with the enforcement of movement restriction, Sampaio (2020) has noted that Annie Wilkinson, a public health professional at the Institute for Development Studies, questioned the ability of people to obey the two most fundamental government directives to isolate themselves

and wash their hands meticulously where there is an inadequate supply of water as a basic needs and where space is limited and rooms are usually shared. Social distancing measures prove difficult in slum areas because of combination of lack of sanitary environment (Sampaio 2020), high density (Islam & Kibria 2020; Sampaio 2020), overcrowding, the desire to visit communal toilets and water points and narrow pathways (Sharif 2020). Also, slum residents are typically involved in daily wage-paying jobs and are therefore poor (Islam & Kibria 2020). They leave their houses every day to seek their livelihood even during the period of lockdown (Islam & Kibria 2020). Such works provide no pension or health insurance – no basic social welfare Muggah (2020) – and are at risk of shocks because of the COVID-19 pandemic (World Bank Group 2020), thus the need for monetary and food support especially for these vulnerable humans. Meanwhile, Muggah (2020) showed that the majority of the world's poorest urban residential areas also lack a private bathroom or toilet and also clean potable water, making prevention practices like washing hands a challenge. Moreover, three-fourths of slum families stay or live in one room (National Institute of Population Research and Training 2015). Living in one room inhibits most slum inhabitants from performing home isolation (Islam & Kibria 2020) when the need arises.

In addition, the negative effect of the application of COVID-19 contention measures has been recorded generally. Ejiofor (2020) reported that there is more than a 50% rise in reported cases of sexual violence during the pandemic (lockdown). Income loss, increased stress, restrictions on movement, separation or quarantine and overcrowding all escalate the chances of children witnessing sexual, psychological and physical violence at home (Ejiofor 2020). Slum-dwellers are usually poor and also the most vulnerable in this regard. Thus, the effort to curtail the impact of the pandemic must also aim at economic empowerment so that urban life in the post-COVID-19 world can be better sustained.

Meanwhile, the World Bank Group (2020) showed that slums are evolving hotspots for the transmission of the COVID-19 virus. To curtail the spread of COVID-19 infection, some effective measures ought to be implemented for slum occupants (Islam & Kibria 2020). The earlier noted statement by the World Bank former president (Robert McNamara 1968–1981) that if cities do not address the challenges of slums constructively, that slums will deal with the cities destructively (Selja 2005 in Ayuba 2019, p. 17) possesses a serious concern especially because of the most recent experience from the COVID-19 pandemic. Thus, any disease outbreak in slums will invariably affect other parts of the city because most slum dwellers have their places of economic activities within the organised city setting and have contact for a greater part of the day with people living in such locations. Bolay (2020, p. 1) noted that urban planning was regarded

as a spatial approach and a technical tool to organise space, without giving much consideration to social challenges. In the face of the recent COVID-19 pandemic and from the lessons thereby learned, this has to change. Urban planning needs to begin to recognise and handle peculiar societal urban problems. Moreover, Prüss-Üstün and Corvalán (2006) as cited in Maller et al. (2009, p.51) asserted that about one-quarter of the world disease challenge and above one-third of the problem among children is as a result of modifiable environmental issues. This, therefore, calls for a coordinated intervention in slums to combat a common enemy (COVID-19 and related diseases) and also make for a sustainable city in post-COVID-19 world.

■ Methods

A desktop research method was employed to make use of the extensive but unorganised online literature related to the subject of interest. The study sought to harmonise the findings of such relevant literature (mostly online databases) while making other necessary inputs to address the subject of COVID-19 pandemic and sustainability of urban life. The sourcing of online literature for this study followed a systematic order as outlined in De Beer et al. (2020) and used in Ezeadichie, Onodugo Vincent and John-Nsa (2022).

■ First step: Define the study objectives

The objectives of this study are to:

1. examine the dynamics of urbanisation and population growth
2. examine urban and slum features in relation to disease spread and the COVID-19 pandemic
3. source for options of improving urban sustainability through slum improvement in the face and from experiences of the COVID-19 pandemic.

■ Second step: Identifying appropriate search strategy for the study

Online scholarly articles pertinent to the research objectives were sourced from google.com, which opened up other literatures from other electronic databases such as ResearchGate, EBSCOhost, Google Scholar, etc. Some key words were used to elucidate articles relevant to the study. Words like urbanisation, urban area, slum or informal settlement features, slums and healthy environment, slums and COVID-19, COVID-19 pandemic, etc. were used.

■ **Third step: Selection criteria for relevant materials**

Articles published from 1995 to 2022 were sought. This was to cover the duration of time perceived not to be obsolete and can reflect the current and evolving societal changes. Moreover, relevant literatures were basically those from African countries, China, India and a few developed countries. Particular interest was paid to relevant literature on Nigerian cities and towns.

■ **Fourth step: Sieving the relevant articles and data**

The articles retrieved were read, and those with relevant information based on the research objectives were retained. The materials and data sieved were based on the following:

1. International online literatures and resources on the world view of slum characteristics and urbanisation. The literatures were assembled based on their content in relation to slum parameters or reports and urbanisation cum population dynamics in urban areas. This is to lay a foundation for understanding the subject under discourse. Some of the literatures found under this phase are Amao (2012); Ayuba (2019); Bolay (2020); Campbell (1996); Olotuah and Adesiji (2006); NIPORT (2015); Mirsaeed (2011); Ritchie et al.(2018); Racelma (2012); Onodugo et al. (2016); UNICEF (2008); UN-Habitat (2009); Tsenkova (2012); Srinivas (2003); Slums and Housing (n.d.).
2. The second stage involved the appraisal of literatures with content on the slum and COVID-19 pandemic. This was needed to appraise the nature of scholarly output on slums and its relationship to the COVID-19 pandemic. The findings here reveal what has been covered in literature in the aspect of slum situation or conditions and the COVID-19 pandemic. Works considered under this front include Ejiofor (2020); Eranga (2020); Huremović (2019); Lu et al. (2020); Muggah (2020); UN-Habitat. (2016b); Sohrabia et al. (2020). World Bank Group (2020) Solymári et al. (2022); Wirastri, Morrison and Paine (2023), etc.
3. The review was furthered to elucidate information on the management and intervention measures that address COVID-19 and other related pandemics and even make for healthy sustainable slums and cities. From this review, the section on the intervention measures that address COVID-19 and other related pandemics and boost the economic, social and healthy sustenance of cities as a whole was written. Other relevant studies reviewed in this area include Zheng, Shen and Wang (2014);

Gouverneur (2015); Islam and Kibria (2020); Maller et al. (2009); Roy (2005); Sampaio (2020); Roy (2011); Sharif (2020); UN-Habitat (2003); UN General Assembly (1987); WHO (n.d., 2020a, 2020b, 2020c); John-Nsa (2021).

4. Other articles that had information related to any aspect of the review but whose topic does not relate to the themes of the review were also extracted to glean such relevant information. Articles in this category include: Santamouris and Vasilakopoulou (2021). Two other articles were used to elucidate information on appropriate methodology for the study (De Beer et al. 2020; Ezeadichie et al. 2022). There were also sources retrieved from the already obtained articles during the review process. These articles include UN-Habitat (2016a); United Nations (2015); Prüss-Üstün and Corvalán (2006); Selja (2005); Karn et al. (2003); Brinkerhoff (2002).

■ Fifth step: Harmonising and reporting information obtained

The elucidated information was harmonised into sections and sub-sections for presentation in this chapter. A total of 43 literatures were considered relevant and used for this study. However, from their incitation, six other articles were also identified, giving a total of 49 references.

■ Results: Responses and solutions

Efforts to mitigate the spread of the COVID-19 virus and other related diseases should be holistic, putting aside all aspects of marginalisation to fight a common enemy. According to Wirastri et al. (2023), there is now strong evidence linking the physical, social and economic aspects of our living and working environments to both individual and community health. It is also essential to implement significant corrective measures in places where these elements have a negative impact on human health. It should be noted that the spread of the virus has no respect for persons or location, and the nature of places such as slums could hasten the spread of the disease, as already discussed. Moreover, the 11th of the Sustainable Development Goals is 'to make cities and human settlements inclusive, safe, resilient, and sustainable'. Thus, the stance that slums are marginalised because they are usually without secured tenure ought to be reviewed and possibly discarded. Furthermore, the control of the COVID-19 virus should follow the course of life and the uniqueness of various settlements if its impact is to be mitigated in the present and the future. For slums to fare well in the face of COVID-19-related pandemic, partial interventions should focus on improving social distancing and environmental cleanliness

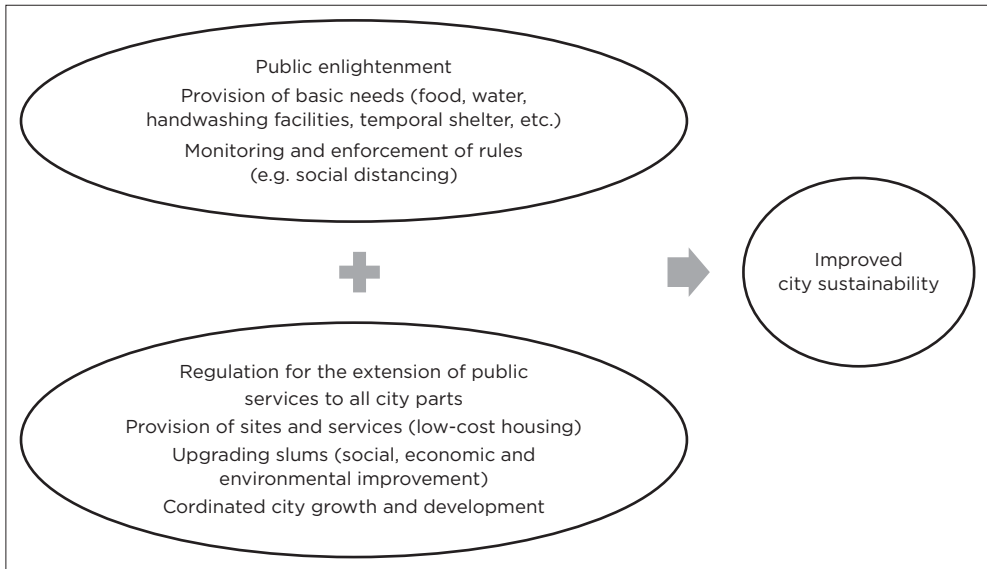
in various ways. Because of high rates of illiteracy associated with slums, provision should be made for the dissemination of information on the virus or disease and the methods of spread. Efforts should be made to increase awareness of the importance of individual hygiene among slum residents and enhance sanitation facilities in slums to combat the COVID-19 virus (Islam & Kibria 2020; Sharif 2020) and other related disease outbreaks. This awareness can best be achieved using indigenous languages, local government officials and slum administrators who are trusted by the people. This would also allay slum dwellers' feelings of mistrust towards government and contribute to residents accepting further interventions in the area. The interventions as harmonised in Figure 2.1 could include:

- *Hygiene*: It is important to provide handwashing facilities, public and/or temporary toilets (sanitised every 4–6 hours), soap, water, disinfectant, hand sanitiser and masks. Handwashing facilities should be provided about five metres from toilets and bathrooms in cases where it is not possible to provide additional toilets and bathrooms so that the users are limited to a single household.
- *Housing*: Housing was an important aspect of containing the spread of COVID-19 and other related ailments, providing space for isolation as well as shelter during lockdown. Thus, Islam and Kibria (2020) advise the government to provide fundamental needs including housing, food, utilities and health care services for all slum residents free of charge throughout the pandemic period so that they are not obliged to seek the means of survival. They also propose that temporary lodgings, with handwashing facilities, living space and latrines, should be constructed to cater for residents' additional housing requirements such as COVID-19 and other related pandemics. Even though provisions in the form of food and money may have been distributed, there is a need to reach more people. Since there have been allegations of governments politicising such gestures, slum leaders and representatives of various groups in slums should be co-opted into schemes and possibly be engaged in the distribution of provisions. Sharif (2020) further recommends that governments could adapt and use available buildings such as closed schools, community centres and shops to offer emergency accommodation.
- *Water*: Supplying adequate water to slum dwellers is essential. Since living quarters in slums are cramped and it may not be possible to altogether stop the collective use of household facilities such as toilets, bathrooms and kitchens, adequate water supply can help in ensuring that public facilities within the compounds are regularly cleaned. This could also be enforced through local administrators, with strict monitoring and sanctioning of defaulters.

- *Monitoring COVID-19 cases:* Slum administrators could be equipped to help monitor infection in slum settlements by tracking and reporting suspected cases to the appropriate bodies. Sharif (2020) also proposes that communities could observe the spread of COVID-19 and other related diseases and select existing spaces to be used for quarantine.
- *Social distancing:* Locations within slums that could attract crowds should be regulated by community leaders and social distancing should be upheld. Where social distancing seems impossible, such places should be provided with a thermometer to check users' temperatures. Those with high temperatures or older adults with a health condition should be encouraged to stay indoors or prevented from entering or using the facility.

A recent trend in working towards sustainable urban environments in relation to slums is the Cities without Slums initiative, which is aimed at developing measures or policies to enable the elimination of slums in the cityscape and inhibit the incidence of slum development. To achieve these goals, cities in developing countries should robustly implement urban planning and management policies intended to inhibit the emergence of slums, coupled with slum upgrading, within the tactical framework of poverty reduction (UN-Habitat 2003, p.29). Gouverneur (2015, p. 1) proposes ways of making future informal settlements sustainable by ensuring that planners focus on all aspects of urban development, including balanced land use, water management, energy efficiency, movement, community involvement, food security, good governance, competitiveness, productivity and the formation of uniqueness and sense of place. Thus, such efforts in the long term, as shown in Figure 2.1, include:

- *Extension of public services to all parts of the city:* The stance that slums are usually without secured tenure and should be marginalised in terms of the provision of urban facilities should be reviewed and possibly discarded. UN-Habitat (2009) shows that attaining sustainable cities and promoting climate protection necessitates planned modification of the way cities are serviced and spatially organised. Policies for the extension of urban facilities and infrastructure to all parts of the city should be put in place. This would help to give slum areas a sense of inclusiveness in the urban landscape. As stated by the then Minister of Housing for Algeria, Mr Moussa, the provision of sanitation, clinics, schools and electricity is important, but sustainable development plans cannot be designed devoid of sustainable urbanisation, and there is a need to lessen the disparity between the poor and the rich by providing basic services to everyone (Racelma 2012).
- *Curtailing slum development:* In a bid to curtail the development of slum development, adjoining urban lands could be annexed to the city through the provision of sites and services. This would help curtail the



Source: Author's synthesis based on a range of Statistics South Africa data.

FIGURE 2.1: Short- and long-term solutions towards slum improvement during COVID-19-related pandemic and thereafter.

development of slums on the urban periphery. Urban boundaries should be well defined and monitored to avoid the incidence of slum development. Moreover, low-cost housing should be provided as a social welfare package to assist the urban poor to access housing.

- *Upgrading slums:* In order to implement best practice in mitigating the spread of COVID-19-related diseases in slums, the upgrading of such settlements should be initiated and implemented with immediate effect. Upgrading is increasingly being advocated. Roy (2005) points out that there has been a remarkable emphasis on urban upgrading strategies as a welcome change from previous policies that sought to eradicate informal settlements or relocate them to urban peripheries. Government, non-governmental organisations (NGOs) and slum dwellers could optimise this period by sourcing external interventions to improve conditions in such settlements even in the post-COVID-19 pandemic. This could be achieved through financing from government, NGOs, institutions and patriotic individuals or groups, with the involvement of slum leaders (e.g. community chairs, neighbourhood watches or other types of leaders). John-Nsa (2021) suggested that upgrading and formalisation of informal settlements can be done incrementally. Although upgrading, formalisation and other forms of informal settlement intervention are important, the key element of the present paradigm of sustainable human development is the idea of human improvement, aiding the underprivileged to help themselves (Roy 2005). Such upgrading must also involve human development.

As Roy (2005, p. 150) notes, emphasising the physical environment rather than human development is an 'aestheticisation of poverty'. Interventions to achieve sustainable development goals should therefore be tilted towards assisting the underprivileged to help themselves (John-Nsa 2021). Because of the high costs of upgrading, especially in the face of dwindling economies impacted by the COVID-19 pandemic, there is a need to empower slum dwellers through incentives, loans and grants to undertake the upgrading of their settlement. However, the Wirastri et al. (2023) study emphasises how critical it is to give investment top priority right away in order to support community and health care system resilience in general. Moreover, the human development initiative aspect should also involve educational empowerment through formal education, informal training, vocational trainings and semi-formal learning. This would encourage slum dwellers to seek the improvement of their settlement. Community involvement in projects where external funding is made available for slum upgrading will help to achieve benefits. Public participation or community involvement is defined as a dynamic relationship among different actors hinged on mutually agreed aims, followed through a common understanding of the best rational division of labour based on the respective comparative advantages of each partner (Brinkerhoff 2002, p. 21 in Zheng et al. 2014, p. 13). UN-Habitat (2003, p.28) contends that there are good prospects for improving the effectiveness of policies on slums through the complete involvement of the urban poor and those conventionally in charge of housing development and investment. Community involvement or public participation in slum upgrading will enhance penetration and success in these areas, which are reputed to be resistant and hostile to most forms of external intervention because of the insecurity of tenure, and will contribute to the sustainability of such projects in the long run.

■ Conclusion

Urbanisation, especially the high rate at which it is taking place, has been a major concern to policymakers and urban planners. The COVID-19 pandemic has highlighted the dire need to address the attendant consequences of high urbanisation rates, as evidenced by the presence of slums in most cities. The deplorable environment of most slum settlements promotes the easy spread of infectious diseases such as COVID-19. Measures to mitigate the spread of the COVID-19 virus – including social distancing, lockdown or movement restriction, regular hand washing and self-isolation – are generally difficult for slum dwellers to comply with. Because of the population density and high room occupancy found in most slums, social

distancing and self-isolation seem difficult, if not impracticable. Apart from the deplorable nature of the slum environment, the economic ability of the inhabitants is generally weak, as they are mostly found in informal employment or daily paying jobs, which do not permit them to adhere to lockdown measures and may not afford regular hand washing facilities. It could be said that the environmental and economic capability of informal settlement dwellers limits their capacity to cope during the pandemic and could further endanger their lives as well as those of the general urban population. This chapter recommends that slums should be given support if the overall aim of curbing the pandemic and maintaining health cities is to be achieved. In the short term or during the pandemic or other related pandemics, because of the economic recession in most countries, partial support, such as providing hand washing facilities at strategic places in the slum settlements, public toilets and bathing facilities to augment the already existing ones and engaging leaders to sensitise community members and trace COVID-19 and cases of similar diseases within the settlement, could be initiated to help mitigate the spread of the virus. The lessons learnt from the pandemic must not be discarded if the future is to be guaranteed and sustained. Thus, there is a need for more deliberate efforts targeted at addressing environmental and economic issues as manifested in slums. The Cities without Slums concept should be vigorously pursued, entailing economic, social and environmental upgrading of settlements and their inhabitants. The physical upgrading of existing slums must be accompanied by human development initiatives to empower slum dwellers to help themselves in the future. Measures or policies should be initiated to inhibit slum development in cities, such as city annexation.

This chapter brings to light the impact that slum neglect could have on the health, economy and social setting of the overall population and also makes useful suggestions on how functional interventions could be carried out in slums in the fight against the global pandemics like the 21st-century COVID-19 pandemic. The chapter will most likely make urban managers and policymakers aware of the need for holistic city development, based on the experience or lessons learnt from COVID-19 pandemic. Furthermore, the chapter also proffers the means of making cities more sustainable in their efforts to recover from the impact of the COVID-19 and other related pandemics and to ensure the reduction of incidence of crime, social unrest, insecurity and more severe economic hardship that are likely to affect urban populations after pandemics of such nature.

Access to information is crucial to people with disabilities: A case of COVID-19 in South Africa⁴

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■ Abstract

Background: The World Health Organization (WHO) advocates actions such as ensuring access to public health information; however, this is not always feasible in countries such as South Africa.

Aim: To present the experiences of people with disabilities in South Africa regarding access to information about the coronavirus disease 2019 (COVID-19) pandemic.

4. This chapter is based on the following technical report: Ned, L, Swartz, L, McKinney, EL, McKinney, V. 2021. 'COVID-19 and disability considerations: Report on the experiences of people with disabilities in South Africa', [http://www.sun.ac.za/english/faculty/healthsciences/Centre%20for%20Rehabilitation%20Studies/Documents/REPORT%20-%20COVID%2019%20AND%20DISABILITY%20CONSIDERATIONS_edited_13%20October%202020%20\(2\).docx.pdf](http://www.sun.ac.za/english/faculty/healthsciences/Centre%20for%20Rehabilitation%20Studies/Documents/REPORT%20-%20COVID%2019%20AND%20DISABILITY%20CONSIDERATIONS_edited_13%20October%202020%20(2).docx.pdf)

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Methods: I use data from a mixed methods study conducted in South Africa. Data were gathered through an online survey that was distributed through various disability networks and organisations.

Findings: The findings reveal that people with disabilities did not always have access to disability-targeted information during the first hard lockdown of the pandemic. While some generic information was provided, they were often unable to differentiate between fake and valid information and did not have the means of asking follow-up questions.

Conclusion: Key actions such as providing information in various accessible formats are integral to ensuring that the needs of people with disabilities are not neglected and contributing towards ensuring a disability-inclusive pandemic response.

■ Introduction

Coronavirus disease 2019 (COVID-19) emerged in Wuhan, China in December 2019, resulting in a devastating global pandemic (World Health Organization [WHO] 2020b; Zhu et al. 2020). The WHO declared COVID-19 a global pandemic in March 2020 (WHO 2020b). Like many other countries, South Africa responded by declaring a national state of disaster, which was gazetted on 15 March 2020 in terms of section 3 of the *Disaster Management Act 57 of 2002*. On 23 March 2020, President Ramaphosa announced a national lockdown, which was set to commence on 26 March 2020, with the aim of delaying and limiting the spread of the COVID-19 pandemic as well as preparing the national health care system.

Vulnerable populations are especially susceptible to the negative impacts of COVID-19. According to the WHO (2020a), people with disabilities and those with underlying conditions are at greater risk of developing serious illness from COVID-19 and also more likely to die. Insufficient attention has been paid to some deeply disturbing questions related to certain vulnerable groups affected by the pandemic; for example, there are crucial questions related to the impacts on people with disabilities, who are particularly exposed to the risks of the pandemic, and the measures taken to address the impacts. The issue of disability is important, because people with disabilities make up 7.7% (3.8 million) of South Africa's population, according to the 2016 Community Survey (Stats SA 2018). People with disabilities tend to have increased health care needs, with important implications for public health (Ned et al. 2020a, 2020b; McKinney, McKinney & Swartz 2020).

While the COVID-19 pandemic is often referred to as a 'great leveller' that collapsed differences and exposed everyone to the same risks, the reality is that the pandemic exacerbated inequalities and disproportionately

affected the most disadvantaged groups in the population in various ways (Sakellariou, Malfitano & Rotarou 2020; UN 2020). For example, existing unmet needs for rehabilitative treatment may be exacerbated by the pandemic as a consequence both of the containment strategies and the increased demand (Ambrosino et al. 2020). Discriminatory laws, poorer health outcomes, increased health needs, as well as experiences of stigma among people with disabilities, may be worsened (Armitage & Nellums 2020; Kittay 2020; Kuper et al. 2020; Ned et al. 2020a, 2020b). Routine services may be more difficult for people with disabilities to access, given the already limited resources in a context where the demand for such services is increasing (Ned et al. 2020a, 2020b). In this context, the needs of people with disabilities may be deprioritised. Some people with disabilities already have inadequate access to water, sanitation and hygiene facilities, making frequent handwashing difficult – a practice that is central to containing the spread of the disease. Additionally, social distance may be impossible for those depending on personal assistants or carers, as well as those living in institutional care, yet some people with disabilities are unable to function without such care. High risks of viral outbreaks have been noted in many institutions, such as homes for the aged or care facilities for people with disabilities where people live in close proximity to one another (Presidency 2020; Meaney-Davis, Lee & Corby 2020; Minkowitz 2020). After reviewing data from 30 countries, the WHO (2020a) posited that people with disabilities account for a very large proportion of the deaths related to COVID-19. However, given the lack of disaggregated data on disability and COVID-19, the extent of the effect that the pandemic has had on disabled people of all ages, whether in care homes or in the community, remains unknown. As the infection rate and the death toll keep rising, government responses ought to come under close scrutiny, because people with disabilities are at higher risk of being impacted not only by the pandemic but also by the measures taken to control it.

This chapter discusses access to information as one of the key issues emerging in relation to COVID-19 and disability and its relevance for knowledge production and dissemination post-COVID-19 in South Africa.

■ Understanding disability-related issues during the time of COVID-19

People with disabilities, as defined by the UN Convention on the Rights of Persons with Disabilities [CRPD]), include:

[7]those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others. (UN 2006)

People with disabilities face issues such as social isolation, exclusion and discrimination, among others, which impose various levels of vulnerability. People with disabilities experience challenges in moving freely and using spaces in the way that people without disability can. For instance, in the absence of ramps, buildings become inaccessible to those using a wheelchair, disadvantaging them in various ways and causing multiple layers of vulnerability. South Africa is unusual in having a Constitution (Constitution of the Republic of South Africa, 1996) that specifically advocates eliminating exclusion on the basis of disability, alongside other equity categories. However, it is generally true to say that the country is not performing well in taking appropriate measures to ensure that barriers to the inclusion of people with disabilities are alleviated.

During the COVID-19 pandemic, growing numbers of people have become much more socially isolated than they were before, in some cases experiencing serious illness with ongoing consequences, which might in turn contribute to various impairments. Many more people have experienced isolation, vulnerability and frailty, which are well known to people with disabilities. However, many of the barriers facing people with disabilities are not intrinsic factors, but environmental and systemic factors. As COVID-19 continues to ravage the country (and the world), there are growing concerns that the dissemination of critical information is not reaching people with disabilities. Inadequate knowledge related to COVID-19, resulting from the dearth of information in accessible formats, exposes people with disabilities to various risks and adds to their existing vulnerabilities. Ineffective information and communication are longstanding and well-documented barriers facing South Africans with disabilities (Ned et al. 2020a, 2020b; Ned & Lorenzo 2016; Ned-Matiwane 2013; Meyiwa 2010). Poor access to information is also noted as a barrier to accessing health, social services and other opportunities of social inclusion (Ned-Matiwane 2013). People with disabilities may thus not be able to access health information and communication on prevention measures because of inaccessible formats, as evidenced in a rapid review on the impact of COVID-19 (Meaney-Davis et al. 2020). Poor access to information may subject people with disabilities to higher risk of contracting COVID-19, as Kuper et al. (2020) and Mulibana (2020) argue.

■ The South African case

The WHO (2020a) published a document titled 'Disability considerations during the COVID-19 outbreak' on 26 March 2020, recommending actions to be taken to ensure that people with disabilities are able to access public health information, sanitation and health services (among other services). However, in countries such as South Africa, many of these measures

remain inadequate. For example, people with disabilities are encouraged to purchase essential items, including food and medicines, online (WHO 2020a); however, this option is not available to the majority of people with disabilities living in South Africa for various reasons, including not having a credit card or funds available; inaccessible online shopping platforms because of challenges related to internet connectivity, electricity and electronic devices or living in an informal settlement or rural area where there are no delivery services (Emmett 2006; Groce et al. 2011; McKinney et al. 2020). People with disabilities are furthermore advised to ensure that they frequently disinfect assistive devices used every day, especially when used in public spaces (WHO 2020a). However, it remains impossible for most South Africans with disabilities, who are already constantly struggling to put food on the table with inadequate funds, to buy expensive cleaning products and disinfectants (McKinney et al. 2020; Mulibana 2020).

As part of South Africa's Constitution, the Bill of Rights states that all people, including people with disabilities, are equal, and that everyone has the right of access to information, health and social security (among other rights). The South African government used mass media (such as television and radio) and technologies for information dissemination and communication (such as mobile telephone and social media platforms) to publicly raise awareness about the pandemic. The movement of people and large gatherings was either restricted or banned during the various lockdown levels of the pandemic, with the implication that many ways of spreading information were not available. Written pamphlets are often used to distribute information, but barriers such as language as well as lack of braille-translated material remain. While many efforts are noted (including zero-rated online information portals run by the Department of Health), growing concern remains that some people with disabilities are being left behind in accessing information on COVID-19 for a range of reasons, including:

- Most people with disabilities still face digital exclusion because of inadequate access, limited affordability of the resources required and lack of disability-friendly formats of information provided. The latest report on progress in attaining the sustainable development goals in relation to disability shows this divide clearly (UN 2018).
- People with hearing impairment are often without sign language interpreters, and service providers are unable to use sign language in hospitals (Huisman 2020), a situation that hinders access to medical care.
- There are often no printed messages in braille.
- Not all national televised broadcasts or press briefings on topics such as COVID-19 transmission, prevention or statistics have sub-titles or an

interpreter, thus resulting in many people with hearing impairments being excluded (McKinney et al. 2020). There are also no available transcriptions provided for discussions by national experts.

- The compulsory wearing of masks makes it impossible for lip readers to lip read what service providers are saying. Owing to exclusion, low levels of literacy among many people with disabilities also introduce additional communication challenges (Andrade & Baloyi 2011; Glaser & Van Pletzen 2012). The implication is that people with disabilities are likely to be excluded unless pandemic responses are disability inclusive in design and implementation (Kuper et al. 2020; Ned et al. 2020a, 2020b). This is important to note because, all too often, people with disabilities are left behind in crisis situations (Meaney-Davis et al. 2020).

■ Policy imperatives

Accompanying the declaration of COVID-19 as a global pandemic, the WHO (2020a) published guidelines to alleviate the impact of the outbreak on people with disabilities. It called upon governments to implement actions to ensure that people with disabilities are not neglected in the fight against COVID-19. Regarding the accessibility of COVID-19 public health information and communication, the WHO (2020a, p. 6) urged governments to:

- Include captioning and sign language for all live and recorded events and communications, including national addresses, press briefings and live social media.
- Convert public materials into easy-to-read format so that they are accessible to people with intellectual disability or cognitive impairment.
- Develop accessible written information products by using appropriate document formats (such as MS Word), with structured headings, large print, braille versions and formats for people who are deafblind.
- Include captions for images used within documents or on social media. Use images that are inclusive and do not stigmatise disability.
- Work with disability organisations, including advocacy bodies and disability service providers, to disseminate public health information.

Since South Africa has ratified the UN CRPD (UN 2006), the country has an obligation to implement the WHO guidelines, and this cannot be treated as optional. According to article 9(b) of the CRPD, states are specifically required to implement appropriate measures to ensure that people with disabilities have access to information, communication and other services, including electronic and emergency services, on an equal basis with others. Furthermore, article 25(b) of the CRPD calls upon states to take all appropriate measures to ensure that people with disabilities have access to health and rehabilitation services (and information) that are gender and disability sensitive.

■ Case example

In 2020, I led a mixed methods study that gathered data through a national online survey (SUNSurveys) during the first and second national lockdown periods in South Africa, as well as through follow-up interviews for more narrative data (Ned et al. 2020a). The aim of the survey was to explore the experiences of persons with disabilities, as well as organisations of persons with disabilities or organisations that serve persons with disabilities (disabled persons' organisations [DPO]), during the COVID-19 pandemic and national lockdown period in South Africa. Full ethics approval was provided by the Stellenbosch University Social, Behavioural and Education Research Ethics Committee (Ethics Number: REC-2020-15244). The study shed light on the various issues including access to information on COVID-19, access to health facilities and services, access to social services, participation in decision-making through NGOs and governmental involvement. For the purposes of this chapter, I report only on the experiences of persons with disabilities regarding access to information during the COVID-19 pandemic.

The development of the survey was informed by current discussions about COVID-19 as well as existing literature about the status of health care access for persons with disabilities both globally and in the South African context. Key documents that informed the thematic areas of the literature review included the UN (2020) 'Policy brief: a disability-inclusive response to COVID-19' as well as the WHO (2020a) 'Disability considerations during the COVID-19 outbreak'. The survey was distributed through DPOs and disability networks country-wide using emails and social media. One hundred responses were received from 8 of the 9 provinces, with the majority of respondents being from the Western Cape (see Table 3.1).

The impairments or disability types represented in this study are quantified in Figure 3.1.

The survey revealed many issues related to COVID-19 and the vulnerability of people with disabilities, but the focus of this chapter is on the theme of rapid access to information.

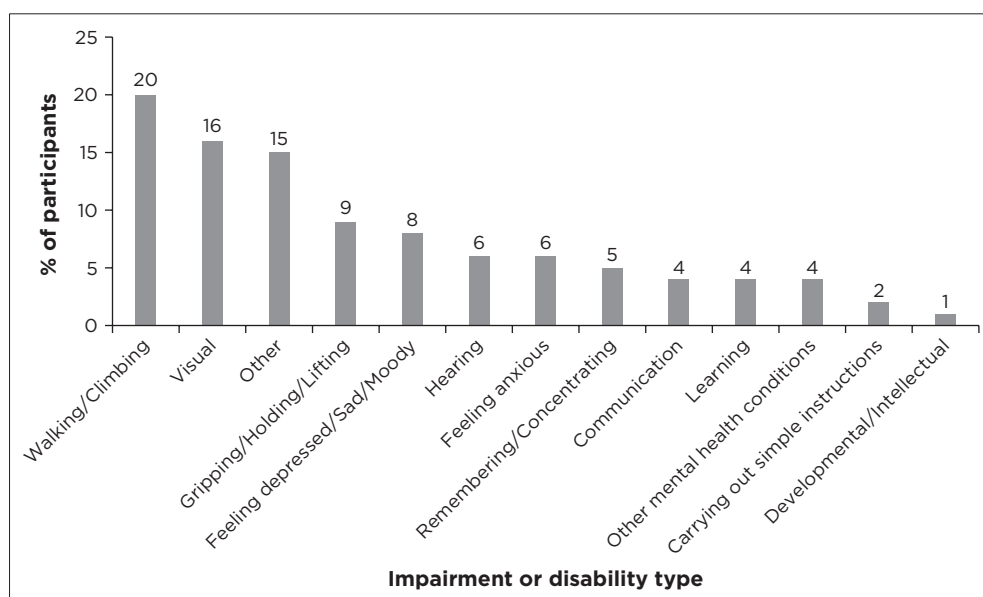
■ Rapid access to information

The study showed that access to generic information on COVID-19 was adequately provided. However, some respondents (33%) reported an inability to ask follow-up questions on the information received. This is indicative of a failure to set up a disability service for communication and a space to raise concerns (WHO 2020a) and may be because of the modes of disseminating information. For instance, this study reveals that most of the information received by participants was through television (23%),

TABLE 3.1: Breakdown of respondents by province.

Province	Percentage of participants
Western Cape	52
Eastern Cape	11
Gauteng	17
Free State	0
KwaZulu-Natal	11
Limpopo	3
Mpumalanga	1
Northern Cape	4
North West	1

Source: Ned et al. (2020a).



Source: Ned et al. (2020a).

FIGURE 3.1: Impairments or disability types represented in the survey responses.

social media (22%), cell phone (17%), radio (16%) or newspapers (10%). It is thus not always possible to ask questions or get direct individually tailored answers through these platforms. It is interesting to note that health and rehabilitation practitioners were not cited as having distributed any information to people with disabilities.

Concerns were reported about little or no availability of targeted disability information related to specific impairment types and the resulting particular needs or required accommodations (Ned et al. 2020a, 2020b).

Respondents also mentioned receiving little or no information on how carers and personal assistants could protect themselves and obtain permits to continue as carers during the lockdown periods. Approximately 24% of participants felt that the information they received was insufficient. The mixed feelings about the information received, or the lack thereof, are reflected in the following comments:

‘Much of the information useful but I feel I was excluded as a blind person since I rely on people guidance and touching putting me on high risk not knowing how to protect myself.’ (Participant 01, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

‘I want to know how I can resume my physical therapy in the safest manner because I have a compromised immune system and a muscle disease so have many breathing difficulties even when not actively ill.’ (Participant 02, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020).

‘Some [*information*] was helpful but not always able to do because your hands are touching the wheels all the time.’ (Participant 03, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

‘The information was general. It is not clear to whom we direct questions to. There is currently no information on assistance provided to persons with disabilities. No work plan procedures/legislation that considers the needs of persons with disabilities.’ (Participant 04, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

‘Wanted to know more about symptoms of people with spinal cord injuries.’ (Participant 05, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

‘Questions I had been that if exposed to COVID-19 would the system in place inclusive enough for the nature of my disability. The testing system did not reach every corner as in a case of voting.’ (Participant 06, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

‘Due to the nature of my disability I need to know whether the health system in place to deal with the victims of COVID-19, does it accommodate the nature of my disability without becoming a victim of the system itself. I’m concerned about an inclusive approach for all vulnerable groups exposed, testing, medication methodology without additional cost and exposure.’ (Participant 07, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

‘The information is helpful. I need to find out more about my illness (immunocompromised) and COVID-19. How dangerous is it to me to contract the illness and is it life threatening?’ (Participant 08, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

‘Unsatisfactory answers in respect of ADHD [attention deficit hyperactivity disorder], ASD [autism spectrum disorder], SMA [spinal muscular atrophy], Down syndrome and learners with physical disability. How will teachers enforce

physical distancing with learners in special schools? Unsatisfactory answers when I requested a breakdown on the number of infections and deaths [...]' (Participant 09, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

Other respondents noted significant information overload as well as an inability to differentiate false news, especially related to information distributed via social media platforms:

'I found the information to be useful but some like in the social media was so not helpful; it only made me to panic (fake news).' (Participant 10, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

'Never was I sure whether the information was true due to false news out there.' (Participant 11, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

'There is a lot of contradictory research published about the virus so one has to decide for oneself what you are going to take on board.' (Participant 12, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

'Too much bombarding with information and changes in protocols at work and on social media.' (Participant 13, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

'Too much information, so difficult to understand what exactly you are referring to.' (Participant 14, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

'Sometimes difficult to separate facts from fiction.' (Participant 15, gender undisclosed, location undisclosed, data is based on an online survey conducted in 2020)

The challenges expressed in these observations demonstrate that information associated with disability was inaccessible. They also demonstrate a failure to meet the WHO (2020a) 'Disability considerations during the COVID-19 outbreak'. Involving and working with disability organisations and practitioners could have alleviated some of these problems related to public health information. Another problem, however, was that many organisations had to close because of inadequate targeted support for community-based organisations (Ned et al. 2020a). This implies that South Africa, as a country, failed to ensure the continuation of disability services or to prioritise access to the necessary resources and equipment.

These challenges added fears and anxieties, which placed additional strain on the mental and emotional well-being of people with disabilities. Such fears included feelings of not knowing what would happen, or what

care they would receive, if they contracted COVID-19; what would happen during isolation or how it would affect their livelihood.

■ Discussion

The low response rate was related to the disparities of digital access, as many disability networks indicated that a majority of their members could not access online platforms because of poor connectivity, limited data and lack of electricity. These shortcomings raise concerns in relation to research because most research activities (as well as teaching and learning) had to move to the virtual environment during the COVID-19 pandemic in order to combat the spread of infection by limiting physical contact. People with disabilities also experience disparities and limitations that are unrelated to COVID-19. For example, many individuals with disabilities, especially those who reside in institutions, group homes or rural areas, may have experienced access and connectivity challenges and consequently not have been able to participate in this survey. These limitations imply that some of the experiences of the diverse, non-homogeneous population of persons with disabilities are not reflected in the survey results, with the risk that future planning for resources will also exclude many of the multiple needs of people with disabilities. This issue needs attention, because South Africa already experiences significant challenges related to under-reporting on matters of disability; for example, disaggregated data for disability and COVID-19 infections are not yet available.

The pandemic has not only exposed the need for effective disability-inclusive systems during pandemics but has also revealed various gaps in current systems for reaching people with disabilities. Using online platforms and digital solutions is often key in disability-inclusive responses, but the findings show that, without universal design, further exclusion may be perpetuated. The South African context and infrastructure fall short of being fully ready for this alternative, particularly because a huge section of society remains digitally excluded, creating service-delivery challenges for the majority of people with disabilities living in poverty in both rural and urban areas. Universal design should therefore form the core of service and product development at no additional cost to people with disabilities.

Information and communication are integral to care and support. Digital platforms and social media have played an essential role during the COVID-19 pandemic. However, the government has grappled with how to effectively communicate the correct information to all citizens. It is clear from the findings that disability remains an afterthought in the planning

and implementation of pandemic responses. For instance, not only did people with disabilities not have clear information about the implications of COVID-19 in relation to their impairment needs, but it was also not clear which support services were available (e.g. social protection services) or how to implement effective measures to prevent infection and protect themselves. This situation is common in many low- and middle-income countries (LMICs). In an audit study, Yap et al. (2020) reveal that only 65% of LMICs made use of sign language interpreters in press conferences, with figures ranging from 33% to 88%. Elsewhere, a global analysis revealed that the WHO's website pages were only 60% compliant with web accessibility guidelines between March and May 2020 (Fernández-Díaz, Iglesias-Sánchez & Jambrino-Maldonado 2020). As Kamalakannan et al. (2021) argue, this lack of accessible information is a modifiable environmental barrier to health equity for people with disabilities. Without accessible information, people with disabilities are unable to benefit from expert knowledge, making them even more vulnerable, especially to the infodemic of misinformation, cybercrime and infection risk. For example, the application of web-accessibility guidelines (Fernández-Díaz et al. 2020), increased provision of sign language interpreters and the utilisation of transparent masks would help to ensure that the dissemination of integral public health information is disability inclusive (Kamalakannan et al. 2021).

Qi and Hu (2020) state that, when one-size-fits-all approaches are applied during times of emergency without a disability lens, inequality will be exacerbated and thus put people with disabilities at even greater risk. Regarding South Africa's pandemic responses, most of the President's briefings to the nation did not utilise sign language interpreters or captions. Notably, people with disabilities cannot be treated the same way as those without disabilities and still be expected to participate fully in all aspects of life. In South Africa, these findings highlight that rapid access to both general and targeted disability-specific information is crucial to ensure that all people with disabilities and their families are well prepared to protect themselves and access what they require. Following the WHO guidelines (WHO 2020a), all telecommunication and broadcasting institutions involved in the design and dissemination of COVID-19 information must ensure that all information is presented in a variety of disability-friendly and accessible formats to enable people with disabilities to receive first-hand information and eliminate feelings of fear, misunderstanding and vulnerability to fake information or misinformation. Similarly, all televised briefings and programmes must include sign language interpreters and transcriptions to enable people with visual and hearing impairments to benefit from expert information.

In addition to general information, there should be more platforms for disability-specific information related to COVID-19. Many participants felt

that the information disseminated did not address their specific needs and questions, and this shortcoming was compounded by the finding that there were limited platforms for directing these questions. These challenges increase the disproportionate impact of the pandemic on people with disabilities and hinder prevention measures. Disabled persons' organisations could perhaps have assisted with hosting disability-specific platforms. However, another issue related to not planning for disability was that many of these organisations were also impacted by COVID-19 because of limited support from government and therefore had to close or limit their services. Nonetheless, DPOs play a key role in disseminating information in alternative formats and facilitating accessible forms of communication, for example, through accessible language, creating infographics and the use of images to support information. Mid-level workers at community level could also contribute to bridging the gaps in access to information.

■ Conclusion

This chapter demonstrated that the barriers of access to real-time information include:

- Lack of accessible varied formats for obtaining information, as well as a lack of a platform to express concerns and get responses to questions.
- The impact of face masks and social distancing measures on people who rely on facial expressions and lip reading to communicate and receive information.
- Poor coverage of sign language interpreters or captions during national COVID-19 briefings.
- Inadequate translation of written formats into various local languages in a multilingual country such as South Africa.

These barriers not only increase the risk of contracting COVID-19 but also exacerbate existing conditions and vulnerabilities such as increased isolation. They also expose the lack of consideration and targeted planning for the needs of people with disabilities. Therefore, government needs to allocate more resources towards providing information in accessible formats.

The starting point for a disability-inclusive response to COVID-19 could include the following as integral government actions to avoid the needs of people with disabilities being neglected:

- Provide information in accessible formats, including deliberate efforts to ensure that information is readable in braille.
- Consider using multiple formats when disseminating information, including formats that are accessible to those with audio or visual disabilities.

- Make use of community-based rehabilitation workers, who have specialised skills at household and community levels and are able to support people with disabilities by bridging the gaps between people and services. Increased investment in these workers could assist in passing information to people with disabilities and their families as well as to relevant government authorities. This information includes increased awareness-raising of stimulus packages and what is required to access these, as well as other interventions or preventive measures to support people with disabilities and their organisations.
- Prioritise the use of closed captioning and sign language in all press briefings, national addresses and social media posts.
- Ensure that all public documentation is easy to read, and that written, audio or image descriptions used in public addresses are provided.
- Use speech-to-text or text-to-speech applications for effective communication.
- Tailor protective equipment according to impairment type; for example, face shields may be better than face masks in some situations to accommodate those who are lip reading.

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The African informal sector: Framing a path amidst the difficulty

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■ Abstract

Background: The informal sector is dominant on the African continent. Such a sector is viewed as one of the primary drivers of a country's economy. Within the African context, the informal sector appears to be an alternative form of employment for people leaving their employment or losing their job in the formal sector.

Aim: This chapter pays attention to analysing reported information around the difficulties that the informal sector has experienced given the challenges posed by the coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic.

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Method: A document analysis was done using key government documents of member countries within the Southern African Development Community (SADC).

Findings: This chapter will discuss (with country evidence) how the informal sector has been impacted by the COVID-19 pandemic.

Implications: Through the documented evidence gathered suggestions are made for the need of a social protection cover especially for the informal sector.

Conclusion: Given the importance of the informal sector to a number of African countries a need exists to pay attention to the development of such a sector.

■ Introduction

The informal sector emerged in the early 1970s and was found to contribute to employment creation (Hart 1973; Sabot 1973) and the economic development of countries (Omoegun, Mackie & Brown 2019). With several African countries attaining independence, economic systems began to be classified with as formal or informal (Sparks & Barnett 2010). The informal economy classification was characterised by a lack of formal registration and also absence to organised markets and resources (Canagarajah & Sethuraman 2001).

Some scholars argue that the informal sector has gained attraction because of prevailing challenge of unemployment and challenges with investment especially on the African continent (Meagher, Mann & Bolt 2016). This emergence has led some scholars to celebrate the informal sector as a dynamic, efficient and democratic alternative to interventionist models of national economic development (Brunger 1990; Chazan 1988; eds. Diamond, Linz & Lipset 1988; Meagher 1995; De Soto 1989). The informal sector consists of businesses that are not officially registered or do not have the required licences or permits to operate (Bruton, Ireland & Ketchen 2012). Businesses in the informal sector often operate on a small scale and often without an address. Such a lack of formalisation makes it difficult to operate and also access funding (Akintoye & Tashie 2013; Osemeke, Nzekwu & Okere 2020). These businesses employ between no employees and up to a maximum of ten undeclared workers with limited skills, with no social protection (Mead & Morrisson 1996). House (1984) divides the informal sector into two subsectors: the intermediate sector that is unregulated and the poor community comprising a large body of residual and underemployed labour.

■ Contribution of the African informal sector

Informal sector operations in Africa are an essential activity for economies of the continent (Kabongo 2019; Madichie, Nkamnebe & Ekanem 2020). These businesses contribute significantly to the gross domestic product (GDP), although only limited data are available on the employment and income generated by the sector, especially in sub-Saharan Africa. In some countries, if the informal economy did not exist there would be no economy, because the informal economy sustains the formal (Devine & Kiggundu 2016). The African informal sector was responsible for creating 1.41 million out of a total of 2.48m jobs between 2012 and 2014 (Madichie, Gbadamosi & Rwelamila 2021). In India, the informal sector accounted for 68% of the net domestic product (Canagarajah & Sethuraman 2001). In the Global South, there is acknowledgement to informal sector role and involvement to economic growth (Sparks & Barnett 2010). This also includes employment creation (Galdino et al. 2018; Ntseane 2019). Potentially, the informal sector being an engine to support and stimulate economic growth (African Union [AU] 2008; Sparks & Barnett 2010).

Considering the role that the informal sector plays in countries' economic development and job creation, Verick (2006) argues for the need to grow the informal sector. This can be done through collaboration between the formal and informal sectors could yield positive results. Collaborations to this agenda for growth become crucial (eds. London & Hart 2011; Prahalad & Hart 2002). A starting point could be the sector embracing technology (Meagher 2018; Rivera-Santos & Rufin 2010). Further, a need exists to improve management systems and practices to the informal sector (Canagarajah & Sethuraman 2001).

■ Heterogeneity of the informal sector

The informal sector is heterogeneous. Firstly, not all businesses in the informal sector are informal. Resources and capability access become important to informal sector development. Businesses in the informal sector tend to comply with some of the regulations, which assures them partial recognition (Canagarajah & Sethuraman 2001).

The informal sector's partial compliance can potentially serve as a threat to its development. However, strategies need to be in place to assist in achieving this level of compliance (Mathibe, Mochenje & Masonta 2021). Establishing linkages between different stakeholders can be a starting point (Devine & Kiggundu 2016).

Secondly, in the informal sector, a need exists to strengthen network and market access (Igwe, Newbery & Icha-Ituma 2018). The lack of this is

partly because of the legal status of these businesses. As a result, they are excluded from traditional markets and rely on informal markets for information, credit, products and skills (Osemeke et al. 2020).

Thirdly, a gender dimension exists; most businesses in the informal sector in Africa remain largely run by women (Canagarajah & Sethuraman 2001). This means that there are a whole range of enterprises with varying degrees of informality. Therefore, the cost of remaining informal is relatively higher for specific categories of workers. The risks and constraints faced by such businesses affect their operation and subsequently their performance (Simanis & Hart 2009). Policy and practitioner interventions become necessary to also intervene in such challenges (Fourie 2018).

■ Challenges of the African informal sector

The informal sector is the main contributor to the economies of African countries gaining labour to the formal sector (Chidoko et al. 2011; Mathibe et al. 2021). A case example to note here is the Nigerian informal economy (Igwe et al. 2018). Notably, informal sector operators in Nigeria face challenges related to adherence to bylaws resulting in them being harassed (Osiki 2018). Such experiences need to be noted with training provided to assist government support informal sector development (Chambwera, Zou & Boughlala 2011; Madichie et al. 2013). Businesses in the informal sector face multiple challenges, partly because most of these businesses are very small and run by unskilled individuals with limited or no education. Some of the informal sector businesses do not comply with regulations or follow the proper channels because of lack of awareness. Some are aware but unable to comply because of constraints of a lack of resources. Because of the informality of the sector, the businesses tend not to make enough money.

There is a growing systematic and institutionalised bias in developing countries towards masculinity, leading to a lack of finance for women entrepreneurs (eds. Chengadu & Scheepers 2017). Brush et al. (2017) document challenges that women in the informal sector face. Women in the informal sector often remain unskilled and are often most disadvantaged as compared to their male counterparts (Mohapatra 2012; Singh & Gupta 2011).

Despite their significant contribution, women tend to be discriminated against because of certain institutional practices derived from culture, ethnicity or religion. Women employees are often placed in low-paid, insecure and informal jobs, while their male counterparts are placed in better-paid supervisory and managerial positions (Garg 2012). Enhancing entrepreneurship among women, especially in the informal sector, contributes to economic growth (Igwe et al. 2018; Rabbani & Chowdhury 2013).

■ Access to resources and markets

The informal sector operates mainly in urban areas. In such areas, the observation is that such areas have less requirements for startup and access to a market (Berner, Gomez & Knorrington 2012; Chant & Pedwell 2008). Despite lower barriers, women in the informal sector still face challenges that impede their growth and development (Kantor 2002). In essence, the prevalence of discrimination in the informal sector is high, especially against women (Canagarajah & Sethuraman 2001; Dana & Ratten 2017). There are also barriers concerning local and national markets, including gender discrimination and stereotyping (Grant 2013). Since there are few entry barriers, competition has kept incomes to the minimum. These constraints imply that small businesses must rely on their labour and personal savings, which explains their small-scale and low business revenue (Canagarajah & Sethuraman 2001). Zoning and other land-related regulations may have further aggravated the situation by limiting the space available or imposing high transaction costs. If they do access land, affordability becomes a challenge in relation to both buying and renting. Most informal sector business owners resort to operating at their residential addresses, in a residential neighbourhood or in invisible locations including slums and other marginal areas (Grant 2013; Osemeke et al. 2020).

■ COVID-19 and African economies

The African continent is noted to be growing (Oluwatayo & Ojo 2018). Notably, South Africa is occupying a position of influence (African Economic Outlook [AEO] 2017). Overall, poverty in Africa declined from 56% in 1990 to 43% in 2012 (AEO 2017). Over the same period, however, the number of poor people increased from 280 to 330m (AEO 2017).

‘There is consensus that entrepreneurial activities have curbed the rate of poverty’ (UN 2009). Consequently, a need exists to link entrepreneurial development in addressing challenges faced by the continent (FAO, IFAD & WFP 2012). In 2003, Kenya’s entrepreneurial activities ‘employed 3.2m people and accounted for 18% of the country’s GDP’ (OECD 2005). Similarly, in Nigeria, entrepreneurial activities ‘produced 95% of formal manufacturing activity in the same year’ (Igwe et al. 2018). The importance of entrepreneurship and the informal sector in Africa ‘at various stages of development is not in doubt, but the scoping and scaling of initiatives for and in the African informal sector have been slow and often obscure. Coronavirus disease caused by SARS-CoV-2 virus (COVID-19) has contributed significantly to slower progress.

■ COVID-19 and the African informal sector case experiences

By January 2021, COVID-19 infections had spiralled, with the death toll at over 1.9m and 210 countries and territories affected (WHO 2021). Africa alone accounted for more than 2m cases (WHO 2021). The informal sector was greatly affected by this increase in COVID-19 infections (International Labour Organization [ILO] 2020). In 2020, over 62% of workers worldwide earned their livelihood in the informal sector. In South Africa, the informal sector greatly suffered (Chinyamurindi & Mathibe 2022).

As noted, the informal sector accounts for eight out of every ten enterprises in the world. Enterprises in the informal sector are characterised by low productivity, low rates of savings and investment and minor capital accumulation, making them particularly vulnerable to economic shocks. Moreover, they are often excluded from COVID-19 crisis-related short-term financial assistance programmes. That is:

Africa's response to the COVID-19 pandemic is just beginning to take shape. While the delayed spread of the coronavirus has given the continent some preparatory head time, the varying economic, social and political contexts are making it more difficult for the region to draw many relevant lessons from the responses in Western countries or China. (Rogerson & Baum 2020)

The responses of governments in Africa to COVID-19 mirrored those of countries worldwide (Nkengasong & Mankoula 2020). This remains problematic, as there is a need for policy responses that take greater account of local and national realities (Fonn et al. 2020). Lockdowns were declared in many countries with little timeframe for either individuals or businesses. These restrictions had an especially negative impact on the informal sector as markets and businesses had to close down, leaving individuals and business owners with no other source of income (Rogan & Skinner 2020).

■ Southern African experience

The southern African block of countries is represented by 16 member countries. These countries have all, uniquely, been affected by the COVID-19 pandemic (Mthembu 2020). A common development theme in all these countries is the need to support informal sector development for economic growth (Ngwenya et al. 2020). Despite this, all these SADC member countries were affected by the COVID-19 pandemic (Karrim 2020). A growing number of people lost their jobs in the formal sector and looked to the informal sector for work (Francis & Valodia 2020).

In South Africa, because of low start-up costs, there is evidence of the popularity of the informal sector as a possible income generator for society in general (Cobbinah & Chinyamurindi 2016). According to some estimates, there are about 2.5m workers and business owners operating within the South African informal sector (Fourie 2018), and this number is believed to be growing (Burger & Fourie 2019; Ngwenya et al. 2020). More recent statistics estimate that about 20% of South Africa's total employment falls within the informal sector (Stats SA 2019). The COVID-19 pandemic has crippled both the formal and informal sectors (Mthembu 2020).

A further challenge affecting small businesses within the SADC community, including the informal sector, stems from the challenges around closing the borders to contain the COVID-19 pandemic (SADC 2021a). In essence, closed borders are equated with economies in stagnation, affecting national and regional trade. This was an observed pattern within the SADC block of countries in response to the COVID-19 pandemic (SADC 2021b). At a national level, most governments within the region introduced mechanisms to safeguard citizens. These mechanisms appear to be driven by seeking strategies to manage the social and economic fallout resulting from the pandemic.

Within the SADC community, value chains have been disrupted, particularly in the fishing and aquaculture sectors (SADC 2020). Given that a number of the SADC member countries are surrounded by ocean and river systems, this poses significant social and economic threats resulting from the COVID-19 pandemic. Furthermore, given the geographically interlinked nature of SADC member countries, there is a need to address the challenges, especially around cross-border movement (SADC 2021b).

Member countries of SADC have started focusing on encouraging two strategies (SADC 2021c). Firstly, post-recovery strategies should be centred on strengthening early-warning systems and managing potential future outbreaks. A key priority in this regard should be to strengthen education, tourism and the informal sector (SADC 2021c). Secondly, post-recovery strategies should be centred on developing roadmaps and action plans that emphasise the resuscitation of national economies.

Despite this focus, SADC member countries still face challenges. As argued in this chapter, these challenges have resulted in continued reliance on external funding in the form of donor support and funding instruments (SADC 2021b). Table 4.1 presents documented challenges in selected SADC member countries and interventions to assist the informal sector.

TABLE 4.1: Informal sector challenges and interventions in selected SADC member countries.

Country	Informal sector challenges	Interventions being introduced	Sources
Zambia	• Informal sector business closures • No social protection cover extended to businesses • Closure of premises because of restrictions	More support for registered formal businesses than for the informal sector	Silimina (2020)
Mozambique	• Poverty risk, with continued and increased poverty levels • Challenges with containment strategies such as restrictions and the trickle-down effect from the formal to the informal sector • No policies or precise interventions that target the informal sector • Fiscal loss in terms of tax revenue because of informal sector businesses not being registered¹	Funding support are needed to help informal sector businesses	Daniel and Sacchetto (2020)

1. This challenge affects much of sub-Saharan Africa

Source: Literature synthesis.

■ East African experience

The informal sector is vibrant within East African countries (Adegoke 2019), but the COVID-19 pandemic has taken its toll on economic and social livelihoods within the East African community. A salient study found that more than two-thirds of respondents in an inter-country survey of Uganda and Kenya had suffered income shocks because of the COVID-19 crisis (Kansiime et al. 2021).

In Uganda, studies show the popularity of the informal sector and the gendered and power dynamics within such a sector (Serwajja & Mukwaya 2020). The issue here appears to be that the informal sector is favoured by those without economic and social power. Notably, this includes women and the youth. It is predicted that most individuals will be affected by the COVID-19 pandemic, especially those operating within East Africa's informal sector. A significant threat to the informal sector is the loss of income, as most people in this sector survive on hand-to-mouth wages (Demeke & Kariuki 2020; ILO 2020).

The continued growth of the informal sector is acknowledged to be because of a decline in the traditional job market (Dasgupta & Lloyd-Jones 2018). Despite the sector being considered ephemeral, with little institutional engagement (Lloyd-Jones et al. 2017), the informal sector has become an essential sector in urban economic development (Ngwenya et al. 2020).

Table 4.2 presents documented challenges to the informal sector of selected East African countries and interventions to assist the informal sector.

TABLE 4.2: Informal sector challenges and interventions in selected East African countries.

Country	Informal sector challenges	Interventions being introduced	Sources
Ethiopia	• Informal sector business closures • More women affected than men • 80% of businesses in the informal sector not registered	• Integrated federal, regional and local government interventions • Monitoring of markets and constant sanitisation	Weber, Palacios-Lopez and Contreras-Gonzalez (2020) Ababulgu Abasimel and Wana Fufa (2021)
Rwanda	• Lack of social protection cover as most informal sector businesses are not registered • Unemployment and underemployment • Financial burden and failure to pay loan repayments	The support is given to most affected informal sector businesses in sectors deemed as value chain sectors for economic development	Faustin and Appolinaire (2020) National Institute of Statistics of Rwanda (NISR) (2020)

Source: Literature synthesis.

■ West African experience

The West African community has one of the strongest economies on the African continent, including countries such as Nigeria and Ghana. The regional body in West Africa, the Economic Community of West African States (ECOWAS), strives:

1. To encourage economic development in the West African economy.
2. Transform the ECOWAS community through improving livelihood of communities.
3. To mobilise the citizens of the region to help achieve the vision by 2020 (ECOWAS 2021).

Adeniji (2020) cites the popularity of the informal sector in West Africa over the last decade. In a state such as Lagos, the informal sector is believed to employ about 5.5m people. The informal sector in countries such as Nigeria has three primary needs: access, skills and tailored service delivery channels (Adeniji 2020). Furthermore, because of the high social burden, most local governments struggled to introduce financial measures to manage the impact of the pandemic (Ayeni 2020). The ECOWAS regional body has encouraged member countries to channel more financial measures to assist their citizens, including investment in strengthening existing capabilities such as health care in response to the COVID-19 pandemic (Olivier 2020). Onyishi et al. (2020) observe that the COVID-19 pandemic in Nigeria not only has health-related ramifications but also challenges of a social nature, which notably include the informal sector, as well as the need to develop urban governance structures and the sector's collective organisation.

Schwettmann (2020) notes other West African countries to be affected by the COVID-19 pandemic:

- *Burkina Faso* provided support in assisting to pay for school fees and financial support to informal sector operators.
- *Cote d'Ivoire* established a support fund worth US\$171m, which was equivalent to 0.3% of GDP.
- *Cameroon* exempted fees related to vehicles and public transport.
- *Togo* allowed for informal sector to access services to send and receive money with ease.

■ North African experience

Table 4.3 presents documented challenges to the informal sector of selected North African countries and interventions to assist the informal sector.

TABLE 4.3: Informal sector challenges and interventions in selected North African countries.

Country	Informal sector challenges	Interventions being introduced	Sources
Algeria	• Food security challenges • Job losses • Health care challenges	• Emergency cash grant • For low-income families, funds were provided to cover their expenses, especially for religious festivals such as Ramadan	Algeria Press Service (2020)
Egypt	• Informal sector job losses	• Informal sector workers received payments (US\$32) to make up for income loss because of the COVID-19 pandemic. The intervention was targeted at 400,000 registered informal workers; within 1 week, 1.2m workers requested access to the grant.	Mada (2020)
Morocco	• Informal sector business closures • No social protection cover extended to businesses • Closure of premises because of restrictions	• Mobile payments are made to transfer cash to workers within the informal sector. • A health insurance fee waiver was introduced. • Electronic transfers to the informal sector are made through technology.	Gentilini, Almenfi and Orton (2020)
Tunisia	• Informal sector business closures • No social protection cover extended to businesses • Closure of premises because of restrictions	• A once-off cash payment of US\$68 to households of those working in the informal sector	Gentilini et al. (2020)

Source: Literature synthesis.

Key: COVID-19, Coronavirus disease caused by SARS-CoV-2 virus.

■ Framing a path amidst the difficulties

Informed by the analysis presented in this chapter, Figure 4.1 presents five areas of focus as action points that need attention to assist the informal sector.

These action plans are briefly discussed in the following sub-sections.

■ Action point 1: Prioritising informal sector development

Given the increasing number of unemployed people, there is a need to prioritise the informal sector. The thinking here is that given the job losses, a number of the unemployed will turn to the informal sector for



Source: Author's own work.

FIGURE 4.1: Action points to assist the informal sector.

economic sustenance. This situation prioritises the need to pay attention to this sector, as it will potentially be a receiving ground for those affected by the COVID-19 pandemic in the public and the private sectors. For instance, SADC countries are being encouraged to seek measures to assist their citizens (SADC 2021c), including assisting those deemed vulnerable and seeking alternative means of sustenance and income, especially within the burgeoning informal sector. Daniel and Sacchetto (2020) propose a range of socially centred development strategies to assist those operating within the informal sector, including the provision of temporary subsidies for electricity, water and rent. This could help those operating in the informal sector manage the social aspects of their lives and provide momentum to their economic endeavours.

■ **Action point 2: More organisation and registration of informal sector businesses**

There is a need to address the challenge that most informal sector traders and businesses are not registered (Ngwenya et al. 2020). Daniel and Sacchetto (2020) recommend the formation of informal business associations to encourage organisations. This could be an effective means for governments to compile a reliable register of informal businesses and could form the basis and become a precursor for interventions to assist informal sector businesses. Serwajja and Mukwaya (2020) motivate the need for formal registration or affiliation for informal sector workers working in artisanal and small-scale mining in Uganda. Such registration and affiliation could potentially also serve as a way to save trades through a recognised organisation.

■ **Action point 3: Financing of informal sector businesses and activities**

In prioritising informal sector development, there is also a need to address financing issues in the informal sector. A noted challenge facing those operating in the informal sector concerns the lack of access to finance (Trombetta, Casadio & Calvo 2017). Before the COVID-19 pandemic, there was already a need for financial inclusion strategies to assist those in the informal sector, and the pandemic has significantly heightened this need (Daniel & Sacchetto 2020). In essence, the prioritisation of the informal sector should be focused on reducing the increasing poverty rate exacerbated by the COVID-19 pandemic (Kansiime et al. 2021) and becoming pro-poor in complementing the formal sector (Dasgupta & Lloyd-Jones 2018). This is a delicate balance to be attained.

■ Action point 4: Addressing border control and movement of goods

The challenges posed by border controls and restrictions of movement need to be addressed. Given that the COVID-19 pandemic affected value chains within the region (SADC 2020), mutually beneficial strategies are required not only for national economies but also for informal sector traders. Table 4.4 details some best practices related to easing restrictions on cross-border transportation.

Most informal sector traders rely on goods coming from neighbouring countries, which prioritises the need to address issues related to the movement of goods and people. This could also take place through easing restrictions, especially for informal sector traders and businesses, as well as support mechanisms to ensure that goods reach the intended recipients at border posts.

■ Action point 5: Training interventions and support services

Given the challenges posed by the COVID-19 pandemic, there is a need to support those within the informal sector who may have been affected. This could take place through targeted training interventions and

TABLE 4.4: Good practices in cross-border transportation.

SADC member country interaction	Nature of interaction
Botswana and Zambia	Efforts have been made to clear traffic that builds up at the Kazungula border post. The two countries participated in implementing a national COVID-19 joint clearance and collaboration strategy.
Democratic Republic of the Congo and Zambia	The introduction of one-stop borders at Kasumbalesa allowed for the clearing of traffic. Further discussions are taking place through the partnership to improve the road connection between the two countries.
Zimbabwe	As a result of the COVID-19 pandemic, Zimbabwe designated and published a map of truck stops and garages to assist drivers in view of the COVID-19 pandemic
Angola	Angola not only simplified but also waived requirements for the submission of stamped original hard copies of documentation. This also entailed switching from manual to electronic submissions.
Namibia	Together with private partnerships, the Namibian government created a temporary quarantine facility to be used for trucks at Walvis Bay. This partnership also ensured the creation of facilities to promote COVID-19 hygiene requirements, a place of rest for truck drivers and security for drivers and cargo.

Source: SADC 2020b, pp. 6–7.

Key: COVID-19, coronavirus disease caused by SARS-CoV-2 virus.

support services. The success of such training interventions and support services depends on implementing action points 1 and 2. The focus in this regard could be two-fold. Firstly, training interventions could assist with aspects related to the running of informal sector businesses given the challenges posed by the COVID-19 pandemic. Secondly, support services could be targeted at ensuring that aspects related to well-being are addressed. In addition to supporting services that assist in the running of informal sector business, there is also a need to provide psychological support to entrepreneurs to mitigate the psychological impact of the pandemic as it affects their economic and social pursuits.

■ Conclusion

We urge the constant prioritisation of research into the informal sector, especially in the recovery period post-COVID-19. Given the challenges experienced in the current period, lessons could be gleaned to help strengthen the sector. This is especially important on the African continent, where the informal sector has a unique position in supporting the formal economy.

Precarity as a way of life? COVID-19 and its implications on youth transitions in South Africa

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■ Abstract

Background: The coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic has deeply impacted economies worldwide, with many countries implementing strict lockdown measures. As a result, a large number of people have experienced either temporary or long-lasting unemployment. There is also evidence of increased poverty rates, particularly in developing nations. In South Africa, young people were among the most impacted groups. Even before the pandemic, literature

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has argued that youth face an extended transition to adulthood because of unemployment, precarity and unstable economic and labour markets.

Methods: This chapter relies on conceptual literature and empirical data from Statistics South Africa (Stats SA) to investigate the various challenges facing young South Africans, particularly poverty and unemployment.

Findings: The results show that youth unemployment and poverty rates were already high before the pandemic. During the pandemic, a significant proportion of young people were out of employment, and the poverty rate significantly increased.

Conclusion: Coronavirus disease caused by SARS-CoV-2 virus will have many implications for youth, including uncertain and extended transitions to work and other domains of life. As a result, the impacts of COVID-19 are likely to exacerbate previous and present forms of youth deprivation and precarity. We argue that the already struggling youth labour markets will require aggressive policy interventions to increase economic opportunities for young people. These policy interventions must come from a pact between the government, business, the labour movement and civil society.

■ Introduction

There can be no doubt that the coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic has had serious negative impacts on the world economy and even on the economies of developed nations. Since the beginning of a series of economic lockdowns, many people have been subjected to temporary or long-term unemployment (Haffejee et al. 2023; Spaull et al. 2020a). Further evidence indicates that many people have been pushed into poverty. South Africa has not been an exception in this; the pandemic has had ongoing negative socioeconomic impacts on many South Africans, including loss of business and livelihoods, unemployment and other social and psychological challenges. Young people have perhaps been the most affected in the labour markets. Even before the pandemic, South African youth unemployment had been increasing, and it is evident that young people are vulnerable in the labour market (Pauw, Oosthuizen & Van der Westhuizen 2008; Ranchhod & Daniels 2020).

Against this background, this chapter investigates the impacts of the pandemic on young people in South Africa. We show how the COVID-19 pandemic has affected youth in terms of the labour market, poverty and well-being. Through a conceptual lens of youth transitions and precarity, we build an argument that the impacts of the pandemic will disrupt and extend youth transitions and increase precarious conditions of living. The main argument of the chapter is that the pandemic will have long-term effects on young people because of the growing incidence among this

group of unemployment and poverty, which were high even before the pandemic. It has been found worldwide that unemployment has a scarring effect on young people (Strandh et al. 2014), including mental health, citizenship and overall well-being, both objective and subjective. We also argue that there is a need for policy responses to mitigate these impacts.

Researchers working in youth studies argue that youth are at a stage of transition, from childhood to adulthood (Black & Walsh 2019; Farrugia 2018). In this transition process, there are general markers of progress, such as transitioning from school to work, and moving out of the parental home into their own home. In contemporary times, however, these transitions have been disrupted and have become nonlinear and uncertain. Changes brought about by globalisation and neoliberal hegemony have made it difficult for youth to enter labour markets. When youth find employment, it is often de-standardised, temporary work with few or no benefits (Kalleberg 2000). Researchers have called this phenomenon ‘precarity’. Globally, precarity has disrupted youth transitions, and many youths have found it difficult to become independent (Hewison 2015; Honwana 2012). In South Africa, youth experience both unemployment and precarity.

There is significance in assessing the implications of COVID-19 for young people. Globally, the literature suggests that the youth were among the most affected groups (Goniewicz et al. 2023; Lambovska, Sardinha & Belás 2021). Specifically, evidence indicates that COVID-19 was associated with increased youth unemployment (Lambovska et al. 2021), increased mental health issues in youth (Liang et al. 2020), risky behaviour and substance abuse (Richter 2020) and decline in academic performance (Di Pietro 2023). All these impacts of COVID-19 have implications for youth transitions to adulthood (Miranda & Alfredo 2022).

South Africa is an important case study in which the problem of precarity and youth transition can be investigated. This is because youth are among the most vulnerable group in the labour market. According to recent statistics, youth unemployment in South Africa exceeds 50% (Stat SA 2020a). Furthermore, the COVID-19 pandemic has disrupted young people’s lives, from career prospects to the labour markets. Preliminary evidence from the Coronavirus Rapid Mobile Survey indicates that 3 million jobs were lost during the first lockdown in 2020 (Spaull et al. 2020a). We therefore argue that post-COVID-19 South Africa presents a bleak and uncertain future for South African youth.

The rest of the chapter is divided into five sections. The next section reviews the literature on youth transitions, precarity and neoliberalism. We then present evidence of youth vulnerability, poverty and precarity by using empirical data from Statistics South Africa. After that, we build an argument for why youth precarity will persist even after the pandemic.

The final section concludes the chapter and argues that these challenges need to receive radical policy responses from the government.

■ Literature review

■ Youth transitions

Traditionally, the transition from childhood to adulthood has been viewed through life course theory. This theory has its origins in development psychology, where youth is considered a transition phase from child to adult (Honwana 2012). This perspective views the transition from child to adult as a linear process, indicated by important milestones in one's life: child to adult, education to employment, getting married, moving out of the parental home and so on (Du Bois-Reymond & Blasco 2003; Walther 2006). Within the life course perspective, age cohorts (also named 'generations') are important in human development. The life course framework, replete with theories and models from psychology, assumes that there are important markers of transition to adulthood:

[...] [P]rofessional transitions from school to work; residential transitions from the parental home to a home of one's own; and relationship transitions from being single to getting married and forming a family. When these three transitions take place in a sequential or synchronised manner – for example, when a person completes his or her education, secures a job, finds a place to live, and then marries and has children – entering adulthood follows a standardised path and is seen as unproblematic. (Honwana 2012, p. 21)

However, since the 1970s, with the spread of neoliberalism in many countries, researchers have critiqued the life course perspective. Neoliberalism, as a politico-economic doctrine:

[P]roposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework [*characterised*] by strong private property rights, free markets, and free trade. (Harvey 2005, p. 2)

Indeed, the virtues of active individualism, free market, trade liberalisation and flexible labour are now common [globally, even in developing regions]. The fundamental principle of neoliberalism is rooted in the notion that individual freedom is best guaranteed by the market (Harvey 2005). [*Therefore,*] the state must withdraw from the provision of services such as health, education, water and sanitation, and these services are to be provided by the private sector [*(Harvey 2005). Despite their origins in the Global North,*] international institutions such as the International Monetary Fund, World Bank and World Trade Organization consolidated and geographically diffused neoliberal policies and practices around the world (Barnett 2010; Harvey 2005; Mpungose & Maharaj 2022).

Neoliberalism and globalisation have transformed labour markets around the world. Researchers stress that these processes have impacted

youth transitions (Allen & Hollingworth 2013; McDowell & Bonner-Thompson 2020). Youth researchers have argued that youth transitions have become nonlinear, de-standardised and not smooth (Du Bois-Reymond & Blasco 2003). Traditional markers of youth transitions have become blurred, and researchers have argued that these transitions have been prolonged or extended (Honwana 2012). The traditionally understood indicators of progress to adulthood – ‘homeownership, family formation and the attainment of stable livelihoods’ – have been eroded or become less certain (Black & Walsh 2019, p. 18).

Researchers have developed several concepts to explain this recent phenomenon. Honwana (2012, p. 4) calls it ‘waithood’, the ‘period of suspension between childhood and adulthood’ that is structural and structuring of the school-to-work transition, with flow-on effects into many aspects of young lives. For Walther (2006), transitions have not only been extended but also de-standardised and fragmented in such a way that even young people find it difficult to classify themselves as youth or adults and tend to fall into an in-between category.

The literature on youth studies argues that another socioeconomic phenomenon has affected youth transitions, namely the condition of precarity (Abebe 2020; Alacovska, Langevang & Steedman 2021; Standing 2011). Also resulting from the neoliberal globalisation and economic restructuring, precarity involves unstable work, characterised by many periods of entering and exiting the labour markets (Standing 2011). The following subsection discusses the condition of precarity in more detail.

■ Precarity and youth transitions

Neoliberal globalisation has transformed the nature of work, both in developed and developing countries. Under the neoliberal ethos of cheap and ‘flexible’ labour, much of the available work has become de-standardised, temporary and casual, without benefits such as medical insurance and pension (Brown 2013). Standing (2011) refers to this process as ‘precarity’. In the literature, the concept of precarious work or precarity has been popular among social scientists. Precarious work is temporary and short term in nature, associated with low wages and no, or only limited, access to insurance and pensions (Doerre 2014; Hewison 2015). Precarity is not a recent phenomenon; unstable employment, low-paying jobs and dangerous work have always been features of capitalism. Since the 1970s, however, cycles of economic crisis in many countries have meant that certain workers are confronted with the insecurity of employment contracts and retrenchment.

Recently, a large and growing body of literature in the social sciences notes that precarity is a new condition for many young people (Farrugia 2018; Gukurume 2018; Hewison 2015). Unlike older generations, the

millennials have only ever lived under neoliberal states, when permanent work has been declining. Thus, we can argue that youth transitions have been affected by precarity. According to McDowell, Rootham and Hardgrove (2014), one of the key milestones for young people as they navigate adulthood is securing permanent jobs and moving out of their parental homes. McDowell et al. (2014) have outlined the types of jobs that are available to young people, and the list includes retail assistants, catering workers, hotel workers, work in bars, work in fast food outlets and care centres. Many of these jobs are low-paying, unstable and short term.

McDowell et al. (2014) assert that the growing trend of young people who are unable to access employment and the housing market has become a permanent feature associated with the transition to adulthood. They believe that precarity intersects across class, age, race and gender. In this instance, young men are the most affected by the phenomenon of precarity, in that the social attributes that favoured men in the industrial world have become a disadvantage in service employment (McDowell et al. 2014). The precarious work opportunities for youth threaten their ability to transition into full-time livelihood (Hardgrove, McDowell & Rootham 2015a).

From a social theory perspective, there is something distinctive about neoliberal ideology (as well as modernity in general) and the way it 'governs' lives. Since the neoliberal ideology encourages the withdrawal of the state in the economy and society, individualism is encouraged. Within the ethos of neoliberalism, the individual has replaced the collective class, and individuals are expected to be responsible for their well-being and families (Larner 2000). As Larner (2000, p. 12) argues, 'while neoliberalism may mean less government, it does not follow that there is less governance'. For youth researchers, this tendency has led young people who live under precarious conditions to *individualise* their experiences of unemployment and precarity. Among the youth, the uncertainty, extended periods of unemployment within the labour markets and lack of clear paths and transitions (e.g. from school to work) are experienced as narrow biographical events (Farrugia 2018).

■ Evidence from South Africa

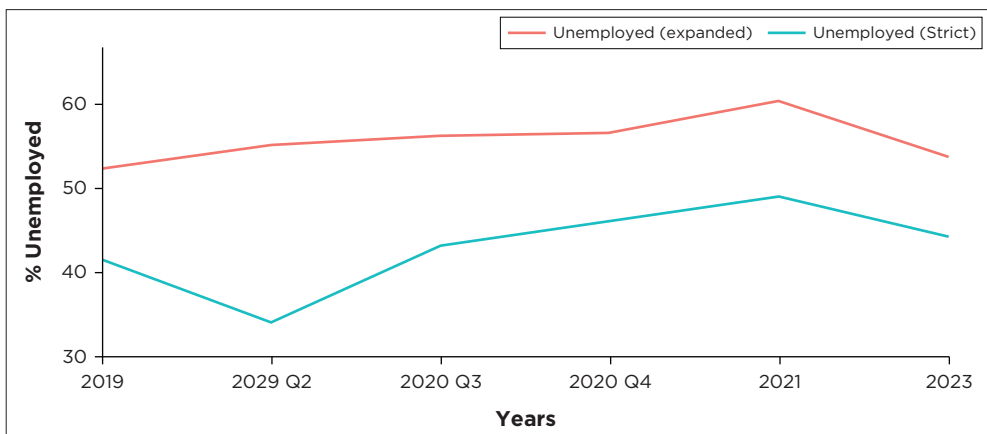
Within South Africa, there is a vast literature on the problems facing youth. This body of literature has focused on poverty and unemployment (De Lannoy, Leibbrandt & Frame 2015; Makiwane & Kwizera 2009), violence (Seekings 2014), risky sexual behaviour and HIV/AIDS (Hunter 2010) as well as substance abuse (Dunkle et al. 2004). All these studies indicate the precarious conditions facing the youth in South Africa, but very few research studies have engaged with concepts of youth transition and precarity. This section presents and discusses recent data on youth

unemployment and poverty and how these are likely to increase precarity among young people even after the COVID-19 pandemic.

■ Youth labour markets

In South Africa, the youth are the most affected by unemployment. Unemployment is one of the dimensions of deprivation associated with poverty among the youth in South Africa (Frame, De Lannoy & Leibbrandt 2016). According to Yu (2013), young people lack the resources and social networks to find better employment. The key element in finding better employment is pursuing post-secondary education, but the rate and chances of employment vary with the field of study; for example, graduates in the humanities, arts and education stand less chance of securing employment in the labour market (Yu 2013).

South African youth are the most vulnerable in the labour markets compared to other age groups. Figure 1.1 shows the youth unemployment rate according to the two definitions of unemployment used by Statistics SA, namely the strict and expanded definitions. According to the strict definition, the unemployed include only those among the economically active population (15–64 years) who are unemployed and *are actively searching for work* (own emphasis), while the expanded definition measures those who are unemployed and includes those who are not searching for work, including discouraged job seekers. Figure 5.1 indicates that youth unemployment in 2020 was 56% using the expanded definition and 43% using the strict definition. South Africa is a member of BRICS, a group of five emerging countries (including Brazil, Russia, India and China), and it is useful to compare youth unemployment statistics between these countries.



Source: Authors' calculation from Quarterly Labour Force Survey quarter 3 data (Stats SA 2019–2023). Data are weighted to be representative of the South African youth population (aged 15–34 years).

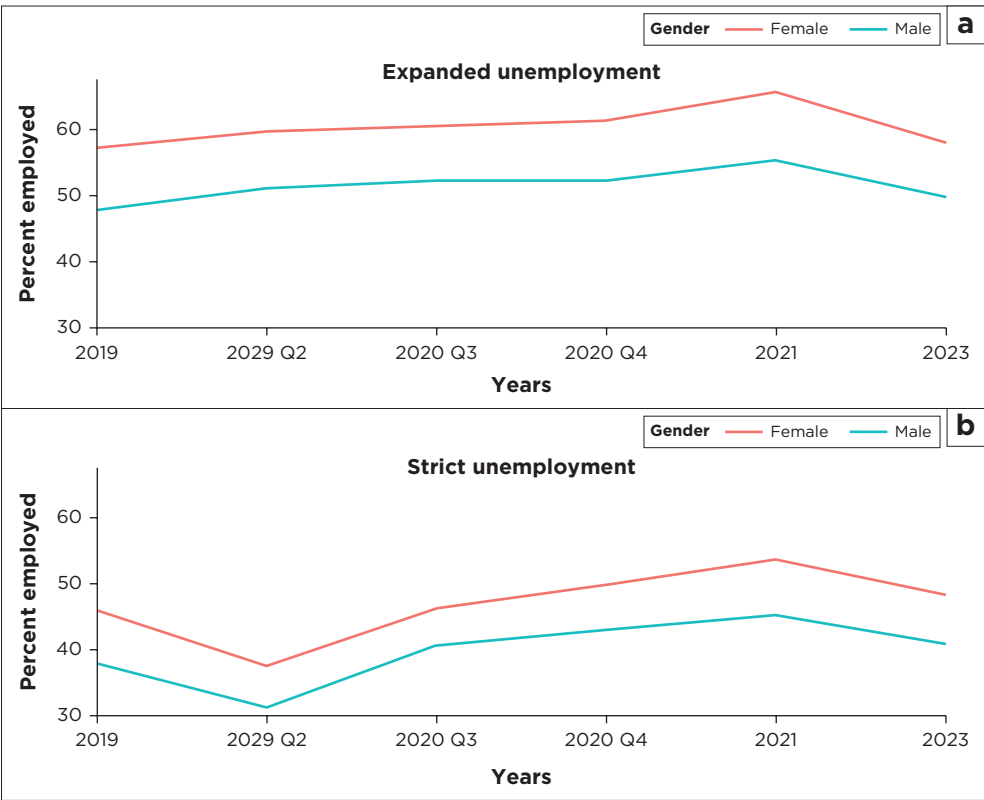
FIGURE 5.1: Youth unemployment in South Africa.

Of the five BRICS countries, youth unemployment is by far the highest in South Africa, followed by Brazil (International Labour Organisation [ILO] 2018).

The high level of unemployment is often regarded as one of the root causes of South Africa's problems, including crime, substance and drug abuse and risky sexual behaviours, which can lead to negative outcomes later in life. Employment is one of the markers of transition to adulthood, and without getting a job, the transition to adulthood becomes uncertain and risky (Strandh et al. 2014). Some researchers have suggested that unemployment among young people has a scarring effect:

Unemployment increases susceptibility to malnutrition, illness, mental stress, and loss of self-esteem, and increases the risk of depression. The unemployed also appear to be at higher risk of committing suicide, and of poor physical health outcomes. (Bell & Blanchflower 2011, p. 259)

Evidence also shows that South Africa's youth unemployment patterns are gendered, and that more female than male job seekers are excluded from the labour markets. As Figure 5.2 indicates, the unemployment rate is 60% among the female youth compared to 52% among male youth.

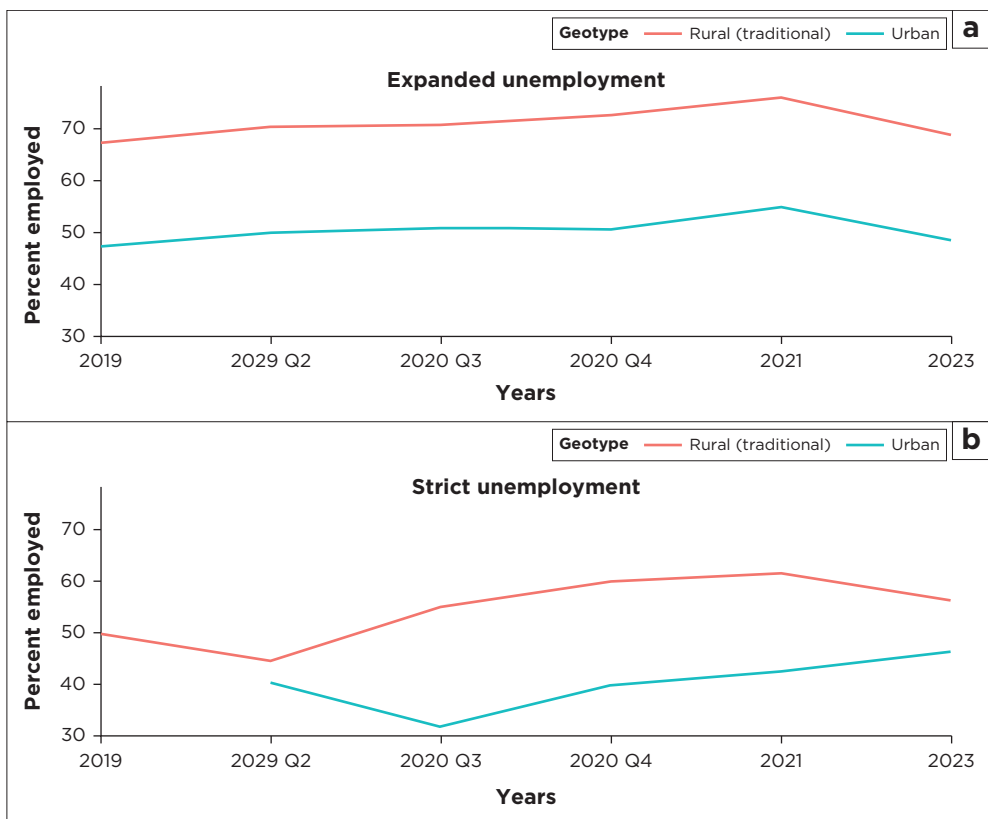


Source: Authors' calculation from Quarterly Labour Force Survey quarter 3 data (Stats SA 2019–2023). Data is weighted to be representative of the South African youth population (aged 15–34 years).

FIGURE 5.2: Youth unemployment in South Africa by gender.

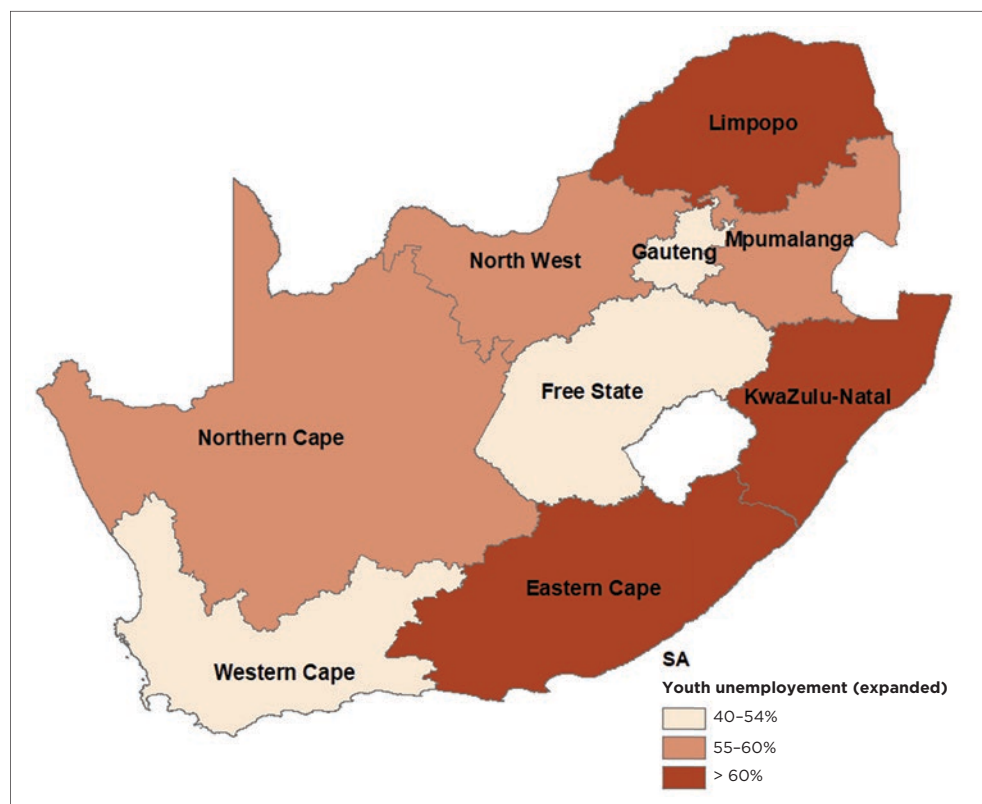
Figure 5.3 suggests that youth unemployment has a spatial dimension, in that it is higher in rural than in urban areas. Furthermore, when unemployment is desegregated by province (Figure 5.4), it can be seen that the 'rural' provinces have a higher concentration of youth unemployment. Eastern Cape, Limpopo and KwaZulu-Natal all have youth unemployment rates of over 60%, compared to Western Cape and Gauteng that have lower unemployment rates. There are spatial and historical explanations for these patterns (Neves & Du Toit 2013).

There appears to be a 'spatial mismatch' between economic opportunities and the geographical location of young job seekers. Firstly, more employment opportunities are available in urban areas than in rural areas. Secondly, the three rural provinces, Eastern Cape, KwaZulu-Natal and Limpopo, are in the former homeland areas. During the apartheid era, these homelands were established for the purpose of creating labour reserves, providing labour to mines in urban areas and to commercial agriculture (Neves & Du Toit 2013). In the post-apartheid era, the spatial inequalities have been maintained and reproduced, in that poverty remains high and



Source: Authors' calculation from Quarterly Labour Force Survey quarter 3 data (Stats SA 2019–2023). Data are weighted to be representative of the South African youth population (aged 15–34 years).

FIGURE 5.3: Youth unemployment (expanded) by geotype.



Source: Authors' calculation from Quarterly Labour Force Survey quarter 3 data (Stats SA 2020a). Data are weighted to be representative of the South African youth population (aged 15-34 years).

FIGURE 5.4: Provincial youth unemployment according to the expanded definition.

economic opportunities are limited in rural areas. This partly explains the high youth unemployment rates in rural areas, especially in the three rural provinces. Post-apartheid policies have failed to redress spatial inequalities (Todes & Turok 2018).

Researchers suggest several reasons for spatial exclusion and poverty in rural areas. With reference to the Eastern Cape, Du Toit and Neves (2007) argue that industries such as mines that require low-skilled labour have been declining. These industries facilitated labour migration, and some of the remittances could be invested in productive assets such as cattle back in the rural areas:

[...]he industries that sustained generations of unaccompanied male circular migration (and that enabled some investment in cattle and local agrarian capacity) no longer require vast numbers of unskilled, cheap black labourers: surveys seem to indicate that remittances are dwindling, that migration to urban centres is becoming less certain and riskier. (Du Toit & Neves 2007, p. 154)

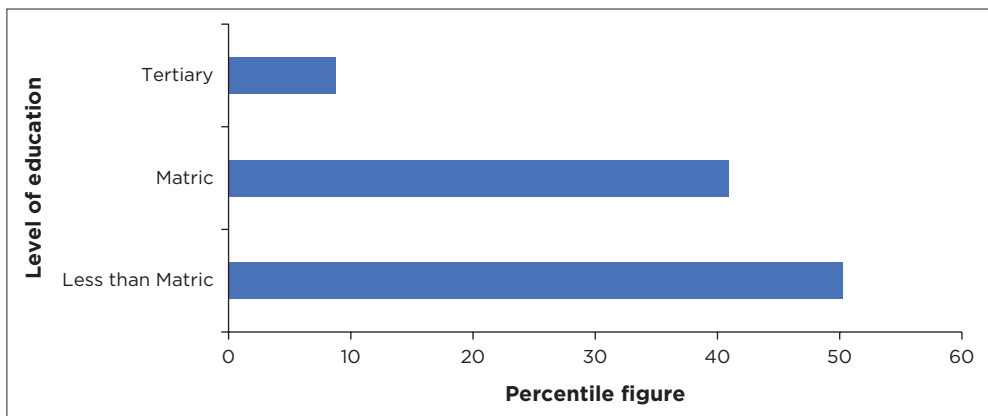
Other factors have been under-investment in smallholder agriculture and the growth of the service sector, dominated by large retail outlets (Du Toit & Neves 2007). These have done little to develop rural areas, as Du Toit and Neves (2007) articulate with considerable insight:

Follow the money, as the saying goes: cash comes into Mount Frere in armoured transit vans, is deposited into the ATMs, is drawn by local people – often against funds deposited there by distant relatives or drawn down as social grants – it typically moves five or ten metres across the street or lobby of a store, and then leaves again: repatriated as profits to South Africa's retail giants. Mount Frere is neither a local economic hub nor a neglected, economically irrelevant hinterland: rather, it is a small node in a larger network. (Du Toit & Neves 2007, p. 159)

As the data and previous case studies presented in this chapter suggest, youth unemployment in rural areas is the hybrid result of historical dispossession and the shortcoming of post-apartheid development policies (Todes & Turok 2018).

Apart from high levels of unemployment, another youth challenge in South Africa is that of individuals who are 'not in employment, education or training' (NEET). According to recent statistics, 43% of South African youth can be classified as NEET (Stat SA 2020a). These young people are at a disadvantage, because the economy requires skilled labour. Figure 5.5 clearly indicates the relationship between lower levels of education and high unemployment: among the unemployed youth, about half of them did not complete matric (Grade 12) and more than 90% of the unemployed youth do not have a post-school qualification.

Some researchers argue that South Africa will have another 'lost generation' of young people (Mattes 2012). During the transition to



Source: Authors' calculation from Quarterly Labour Force Survey quarter 3 data (Stats SA 2020a). Data are weighted to be representative of the South African youth population (aged 15–34 years).

FIGURE 5.5: Youth classified as not in employment, education or training.

democracy, the phrase 'lost generation' was used to describe young people who were affected by the political violence of the 1970s and 1980s and as a result missed education and economic opportunities (Mattes 2012). Seekings (1996) describes the 'lost generation' phenomenon well:

Broken homes, boycotted schools, violent streets and a depressed economy were deemed to have bred a 'lost generation' of 'marginalised youth. Living outside of the social structures and devoid of the values deemed essential for 'civilised' society. (Seekings 1996, p. 103)

The notion of the youth as a lost generation have reappeared in media and policy discussions in light of the socioeconomic challenges facing youth in South Africa:

In the late 2000s and 2010s ... anxiety over the youth resurfaced in the media, driven by a concern that their disappointment and frustration with the slow pace of social and economic change would threaten South Africa's fragile democracy. Unemployment, crime, violence, and declining social cohesion would feed each other. Widespread, often violent protests over service delivery and governance, and a rising tide of violent strikes, were reminiscent of the tumult of the 1980s. (Seekings 2014, p. 72)

Related to this, there are many indications that the lack of socioeconomic opportunities leads to frustration among young people. Protests by young people have been increasing (Dawson 2014). Researchers have tended to associate large groups of unemployed and impoverished youth with the risk of political instability (Urdal 2006). Known as youth bulge theory, this perspective argues that 'if young people are left with no alternative but unemployment and poverty, they are increasingly likely to join a rebellion as an alternative way of generating an income' (Urdal 2006, p. 611). Similarly, Alexander (2010) argues that the increasing political protests may be attributed to what he calls the 'rebellion of the poor':

The protests reflect disappointment with the fruits of democracy. While some people have gained, the majority are still poor. Levels of unemployment are greater than in 1994, and income inequality remains vast. People can vote, but all too often elected representatives are self-seeking and real improvements are few. (Alexander 2010, p. 37)

So far, this section has analysed youth unemployment dynamics in South Africa. However, there is evidence that even among those who are employed, many are in precarious jobs, characterised by low wages and without benefits such as health insurance and pension. Table 5.1 indicates the precarious existence of many of those who are employed.

TABLE 5.1: Characteristics of employed youth.

Variable	Percentage
Sector of employment	
Formal sector	69.6
Informal sector	28.0
Other	2.4
Pension contribution	
Pension contribution	42.7
No pension contribution	55.1
Don't know	2.2
Paid leave benefits	
Paid leave	52.2
No paid leave	47.6
Don't know	0.3
Unemployment Insurance Fund (UIF) contribution	
UIF contribution	66.7
No UIF contribution	31.7
Don't know	1.7
Medical aid benefit	
Medical aid	24.0
No medical aid	74.8
Don't know	1.2
Duration of the employment contract	
Permanent	55.9
Limited	18.5
Unspecified	25.5

Data are weighted to be representative of the South African youth population (aged 15–34 years).

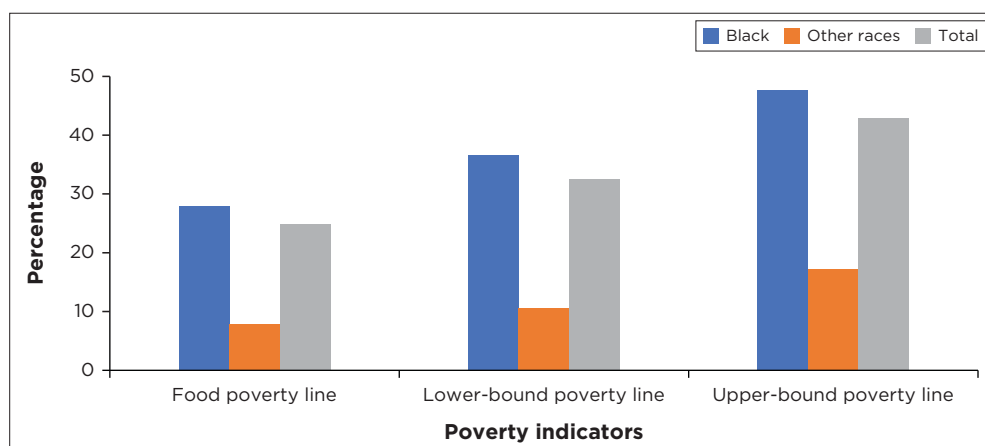
Source: Authors' calculation from Quarterly Labour Force Survey quarter 3 data (Stats SA 2020a).

■ Poverty dynamics

Poverty is the result of multiple factors, including illiteracy, a lack of income and assets and social isolation, among others (Moore 2005). According to Moore (2005), young people tend to suffer the consequences of poverty transmitted from generation to generation. One of the implications of chronic poverty for young people is that, unless they come from a well-connected family, they are usually discriminated against in the labour market and find it difficult to obtain employment below the age of 25 years (Moore 2005).

Using data from the General Household Survey, poverty estimates were calculated using poverty lines.⁵ Using the food poverty line as the benchmark, Figure 5.6 indicates that about 25% of young people were living in poverty in 2018. Furthermore, inequality according to racial lines

5. South Africa has three types of poverty lines based on monthly income: (1) food poverty line (R624), (2) lower-bound poverty line (R890) and (3) upper-bound poverty line (R 1,335), refer to: <https://www.statssa.gov.za/publications/P03101/P031012021.pdf>.



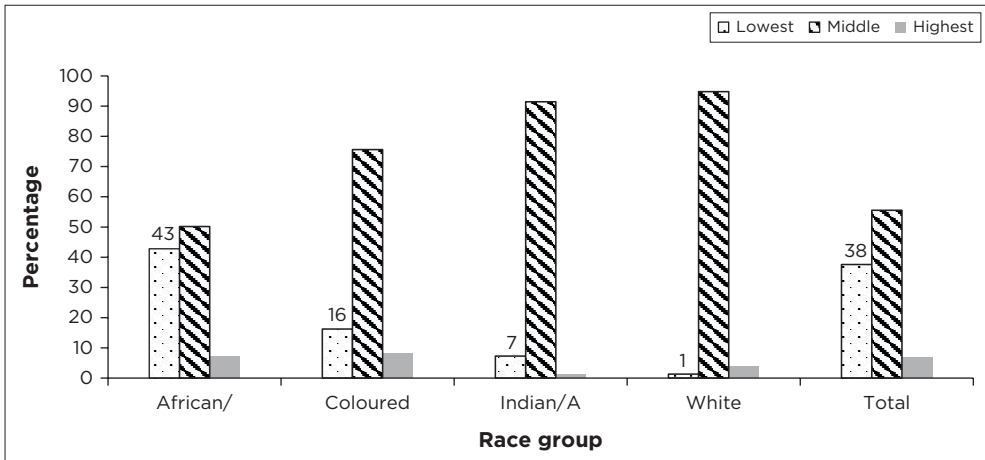
Source: Authors' calculation from General Household Survey dataset (Stats SA 2018). Data are weighted to be representative of the South African youth population (aged 15–34 years).

FIGURE 5.6: Poverty indicators using poverty lines.

was apparent: 28% of black youth were living in poverty, compared to only 8% of youth of other races. Using the upper-bound poverty line, 48% of youth live in poverty, and again there are racial inequalities in the distribution of poverty; as Figure 1.6 indicates, 48% of black youth can be classified as poor, compared to only 17% of youth of other races.

We also used non-monetary measures of poverty, calculated using household asset endowments and including whether a household has access to running water, a flush toilet and electricity on site. We call this measure the 'living conditions asset index', and principal component analysis was used to construct the index. The assets included in the index are motor vehicle, sound system/radio, television, satellite television or digital satellite television, air conditioner, computer, washing machine, microwave, electric stove, geyser, running water, flush toilet and electricity. The index was then divided into three terciles: lowest, middle and highest. The lowest tercile indicates the lowest asset endowment and thus the poorest, and the highest tercile indicates the richest. Figure 5.7 shows that 38% of youth come from households that could be classified as poor in terms of the living conditions asset index. When desegregated by race, about 43% of African youth come from poor households as defined by the index.

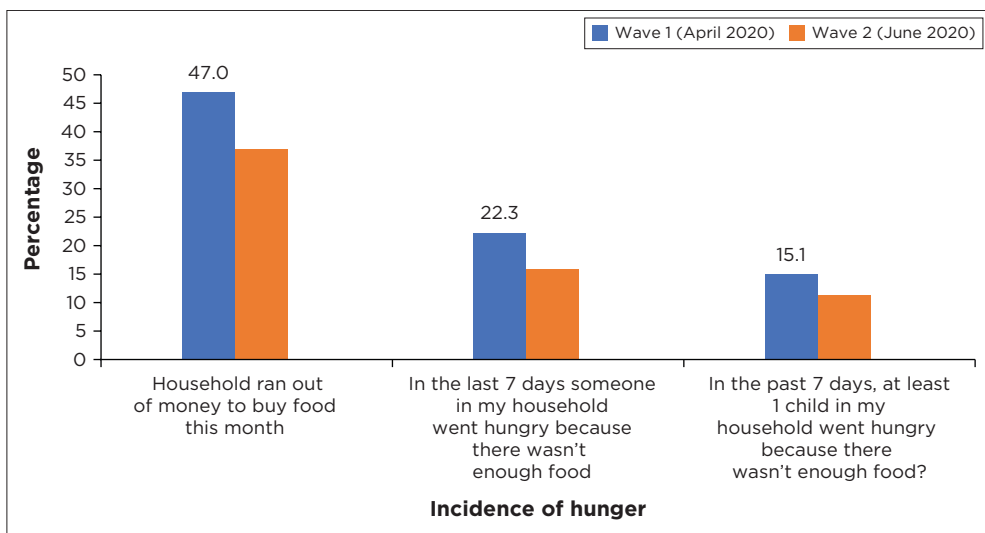
The poverty statistics analysed and presented here are from the 2018 General Household Survey, but we anticipate that more recent data would show that poverty increased further during economic lockdown. Fortunately, the Coronavirus Rapid Mobile Survey collected data from a nationally representative sample during the COVID-19 lockdown in 2020 (Spaull et al. 2020a). As indicated in Figure 1.8, 47% of respondents stated that they had



Source: Authors' calculation from General Household Survey dataset (2018).

Data are weighted to be representative of the South African youth population (aged 15–34 years).

FIGURE 5.7: South African youth classified according to race and living conditions asset index.



Source: Authors' calculations from National Income Dynamics Study–Coronavirus Rapid Mobile Survey (NIDS-CRAM) (wave 1 and 2) datasets (Spaull et al. 2020a, 2020b).

Data are weighted to be representative of the South African adult population.

FIGURE 5.8: Incidence of hunger during the coronavirus disease caused by SARS-CoV-2 virus lockdown.

run out of money to buy food at some point during April 2020. During this period, South Africa was subject to strict lockdown regulations. Figure 5.8 further shows the incidence of child hunger in households.

This section has presented and discussed recent data on unemployment and youth well-being. As shown in the preceding discussion, there is a

‘youth problem’ in South Africa. In the next section, we argue that considering the challenges brought about by the pandemic, youth precarity will persist, with negative implications for youth transitions.

■ COVID-19, youth and the future of work in South Africa: Implications for youth transitions

The empirical evidence in the previous section demonstrates the precariousness of youth labour markets. Youth are at the stage where they are expected to transition to adulthood and entering the labour market is one of the first steps. In the context of the dynamics brought about by COVID-19, youth transitions are expected to be further extended and disrupted. This disruption of transitions to adulthood negatively impacts the youth, with some individuals having reached 35 years of age and still wanting to enter the labour market and start their own family. In such cases, age is no longer an indicator of youth. What was previously understood as a ‘transition’ or ‘phase’ is now viewed as a new ‘condition’ (Woodman & Leccardi 2015). Factors that have traditionally been regarded as indicators of progress to adulthood, such as home ownership, stable employment and having a family, have been eroded or become less certain (Black & Walsh 2019).

It is important to compare the characteristics of the crisis brought about by COVID-19 with those of the previous financial crisis. For example, the literature notes that the 2008 global financial crisis led to many negative outcomes for young people. The global financial crisis had several negative impacts on youth in Europe:

Discussions of youth precarity have come to be shaped by the critical juncture of the 2008 GFC [global financial crisis], which resulted in a sharp rise in youth un- and under-employment, an expansion of education and training, a housing crisis which prevented many from leaving the parental home or buying their first home, and a raft of public service cuts and austerity measures. (Devany et al. 2020, p. 86)

Similarly, we predict a bleak picture for youth in South Africa. Reliable research suggests that the incidence of hunger and poverty increased in many poor households during the lockdown (Spaull et al. 2020a). Although there were some forms of social protection, such as an increase in the child support grant and cash grants to the unemployed, these were short term in nature, and many cases of mismanagement and corruption were reported in the media. As a result, we anticipate that the government is likely to experiment with austerity measures. Even before the pandemic, talks of austerities were circulating in the media and policy discourses because of the increasing ratio of government debt to gross domestic product (GDP).

Youth from poor households will be the most severely affected and will be pushed further into poverty if the austerity measures are implemented.

Evidence suggests that during the lockdown, many people fell back into poverty (Bassier et al. 2023). As indicated in the previous section, poverty in South Africa is transmitted from one generation to the next (De Lannoy et al. 2015); many young people are thus victims of intergenerational poverty. Research indicates that poverty is associated with poor outcomes for young people. For example, youth from poor households are more likely to drop out of school or have poor school outcomes (De Lannoy et al. 2015). Since higher education levels are linked to better employment outcomes, youth from poor households are likely to be pushed further into unemployment. In this sense, we postulate that precarity is now a semi-permanent, if not permanent, condition for young people in South Africa.

When young people can find employment, they are most likely to find temporary jobs and to be in and out of employment over short periods. Du Bois-Reymond and Blasco (2003) call this process a 'yoyo transition', characterised by 'complex cycles of dependence and independence, of entering and leaving education and employment, of leaving and re-entering the parental home, which also extends and complicates their experience of youth' (Black & Walsh 2019, p. 18). The argument is that the transition to adulthood is now characterised by unpredictability, vulnerability and reversibility. As a result, young people's experiences and future prospects have become uncertain, with associated risks and contingencies (Black & Walsh 2019). It is in this context that we argue that youth transitions after the pandemic will become nonlinear, extended and disrupted. Many young people will remain in, or be pushed into, a state of vulnerability.

Another issue that is circulating in media and policy discourses is business loss, especially in the restaurant, travel, tourism and hospitality sectors. As Stat SA (2020b) reports, the number of international tourists to South Africa decreased by 91% from 834,274 in 2019 to 73,988 in 2020. Since these sectors mainly employ young people, we can argue that youth were severely affected by the pandemic. Even after the pandemic, it will take time for these industries to recover. It is also likely that many young people will be out of work for extended periods.

From the discussion in this chapter, we suggest that youth precarity will be extended in the lives of youth in such a way that it becomes the way of life, even after the pandemic. The COVID-19 pandemic has thus had adverse effects on many young people's career prospects. Youth seeking to enter labour markets for the first time in 2020 were negatively impacted and joined the 'the reserve army of labour' who have been unemployed for a long time. We extend the idea of youth precarity beyond labour markets to other spheres of life. For example, from the housing perspective, many

young people will be without housing security or will be homeless. In this context, homelessness refers to the growing phenomenon where many young people, especially in cities, are squatting with friends or living somewhere for just a short time before moving to another area. In this sense, there is no security, and there are many uncertainties and instabilities.

The idea of uncertainty is important when dealing with young people. When youth are at school or in higher education, they have imagined future lives and aspirations (Hardgrove, Rootham & McDowell 2015b). These imagined futures are exposed to them by the images of success that circulate in the media. However, when these aspirations are interrupted by the existing socioeconomic realities, many youth face uncertainties (Hardgrove et al. 2015b). Thus, we argue that because of the many disruptions in their lives because of COVID-19, many youths will experience uncertainties in terms of their education and career prospects.

The challenges brought about by the COVID-19 pandemic require aggressive policy responses. As discussed, unemployment and precarity extend and disrupt youth transitions. Furthermore, unemployment has a scarring effect on youth lives and leads to mental health challenges and many social problems (Strandh et al. 2014). Unless these problems receive policy attention, we risk having youth affected by a wide range of mental health and social issues.

■ Conclusion

This chapter aimed to investigate the impacts of the COVID-19 pandemic on young people in South Africa. The chapter provided evidence through empirical data from Statistics SA of youth vulnerability, poverty and precarity. This evidence was presented to show that youth precarity is expected to persist beyond the COVID-19 pandemic. The chapter has shown that there is a 'spatial mismatch' between economic opportunities and the geographical location of young job seekers, since there are more unemployed youth in rural areas, but more employment opportunities in urban areas. The rural areas with the highest numbers of unemployed youth are in the Eastern Cape, KwaZulu-Natal and Limpopo provinces, located in former homeland or Bantustan areas.

This chapter also found that many young people are victims of intergenerational poverty. Research has indicated that poverty is associated with poor outcomes for young people. Moreover, it was discussed in this chapter that youth from poor households are more likely to drop out of school or have poor school outcomes. It was also demonstrated that higher levels of education are associated with better employment outcomes, and

that youths from poor households thus tend to be pushed further into unemployment. In addition, there is evidence that even those who are employed are in precarious jobs, characterised by low wages and without benefits such as health insurance or pensions.

The overall argument of this chapter rests on the premise that the current labour markets and economic conditions leave many young people vulnerable and in precarious conditions. Youths who experience precarity in their everyday life are unlikely to transition into adulthood, which society associates with indicators such as employment, homeownership and having one's own family. Youth precarity creates a gap between imagined futures and existing socioeconomic conditions. It is against this background that we argue for radical policy responses from the government so that young people can have successful career pathways; however, the issue of unemployment is perhaps more urgent: young people who are NEET need jobs, and they need them now!

COVID-19 revealed South Africa's need to circularise its economy

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■ Abstract

Background: The coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic not only highlighted the under-preparedness of countries in managing pandemics but also exposed the fragility of their economies. In South Africa, the pandemic halted most economic activities, including recycling, which led to widespread job losses. These economic shocks are thought to be largely a consequence of the country's reliance on a linear, as opposed to circular, economy. The inefficiencies in value chains that were exposed by the pandemic present opportunities to change mindsets, behaviours, systems and technologies as part of a transition to a circular economy (CE).

Aim: This chapter aims to provide a perspective on how South Africa's transition to a CE could build economic resilience by managing waste as a potential resource, creating jobs and contributing to sustainability imperatives.

Methods: This perspective chapter draws on peer-reviewed and grey literature to support the expert opinions and arguments presented by the authors.

Findings: In South Africa, environmental positives brought about by the lockdown were quickly eclipsed by increased waste generation and accumulation, a compromised manufacturing sector because of a shortage of raw materials, increased dependence on imports, limited recycling activities and widespread non-sustainable natural resource use. While a few examples of circular practices have emerged, primarily in the health sector (e.g. safe sterilisation and reuse of surgical masks), efforts to apply circular principles have been limited in other sectors. This appears to be a consequence of the combination of a lack of investment in circular approaches (particularly decarbonisation), ineffective waste governance, a poorly structured and managed waste sector, complex value chains and industry's lack of agility to adapt to the 'new normal'. However, additive and advanced manufacturing facilities, an established recycling sector, some level of experimentation with blockchains, and the introduction of stricter rules around extended producer responsibility to reduce waste inputs to landfill represent a base upon which to start building the country's CE.

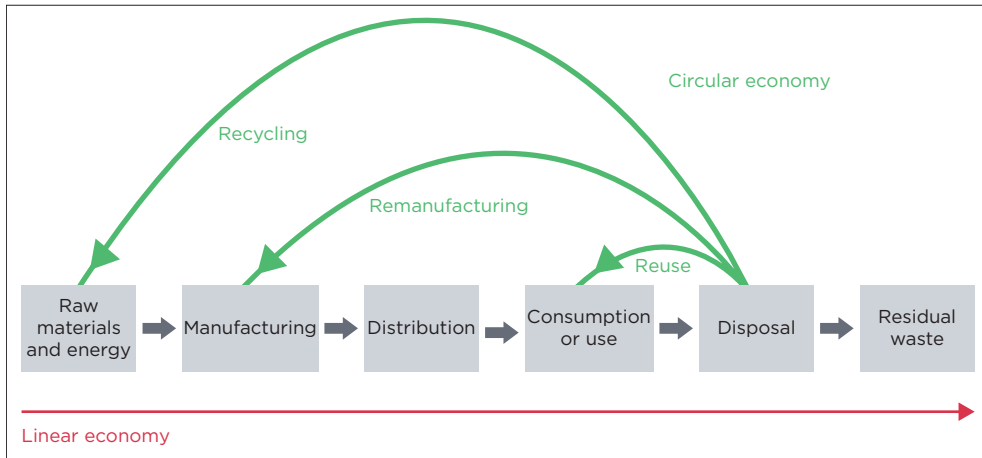
Implications and conclusions: The CE could represent an effective 'vaccine' against rising unemployment in the country, and decisions by other countries to base their COVID-19 recovery plans on regenerative models and circular principles lend support to this suggestion. The fragility of South Africa's supply chains and private sector as a whole were exposed by the pandemic; however, there is potential to apply CE strategies holistically across supply chains, government policy, infrastructure, technology and consumer behaviour to build resilience and sustainability.

■ Introduction

The coronavirus disease caused by SARS-CoV-2 virus (COVID-19) had devastating macroeconomic effects globally, which led to increasing levels of economic uncertainty and unemployment (International Labour Organization [ILO] 2020; Rathnayaka, Khanam & Rahman 2023). Even though the pandemic spanned just a few months in many parts of the world, there were many early predictions that it would bring about an increase in global poverty and unemployment (Couch, Fairlie & Xu 2020) and compromise the world's chances of achieving the UN sustainable development goals (SDGs) by 2030 (Sumner, Hoy & Ortiz-Juarez 2020). Four years on from when COVID-19 was first declared a pandemic in March 2020, these predictions are slowly becoming a reality, particularly in relation to the SDGs focused on poverty, communities, industry, innovation, infrastructure and sustainable cities. Reports of rising levels of poverty brought about by the pandemic and exacerbated by increasing unemployment have been reported (ILO 2020) in many parts of the world, for example, Norway (Solsvik 2020), Austria (Murphy & King 2020), the USA (Badka et al. 2020), Portugal (Almeida & Santos 2020), China (Li et al. 2023).

Data on COVID-19-induced job losses in Africa are starting to emerge (Mafuwane 2023), and this is not surprising given the continent's 'disproportionate burden of poverty and disease, high levels of unemployment, poorly developed infrastructure, lack and in some cases absence of safety nets, and under-resourced healthcare systems' (Ataguba 2020; Gouda et al. 2019; McIntyre et al. 2018; O'Hare 2015). In South Africa, the pandemic struck the country at perhaps its weakest point, when the economy was already struggling in terms of growth, unemployment and rising sovereign debt (Alenda-Demoutiez & Mügge 2019). The pandemic halted most economic activities in the country for months and led to job losses across several sectors (Francis 2020; Posel, Oyenubi & Kollamparambil 2021).

As in many parts of the world (Meier & Pinto 2024), the COVID-19 pandemic alerted the South African government, business sector and society at large to the deficits of 'normal' patterns of production, consumption and their enduring impact on supply chains. This has triggered a global discourse on how transitioning to a circular economy (CE) can make supply chains more resilient, transparent and sustainable (Cifuentes-Faura 2022; Giudice, Caferra & Morone 2020; Ibn-Mohammed et al. 2021; Khan et al. 2021; Nandi et al. 2021; Su & Urban 2021; Wuyts et al. 2020). The definition of the CE is still evolving, but its most common characteristic is the need to move away from the predominant linear economic approach towards a closed-loop model (Figure 6.1) that is based on zero waste and



Source: Author's own work.

FIGURE 6.1: Closed-loop economic model.

cleaner growth targets (Heshmati 2017). According to the International Institute for Sustainable Development (Vaughan et al. 2018):

A circular economy is one in which materials constantly flow around a 'closed-loop' system, rather than being used once and then discarded. The value of materials is therefore not lost when they are thrown away and the cost of waste management and disposal is avoided. This system decouples resource use from waste and shifts to greater reusing, restoring and recycling where the main interest of customers will be high-quality services rather than owning products. (p. 1)

In a recent article on the need to relook at the SDGs in the context of COVID-19, Naidoo and Fisher (2020) pointed out that our dependence on globalisation and economic growth to drive green investment and sustainable development is unrealistic. According to Ibn-Mohammed et al. (2021):

[T]he adoption of circular economy – an industrial economic model that satisfies the multiple roles of decoupling of economic growth from resource consumption, waste management and wealth creation – has been touted to be a viable solution. (p. 2)

These authors go on to argue that while addressing the public health consequences of COVID-19 is the main priority, the stimulus packages introduced by governments in many parts of the world, including South Africa (Mishi et al. 2023), to aid recovery present the opportunity using recovery plans to promote resilient low-carbon CE practices like repair, refurbishment, remanufacturing, recycling and materials substitution.

There are indications that the unpreparedness of both developed and developing countries in dealing with the economic shocks brought about by the pandemic and their delayed or incomplete recovery (i.e. lack of

resilience) may be partly because of their failure to circularise their economies (Ibn-Mohammed et al. 2021). Arguments proposed by multiple experts (Ibn-Mohammed et al. 2021; Naidoo & Fisher 2020; Sumner et al. 2020) make a case for countries such as South Africa that are heavily reliant on a linear economy to begin transitioning to a CE, to improve their chances of recovering from the COVID-19-induced economic downturn and improved resilience. According to Kechichian and Mahmoud (2020), the CE can support COVID-19 responses by building economic resilience:

[B]ecause it's based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems, the circular economy can help us meet the Sustainable Development Goals. Implementing it would also promote water and nutrient security as well as security or resiliency in materials while mitigating what experts believe to be this century's biggest global threat to health: climate change.

By drawing on the broader literature that is now emerging on how systems across a number of sectors could be improved based on the learnings gained as a consequence of the pandemic, this chapter argues that in the 'new normal' inefficiencies along value chains exposed by the crisis represent opportunities for countries such as South Africa to use CE strategies holistically across supply chains, government policy, infrastructure, technology and consumer behaviour as a way of building resilience. Furthermore, using the country's waste management history as a backdrop, the chapter explains how the CE provides the framework to seize opportunities to manage waste as a potential resource, create jobs and contribute to sustainability imperatives. A few, but significant, examples of how the country has made use of government's COVID-19 recovery funding and reprioritisation efforts to fast-track the transition to a CE are also highlighted. Finally, some recommendations are made regarding how the country could leverage existing resources, policies, systems and expertise to circularise its economy.

■ COVID-19 exposes the limitations of South Africa's linear economy

A more strategically planned and orchestrated transition to a CE in South Africa in the years preceding COVID-19 would have built resilience by creating new businesses, jobs and entrepreneurs and increasing employment along value chains in several sectors. While the South African government has professed to be in pursuit of a CE for some time now and even launched the African Circular Economy Alliance (ACEA) together with Nigeria and Rwanda in 2017 (Preston, Lehne, & Wellesley 2019), evidence on the ground suggests that the country's economic activities remain largely reflective of a linear economy (i.e. one that takes, makes and disposes of resources).

A paper by Wuyts et al. (2020) shortly after COVID-19 was declared a pandemic explored the interplays between CE principles and COVID-19-related issues, but as with much of the research published on COVID-19 during that period, the authors focus largely on public health and the health care sector specifically. This is probably because the COVID-19 crisis led to an exponential increase in medical waste (Yu et al. 2020), disrupted medical waste management systems (Zambrano-Monserrate, Ruano & Sanchez-Alcalde 2020) and placed enormous pressure on global medical device and equipment value chains (Wuyts et al. 2020). The health care sector globally, including South Africa, faced a shortage of essential medical equipment and personal protective equipment (PPE) (Ranney, Griffeth & Jha 2020) and limited capacity to adopt circular strategies (Wuyts et al. 2020) apart from safe sterilisation and reuse of PPE to mitigate the shortages and increased waste volumes. After this initial health care-focused response to the pandemic, there has been an increasing effort to relate CE practices to environmental policies, supply chains, government policy, infrastructure, technology and consumer behaviour in the context of economic recovery from COVID-19 (Cifuentes-Faura 2022; Giudice et al. 2020; Ibn-Mohammed et al. 2021; Khan et al. 2021; Nandi et al. 2021; Su & Urban 2021).

Efforts to investigate how the CE can drive growth in sectors other than health, increase sustainability and promote employment after COVID-19 have been limited in South Africa. However, the pandemic did force the global community, including South Africans, to pause and reflect on the disadvantages of pursuing a take, make and dispose agenda. This is largely because of the pandemic's much-publicised positive indirect effects on the environment, such as cleaner air and decreased pollution levels (Chen et al. 2020; Dutheil, Baker & Navel 2020). As in other parts of the world (Abubakar et al. 2021; Zambrano-Monserrate et al. 2020), in South Africa, these environmental positives were rapidly eclipsed by the feverish increase in waste generation and accumulation, and the stalling of the manufacturing sector, which resulted in an increasing dependence on imports, and encouraged widespread non-sustainable natural resource use (most especially water). Furthermore, cities across South Africa suspended recycling programmes because of concerns about the risk of spreading the virus in recycling centres. This was not unique to South Africa though; in Italy, for example, infected residents were at one stage not allowed to sort their waste (Zambrano-Monserrate et al. 2020). There were also some surprising responses from certain industries globally such as seizing the opportunity to repeal disposable bag bans and a switch to single-use packaging by companies that usually encourage consumers to bring their own bags (Zambrano-Monserrate et al. 2020).

In South Africa, the exponential increases in medical waste, packaging waste from online shopping for home delivery, increases in disposable plastic

bag use and the dramatic increase in online food ordering because of lockdown regulations led to an increase in both organic and inorganic waste. Data on this increase were not available for South Africa and Africa at large at the time of writing this chapter, but hospitals in Wuhan, China, for example, produced approximately 190 metric tons more medical waste per day during the outbreak than pre-COVID-19 levels (Calma 2020). It should also be noted that the constituents of waste changed globally after COVID-19, even at the domestic level (Calma 2020). In South Africa, this was seen in terms of an increase in PPE waste such as gloves, masks and sanitiser containers (authors' unpublished observations). This phenomenon of a pandemic-induced increase in waste quantity and diversity has sharpened the focus of some countries with respect to waste recycling (Liu et al. 2020) largely because recycling is the most widely used and effective way to mitigate the negative environmental effects of waste, including environmental degradation and pollution (Schanes, Dobernig & Gözet 2018), conserve and generate energy and use natural resources more sustainably (Ma et al. 2019).

Had South Africa been more prepared to deal with the waste-related consequences of COVID-19 and more agile in adapting existing manufacturing and recycling infrastructure to produce urgently needed PPE, the country could have created jobs and reduced the dependency on costly importation of these items. This is a consequence of a much broader and long-standing problem within the country: Little attention has been given to the linear economy approach within both the manufacturing and recycling sectors; in fact, linear approaches became even more pervasive across almost every sector in the country during the pandemic. This is related to the fact that apart from a few academic exercises (such as Asante, Amoyaw-Osei & Agusa 2019; Borthakur 2020; Godfrey & Oelofse 2017; Okonta & Mohlalifi 2020; Strydom 2018), very little focus is being given to scaling existing recycling activities in South Africa at present, and the opportunity to turn the rising volumes and diversity of waste (Adeleke et al. 2021 and references therein) into new jobs and increased employment along the waste value chain is not being maximised. This is reflected by the country's relatively low recycling rates, estimated at 7.2% in 2015 according to Strydom (2018), and reveals the untapped potential to leverage socioeconomic benefits associated with job creation, improved livelihoods and reduced environmental impacts, as illustrated by a recent attempt to quantify the economic activity in the informal recycling sector in South Africa (Godfrey 2021). Despite the significant contribution of informal waste reclaimers to South Africa's economy and the private sector's investment in the local recycling economy (Godfrey 2021), the recycling economy can be regarded as underperforming. A possible explanation for this can be borrowed from Godfrey and Oelofse's (2017):

While the waste hierarchy is embedded in national policy (in South Africa), an extensive legislative framework has made it more and more challenging for the

public and private sector to remain compliant and competitive in a local and global market, and still drive waste away from landfill towards reuse, recycling, and recovery. (p. 1)

Given the South African economy's heavy reliance on natural resources and mining, and multiple challenges associated with the maintenance of ecological infrastructure and lowering greenhouse gas emissions, the need to build resilience through regenerating natural systems, keeping products and materials in use and factoring out waste and pollution is urgent (Joshua & Bekun 2020). This is true for many countries given the reliance of the global economy on complex supply chains that depend on the input of more than 100 billion tons of raw materials each year (De Wit et al. 2018). Experts have been warning governments about these unsustainable practices for decades, but it took only a few months of a singular pandemic for many to realise the need for a paradigm shift in manufacturing and waste management; more specifically, the need for the holistic adoption of CE strategies across all sectors, supported by policy, finance, infrastructure, technology and education, in order to drive sustainability alongside post-COVID economic renewal. This shift could promote food, nutrient and water security as well as security and resilience in materials, given the already detrimental effects of the COVID-19 disease on economic activities and food systems across the developing world (Giudice et al. 2020). Most importantly, transitioning to the CE could help the country contribute to mitigating what is still regarded as the biggest global threat to human health, climate change. On this note, it is worth noting that South Africa is one of the world's largest greenhouse gas emitters (Zheng et al. 2019) largely because of its reliance on coal (Joshua & Bekun 2020).

According to a Chatham House report (Preston & Lehne 2017), the CE can alleviate some of the challenges that South Africa faces around resource conflicts and the disproportional distribution of resources by encouraging participatory forms of governance, which bring local stakeholders together for the management of resources. Additionally, the CE can introduce closed-loop value chains that transform waste into resources and pursue social objectives in combination with reducing pollution. Studies on how waste management challenges imposed by COVID-19 have been addressed have also highlighted the role that entrepreneurship can play in addressing these challenges (Neumeyer, Ashton & Dentchev 2020). Entrepreneurs should be viewed as change agents who can help realise CE ambitions if South African cities support local production and short, closed-loop supply chains. However, in comparison with many other countries, the South African government does not appear to be doing enough to incentivise business models that promote CE practices like repair, refurbishment, reuse, recycling and waste minimisation. In Bangladesh, for example, a country that is presently facing mass unemployment, the Ella Pad initiative

is creating jobs by supporting female entrepreneurs who turn waste from the textile industry into hygiene and sanitary products for women (Graham 2018). By supporting businesses that contribute to the CE, the government can indirectly create 'green jobs' (which include CE jobs as a sub-category) that place an emphasis on decent work (ILO 2016). The CE can thus be seen as a means of bringing competitiveness, productivity, wage stabilisation, innovation and strategic industrial goals together with climate and environmental objectives (Vaughan et al. 2018). This has led to many authors proposing the CE as a sustainable development strategy to address pressing resource scarcity and environmental degradation challenges (Cifuentes-Faura 2022; Heshmati 2017), both of which represent major areas of concern for South Africa (Joshua & Bekun 2020).

■ Merging the circular economy with South Africa's COVID-19 response

The COVID-19 pandemic has exposed the many cracks in South Africa's current economic system, which is how communities and government organise and distribute available resources, services and goods across provinces and the country as a whole. As alluded to earlier, the country was facing multiple crises even before the pandemic, including climate change induced extreme weather events, rising inequality, human rights violations and poor linkages between government and the private sector. The government's decision to offer financial aid to its citizens and businesses and to invest in infrastructure across many sectors to respond to the pandemic ran the risk of exacerbating these crises if the root causes were not addressed (Mafuwane 2023). While the government's decision to continue providing this aid despite this risk can be understood to some extent, the long-term solution should ideally involve formulating and embarking on a sustainable growth trajectory that is supported by resilience mechanisms and large-scale decarbonisation efforts that benefit all sectors of society – in line with country's 'Just Transition Framework' (Presidential Climate Commission 2022).

In this regard, South Africa has invested inadequately in decarbonisation to date, which will pose a major challenge to its (just) transition to a CE both in the short- and long-term. Materazzi and Foscolo (2019) underscore the role that waste (together with renewable gas) can play in decarbonising the energy sector, which represents one of South Africa's major areas of concern. Investing in decarbonisation, therefore, represents a priority in the country's post-pandemic response. This suggestion is supported by a recent review of stimulus packages because of the financial crisis, which showed that those linked with green projects were more beneficial in terms of outcomes than traditional packages (Mundaca & Richter 2015). One area

in which South Africa has made some gains, and which offers a significant opportunity for growth, is renewable energy. In 2011, the South African Department of Energy launched the Renewable Energy Independent Power Producer Procurement Programme with the objective of securing additional renewable energy generation capacity for the country's national electricity grid. The programme's procurement framework was designed to drive socioeconomic and enterprise development in local communities and promote job creation through local employment as well as local community shareholding (Davies, Swilling & Wlokas 2018). We believe that the programme is far from reaching its full potential and the country's energy challenges have heightened over the last few years, with no clear solution in sight (Bowman 2020). This can be partly remedied by making waste an energy resource (in line with adopting a CE approach), but this demands a rethinking of 'waste' and the practice of waste management across all sectors in the country. Materazzi and Foscolo (2019) assert that a range of technologies are available for [t]he potential of waste as an energy source; these include simple systems for disposing of dry waste to more complex technologies designed to deal with large amounts of industrial waste.

In the context of a pandemic such as COVID-19, where waste itself (especially medical waste) can pose health hazards and become an avenue that facilitates the transmission of the virus, the adoption of waste-to-energy technologies can ensure the disposal of waste in a manner that minimises further health risks and generates energy, contributing to alternative energy sources that are sustainable and renewable.

It must be said though that there are a few examples of the country's willingness to apply CE principles in dealing with the challenges posed by COVID-19. The shortage of surgical face masks in South Africa, for example, drove circular innovations within the health care sector in terms of the use of sterilisation agents and novel protocols (e.g. steam and vaporised hydrogen peroxide) to decontaminate surgical face masks for reuse. There has also been a rapid emergence of fabrication laboratories ('Fab Labs') that focus on innovating prototype designs and processes for medical use. The pandemic has encouraged the manufacturing and technology sectors to learn from history, where during times of war, factories, facilities and infrastructure and knowledge resources and creators were repurposed or redirected to create offensive and defensive infrastructure. In this regard, the additive and advanced manufacturing facilities already in place at various universities across the country (Alabi et al. 2020) represent a valuable resource base. The facilities, either on their own or in combination with electronics/mechatronics and other technologies, can be mobilised to design, develop and manufacture much-needed medical devices when needed. This was evidenced by the fact that within a few weeks of the first COVID-19 cases being reported in South Africa, preparations were already

underway at a number of these institutions to develop agile manufacturing teams to fight the pandemic.

An excellent example of such an initiative is the COVID-19 Agile Solutions Team, which was started as a virtual group through collaboration between Aerosud, the Council for Scientific and Industrial Research (CSIR), Vaal University of Technology, Central University of Technology, North-West University and Progressus Research and Development Consultancy. In an effort to respond rapidly to manufacturing needs in relation to medical equipment, the consortium adopted 'Agile Methods', which are increasingly being used to reduce time spent on evaluating solutions and to increase output during disruptive times. Although initially designed for software development, Agile Methods allow manufacturers to achieve a fast rate of change and rapid response to customer demands by emphasising rapid iteration, operator augmentation, operational flexibility and bottom-up innovation. This Agile approach to manufacturing and the additive and advanced manufacturing facilities within universities, which are being strengthened during the pandemic, represent one of the pillars on which South Africa's CE could be built.

In contrast, the South African private sector has shown few signs of adopting CE principles as part of the response to challenges facing the country before and after the pandemic. Apart from a very recent effort to introduce two-litre reusable plastic (polyethylene terephthalate [PET]) cooldrink bottles that are returned for a discount at the next purchase, packaging companies have made little to no effort to produce sustainable and recyclable consumer goods, despite the rise in single-use plastic packaging brought about by lockdown-related home deliveries and consumer preferences. This could be a consequence of the public's fears associated with reused materials, but it should be mentioned that protocols for recycling many waste streams in the country are yet to be established, and this is an area that demands urgent attention. Moreover, there is little tangible evidence of the food and beverage sector redirecting surplus food to those in need or even to composting initiatives. There is little appetite currently to compost perishable food vegetables that are discarded even though compostable waste can contribute to food production and thereby to food security. Studies in many parts of the world have shown that food waste solutions and innovations that combine strategic dimensions of waste management with practice-driven initiatives can contribute significantly to CE gains (Martin-Rios et al. 2018 and references therein). Innovations around sustainable and recyclable consumer goods and waste reduction, as well as food wastage, have historically not been prioritised in South Africa (Godfrey & Oelofse 2017; Okonta & Mohlalifi 2020; Strydom 2018) and require focused innovation efforts to shift towards and sustain a CE.

With regard to the use of the CE to create businesses and jobs, a joint study by the Ellen MacArthur Foundation and McKinsey Center for Business and Environment (Schulze 2016) suggests that resource productivity represents a currently underexploited source of wealth and competitiveness in the country. The report's findings point directly towards three of South Africa's major weaknesses: Capabilities related to recycling, designing and producing longer-lasting products and providing maintenance services from the manufacturer. The production of longer-lasting products will remain largely out of the country's control until more of the domestic electronic products and machinery sold are manufactured within the country. A lower-hanging fruit for South Africa appears to be an existing recycling sector, which over the last three decades has moved through four main stages of development: 'the age of landfilling', 'the emergence of recycling', 'the flood of regulation' and 'the drive for extended producer responsibility (EPR)' and is currently standing on the brink of a fifth stage, namely, 'the future is a circular economy' (Godfrey & Oelofse 2017).

However, while the large numbers of 'waste pickers' that feed the informal markets appear to be very efficient at collecting recyclable waste (approximately 51% of all paper and packaging waste collected in South Africa in 2017; Godfrey 2021), South Africa is still decades behind the developed world in terms of having the infrastructure and technical capacity to turn this waste into products and create markets for these. Increasing the diversion of recyclable waste from landfill will require considerably more investment by the private sector and the government. Far too much recyclable waste in South Africa (approximately 65.2% in 2017) is being sent to landfill for disposal (Department of Environmental Affairs [DEA] 2018). South Africa must make a greater and immediate effort to learn from what other countries have implemented in terms of recycling policy and technology as growing and sustaining the recycling sector will require complementary governmental policies, business initiatives, consumer shifts and technological innovations to transition towards circular models that are digitally enabled and environmentally conscious.

On this note, South African municipalities could learn from the example of Amsterdam, the first municipality to put in place a Circular 2020–2025 Strategy as the basis for its recovery from COVID-19. The primary objectives of the strategy are to reduce food waste, impose sustainability requirements on the construction industry and reduce the use of new raw materials. The European Union and South Korea similarly built their economic recovery plans (REACT-EU and Korean New Deal, respectively) for COVID-19 around regenerative models and CE principles. For South Africa, a major step in this direction has come in the form of government's introduction of the Section 18 Regulations to the *National Environmental Management: Waste*

Act on 05 November 2020, which refers to the EPR aspect of the *National Environmental Management Waste Act (NEMWA)*. The regulations came into effect on 05 May 2021 and include setting new targets for recycled content such as plastic packaging and more binding EPR, requiring manufacturers, distributors and importers to ensure that used products are returned and recycled. Furthermore, producers are expected to work with waste management companies and informal waste collectors to establish collection and recycling schemes. Policy tools like taxes, subsidies and regulations have all been recognised as effective mechanisms for incentivising circular practices such as recycling (Ibn-Mohammed et al. 2021).

Transitioning to a CE will help South Africa build systems that survive unplanned stresses, rather than buckle under them, and this requires a systematic shift rather than the reduction of negative impacts associated with a linear economy. In a CE, this is achieved by adding value and resilience along supply chains through the integration of new products, services and a larger number of actors. Furthermore, as already alluded to, this systemic shift must bring together solutions and insights at multiple levels and from multiple stakeholders (individual, organisational, supply chain, governmental and community) to ensure widescale buy-in and impact (social, technological and commercial). In this regard, Industry 4.0 developments, digitalisation and new emerging technologies such as blockchains are interconnecting the world while simultaneously disrupting the traditional economic model. A number of experts argue that the tracking, tracing and responsiveness of supply chains can be supported through digitally enabled CE practices (Khan et al. 2021; Kouhizadeh, Zhu & Sarkis 2020 and references therein; Nandi et al. 2021). Blockchains, for example, have been successfully applied in a wide range of industries (government, utilities, health care and finance), providing information on a product's life cycle, which is a necessity for CE design and operation. However, the ability of blockchain technologies to build long-term resilience by aiding supply chain and logistical activities to close the loop can only be realised if stakeholders work together and maintain the supply chain continuity (Kouhizadeh et al. 2020). While South Africa, together with partners such as China, India and Russia, has initiated some research on blockchain technologies, their application within South Africa remains largely limited to the banking industry (Maupin 2017).

It is clear that COVID-19 was severe in terms of its effects on food systems, particularly in developing countries (Dewick, Pineda & Ramlogan 2020). To its credit, the South African government has over the last few decades provided varied support to households engaged in small-scale farming to improve their livelihoods, income and food security (Afful & Mafsiakaneng 2018). However, the pandemic was a very difficult time for

small-scale informal farmers located in rural areas of South Africa, given that they lack formal safety nets. These farmers represent the cornerstone of local, and to an extent, national food security strategies and far more effort must be made to assess how CE principles could help them reduce their states of vulnerability. The challenge is that small-scale informal farmers are plagued by structural problems (Dewick et al. 2020) and some level of formalisation is necessary before attempting to circularise small-scale, informal farming activities.

■ Enabling South Africa's recovery plan through effective waste governance

The preceding section has argued that the radical and immediate introduction of CE principles will increase the country's levels of preparedness to deal with future disasters. However, this will be challenging in a country that has been experiencing a waste overload for decades and is burdened by several unlicensed landfills and a dearth of waste management plans or waste treatment facilities to accommodate this overload (Schenck et al. 2019). COVID-19 has exacerbated these challenges within the waste sector, placing authorities, waste workers and the waste economy under significant pressure and bringing into question the effectiveness of the country's waste governance.

The DEA's State of Waste Report (2018) showed that South Africans generated about 55.6 million tons of general (municipal, commercial and industrial) waste in 2017. However, at most just 34.5% of this is recycled or recovered for other uses. The report also highlights the fact that hazardous waste types (e.g. mercury- and asbestos-containing waste) and other toxic materials continue to be dumped at landfill sites. Thus, there are governance and logistical challenges to shifting waste management in the country from a linear to CE that need to be addressed. Furthermore, as Asante et al. (2019) point out, the mishandling of waste can have serious health risks. This is a particular concern in the South African context where the informal waste sector is largely uncoordinated in terms of process and safety (Schenck et al. 2019).

While the COVID-19 lockdown called for by the South African president dramatically altered the daily lives of people across the country, one of the things that remained relatively unchanged was the massive amounts of waste produced. During the pandemic, the country's efforts to manage waste were also hampered by measures put in place by the Minister of Environment, Forestry and Fisheries to prevent the spread of the disease by suspending waste recycling, as set out in Regulation 4(10) issued by the Minister of Cooperative Governance and Traditional Affairs on 29 April 2020 in terms of section 27(2) of the *Disaster Management Act (No. 57 of 2002)*.

These measures were, however, understandably necessary to curb the spread of the virus, given that current waste-sorting practices require high levels of contact with surfaces and make social distancing challenging. The imposition of these measures and their impacts also presented a valuable opportunity to rethink how waste can be effectively managed using CE principles and how to enable this through mass behavioural change.

Researchers and practitioners have for some time been warning government about the severe decline in landfill operation and management standards, particularly at the municipal level (Schenck et al. 2019). This will contribute to declining capacity and in many cases the closure of these facilities, further supporting the need to reduce landfill input through the adoption of circular principles. This motivated the Minister of Environment, Forestry and Fisheries to publish a section 28 notice calling for Industry Waste Management Plans for four (viz. e-waste, tyres, plastics, glass, lighting and fluorescents) out of a total of some 40 waste streams. Apart from ensuring a clean and green environment, the plans are intended to develop skills and create jobs but as these plans have yet to come to fruition, the waste management sector continues to struggle with country's growing waste burden.

While South Africa has a long history of evidence of recycling, this has been and still is, largely motivated by social and economic needs (Godfrey & Oelofse 2017). As mentioned previously, the local recycling economy relies on an active informal waste sector, driven largely by informal waste pickers who have been successful in accessing resources that have proved to be difficult for the private sector to access owing to what we deem excessive gatekeeping by municipalities. South Africa's measures to prevent the spread of COVID-19 were particularly difficult for waste pickers. When the country went on lockdown on 26 March 2020, they were locked out of landfills and unable to collect on the streets. This triggered waste picker protests and their forced removal at certain landfills in the country. They were not been included in government support programmes and some individuals were even arrested and incarcerated for breaching the lockdown regulations. This was yet another example of the failure of government policies on waste and recycling to meaningfully include waste pickers. Their role within the sector appears to be overlooked by an economic model that deems them to be informal and, therefore, irrelevant. This is accentuated by the failure of municipalities to recognise the separation of waste at source system and the tendency to implement recycling programmes that neglect the role of waste pickers. If South Africa is to transition to a CE and build resilience for dealing with future disasters, then waste pickers can no longer be marginalised (Schenck et al. 2019) and the informal recycling economy must receive greater attention, coordination and investment.

South Africa has considerable potential and policies that will allow for the implementation of resource recovery systems that would create economically viable waste businesses and employment in the 'new normal'. Given that South Africa is entering the global CE much later than others, government should avoid making overly elaborate changes to existing waste policies and focus any CE-based recovery plan on three basic principles: Extending the lifespan of products and materials; eliminating, reducing or designing out waste and restoring or maintaining natural systems (MacArthur 2013). This all needs to be underpinned by mechanisms that promote symbiotic cooperation between government, business and consumers. In this regard, there is an urgent need to mobilise the public, private and higher education sectors to collaborate, adapt and develop waste management innovations to support the CE.

■ Conclusion

This chapter argues for the adoption of the CE in South Africa (and globally). By disrupting operations and markets, the pandemic has revealed opportunities to rethink 'business as usual' models. In the context of South Africa and waste management specifically, the pandemic has exposed existing challenges and capacities to deal with the increase in waste. It has also placed a spotlight on outmoded and inefficient approaches to deal with priority waste streams, which have the potential to be recycled, repurposed and reused. The results of this lack of foresight to view waste as a potential resource include unsustainable practices, an inability to use innovations and technology to address enduring and persistent challenges such as the production of energy from waste and a lost opportunity to generate much-needed jobs. Adopting the CE approach could unlock opportunities to address the SDGs, contribute to improved socioeconomic conditions and protect and conserve the environment. However, there are questions about whether the SDGs are still realistic given the major setbacks many countries, including South Africa, have experienced as a consequence of the pandemic and the developmental reprioritisation that needs to take place in order for them to fully recover from the pandemic.

It is also becoming abundantly clear that if countries such as South Africa design their economic responses to economic shocks such as pandemics around innovative CE business models, an important aspect to consider is digitalisation, which has become a key feature of many transitions from a linear to CE globally (Khan et al. 2021). This digitalisation should not be limited to medical solutions or systems that enable working from home; digitalisation can enable the CE by helping businesses close loops, minimising waste, increasing the efficiency of processes, increasing the lifespan of products and lowering transaction costs.

The COVID-19 pandemic has shown the South African government (and private sector) that there is an urgent need to build more resilient and sustainable social systems, economies, governance structures and ecosystems. Given that prioritising resource efficiency lies at the centre of any CE, South Africa could build resilience and address the climate mitigation agenda by circularising its economy. A more circular and resource-efficient economy will translate into long-term reduced greenhouse gas emissions along value chains, from logistics and manufacturing, all the way through to the mining of raw materials.

There is an abundance of evidence to suggest that the CE approach can inform more effective policy development and regulatory frameworks in relation to sustainability, create jobs and integrate sustainability into entire value chains, from extraction to production, consumption and recycling or reuse. The South African government needs to draw on this evidence to craft a plan to build a stronger, revitalised and resilient economy. Basing this plan on a CE will help the country not only recover in the 'new normal' but prosper in it as well.

Repositioning the oral health professions post-COVID-19

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■ Abstract

Background: The coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic has impacted all facets of life in unprecedented ways. Worldwide, oral health professionals were mandated to perform emergency treatment only and to avoid the use of high-speed hand pieces and ultrasonic instruments, which would aerosolise secretions. However, the shortage of personal protective equipment (PPE), uncertainty regarding safety and lack of guidance from the profession resulted in a complete halt to routine oral health services and dental education. In South Africa, the strategy for the management and prevention of COVID-19 was targeted at a primary and community level, but dentists and other oral health care professions were conspicuously absent from the health team. Conversely, in other countries oral health professionals were redeployed to assist with triaging, with final-year medical students graduated early to join the pandemic workforce (Stetler 2020). The training of South African oral health professionals occurs independently of other members of the health care team. Thus, the relevance of the integration of the oral health professional into the health team to allow for holistic person-centred care needs to be reaffirmed.

Aim: The aim of this chapter was to propose new perspectives on how the oral health professions should reposition themselves as part of the health care team and evolve in a post-COVID-19 world in terms of teaching and learning, developing the professional and research.

Methods: A review of the literature was used as the methodology for this chapter. Pre-COVID-19 literature suggested integration of oral health professionals into the health team to allow for holistic person-centred care. Evidence of this integration during the COVID-19 pandemic allowed a new perspective to reposition the oral health profession. Direction was provided by literature on teledentistry, interprofessional education, evidence-based dentistry, decentralisation, person-centred care and dental education.

Findings: The oral health care professions model was developed, founded on the three concepts of person-centred care, decentralisation and interprofessional education. These concepts would be augmented through technology, one such example being teledentistry.

Implications: The COVID-19 pandemic has taught that communal responsibility takes precedence over individual needs while remaining cognisant of ethical principles. It is imperative that a post-COVID-19 programme adopt an alternative health care training model in oral health that is not only person-centred, but also evidence-based and encompasses appropriate socio-political aspects using an interprofessional educational and collaborative approach.

Conclusion: Post-COVID-19 changes to education at both undergraduate and postgraduate levels should propel the role of oral health professionals with expertise beyond the oral cavity to the whole person and community, integrate oral health more explicitly within overall health and locate the oral health professions as an integral part of the health sciences professions.

■ Introduction

The devastating effects of the coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic across the world are unprecedented (Hedding et al. 2020). Globally, countries shut down in an attempt to control the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Mitchell 2020; Pawar 2020). Health care systems scrambled to manage the outbreak, with 99,387,865 confirmed cases of COVID-19, including 2,131,720 deaths worldwide, as reported by the World Health Organization (WHO) at the time of writing (WHO 2020b). In South Africa, the different lockdown levels had a significant impact on the delivery of education, social and health services and employment (Le Grange 2020; Mbunge 2020). Moreover, the pandemic highlighted social injustices and inequitable access to health care, including oral health care, for the most vulnerable communities (Mbunge 2020; Nyasulu & Pandya 2020; Pillay et al. 2021; Siedner et al. 2020). The restrictions imposed on industry, education, health and other sectors during the various levels of lockdown resulted in the need to explore alternative and more innovative means to operate, even at compromised levels. The literature suggests that the COVID-19 crisis will change the way public health as a discipline could inform dental education and shape the nature of the oral health workforce (Quinn et al. 2020). This is an opportune time to reposition the oral health professions, which currently operate in silos, more appropriately within the health sciences on the African continent, and more specifically in South Africa, with respect to education, research and practice.

Preventive public health measures, such as social distancing, handwashing and the wearing of masks, were advocated to limit the spread and transmission of COVID-19. In addition, as the virus spread through the air, it had been advised to avoid closed spaces, crowded places and close contact with others ('the 3 Cs') (Luo et al. 2020). However, for the majority of South Africans who live in informal settlements and crowded dwellings, in densely populated areas with limited safe water, these preventive measures were challenging to implement (Dintsi, Mbanga & Smallwood 2020; Gibson & Rush 2020; Nyashanu, Simbanegavi & Gibson 2020; Wilkinson et al. 2020). Challenges related to basic living conditions, dependence on the public health sector and on community transport, and a lack of or reduction in income placed the most vulnerable communities

at greatest risk of contracting a COVID-19 infection, confounding their already high burden of disease and social ills (Abdool Karim 2020; Mbambo & Agbola 2020; Moonasar et al. 2021).

This chapter explores how a decentralised system, augmented with the use of technology, could contribute to the integration of oral health care into a more holistic person-centred approach. Together with different aspects of interprofessional education (IPE), this could provide a framework to reposition the oral health professions in a post-COVID-19 South Africa.

■ Literature review

■ Dental education during the COVID-19 pandemic

At the onset of the pandemic, the WHO issued a statement recommending that routine dental care be suspended in all countries. In the Western Cape province, 4.5 million South Africans have no dental insurance and rely solely on public dental facilities for care (Smit & Osman 2017). The significance of this directive highlighted the inequities in oral health for the most vulnerable members of society, who generally only access oral services when symptomatic, in that their access to such services was denied or deferred during the COVID-19 lockdown (Ayo-Yusuf & Naidoo 2016). Dental public health clinics were not operational because of not having the necessary biosafety measures to provide treatment. In a country such as South Africa where the oral disease burden is high, this mandate not only discounted but had the potential to further exacerbate the disease burden (Bhayat & Chikte 2018).

Delivering much-needed dental care during the COVID-19 pandemic became a national and global concern. Dental organisations and dental institutions established protocols providing guidance on how to practise with minimum risk of transmission of the SARS-CoV-2 virus (Clarkson et al. 2020). Consideration had to be given to the timing of appointments, building site capacity and ventilation, as well as the number of persons in the rooms to facilitate social distancing. Well into the pandemic, the WHO released interim guidance about the provision of essential oral health services, acknowledging the importance of prevention and self-care for oral conditions (WHO 2020a). They advised that non-urgent dental care such as cleanings, oral health check-ups and preventive care be postponed. Four-handed dentistry, the placement of rubber dams, the use of high-volume saliva ejectors and the use of pre-procedural mouth rinses were advocated to reduce the creation of droplets and aerosols. In South Africa, the most common strategy for the management and prevention of COVID-19 was targeted at the primary and community level (Abdool Karim 2020). However, public health facilities in South Africa were only able to

provide emergency treatment, as many are under-resourced and do not have the necessary infrastructure or communication technology to pursue teledentistry. During the COVID-19 pandemic, oral health professions in South Africa provided limited support in terms of frontline care other than emergency oral health services. It is suggested that most needed human resources and rich learning experiences were missed by excluding dental students during the frontline COVID-19 pandemic response (Nalliah et al. 2024).

Most higher education institutions (HEIs) suspended all face-to-face classes to curb the spread of the virus, necessitating HEIs to adapt their teaching practices to emergency remote teaching to enable successful learning (Di Carvalho et al. 2023; Mahlaba 2020; Van Schalkwyk 2020; Thaba-Nkadimene 2020). Dental institutions were not exempted. The leadership of the dental schools adapted to the pandemic and ensured academic continuity for their students by transitioning most of the teaching activities to an online setting (Coughlan et al. 2022). Traditional teaching and clinical workflows therefore had to be adapted by embracing information and communication technologies (ICTs) and utilising access to social media platforms (Di Carvalho et al. 2023; Talla et al. 2020). Student learning in dental schools is heavily reliant on chairside teaching involving patient contact, which could not be replicated or even simulated during this time. Dental schools worldwide continued to deliver didactic teaching in the hope that they would return to clinical training and teaching as soon as the pandemic abated (Chang et al. 2021; Gurgel et al. 2020; Iyer, Aziz & Ojcius 2020; Quinn et al. 2020). The COVID-19 pandemic has resulted in the interruption of several higher education activities such as face-to-face instruction, including pre-clinical and clinical training; patient assistance; discontinuation of human and some animal studies, especially in postgraduate programmes; cancelling of scientific congresses and conferences; abrupt changes to academic calendars including extra semesters and postponement of graduation ceremonies and the entry of new students (Gurgel et al. 2020).

■ South African context

With the onset of a national lockdown in South Africa, all dental schools in the country suspended face-to-face teaching, as well as clinical and community research and training for all oral health science undergraduate and postgraduate programmes (oral hygiene, dentistry and dental therapy). Iyer et al. (2020) reported that some dental schools in the USA were able to continue pre-clinical teaching through social distancing, using simulation or virtual reality systems and haptic technology units, but most South African dental schools do not have access to these expensive technologies. However,

the 2015 *#FeesMustFall* protests in South Africa had prepared some universities for a blended learning approach, whether synchronously or asynchronously (Czerniewicz, Trotter & Haupt 2019; Potgieter et al. 2019). Most universities in South Africa have an online platform, but the pandemic forced educators to upskill and become flexible, agile and responsive. By 2020, dental educators were using flipped classroom techniques, case-based discussions, voice-over presentations, tutorials and problem-based learning. Although these techniques are valuable tools, they cannot replace authentic learning in a preclinical laboratory or a clinical patient contact session. Assessment strategies also had to be reviewed as the integrity of online examinations was interrogated. South African dental programmes, like other dental curricula globally, are underpinned by a competency-based approach. Competency-based education has been defined as the observable and measurable ability of a health professional to integrate knowledge, skills and attitudes (Englander et al. 2013). In addition, dental schools in South Africa are guided by minimum clinical procedure quotas for dental students prescribed by the Health Professions Council of South Africa (HPCSA). These were not only impossible to achieve because of the restrictions on clinical procedures imposed during lockdown, but also do not necessarily facilitate proficiency according to the three elements of competence identified in the literature, namely intellectual competence, physical-technical competence and interpersonal competence (Yip & Smales 2000). Thus, a measure of competence would require thoughtful engagement and a balance of sufficient procedures as well as overall patient care to ensure that graduates are competent not only in the South African context but also in the broader global arena. Ultimately, the changing landscape provided by the COVID-19 pandemic gave dental schools the opportunity to research and evaluate the benefits and implementation of competency-based education in the South African context.

In South Africa like most developing countries, the ‘digital access divide’ presented additional challenges (Postma et al. 2020). A study conducted at a South African dental school revealed that while almost all students owned a digital device, many did not have access to the internet off campus (Postma et al. 2020). The closure of university residences meant that students returned home to areas with limited connectivity and unreliable and inadequate internet speeds. The cost of data is an additional challenge for students. Negotiations between institutions and service providers resulted in the subsidisation of some university online learning platforms through zero-rating. Research conducted post-COVID confirmed that HEIs lacked the preparedness for threats like COVID (Dukhi et al. 2024). Students were negatively impacted and most faced challenges such as loss of study time, insufficient money for essentials, loss of social contact and insufficient money for food. Inequality in learning support and the veracity of assessment

were also highlighted at different institutions (Dukhi et al. 2024). These factors highlight the need for the development of technology-assisted programmes for dental training that may be used in developing countries.

At HEIs, responsibility for the online landscape depends largely on collaboration between educators and information technology specialists to build these lectures, develop virtual reality and augmented reality devices for anticipated simulated exercises, provide training to use medical applications for information sharing, develop a different set of examination systems and create a new set of guidelines for dental education under the pandemic situation (Chang et al. 2021). The lifestyle changes forced upon communities by the pandemic extended as far as dental education. The pandemic set the scene and tempo for any similar future challenges that dental educators might face. Dental educators should prepare in advance and should not panic, but should remain cautious, flexible and willing (Chang et al. 2021). The novel coronavirus has forced dental educators to revolutionise education in many ways, and the current model of dental education should hence be transformed to suit different situations and include new technological tools for application within oral health programmes.

Cognisance should be taken of the fact that the almost instantaneous transition to lockdown resulted in emergency remote teaching. As such, it did not allow for the careful design of processes that would under normal circumstances guide effective online learning and teaching (Hodges et al. 2020). These challenges might create an opportunity for contact universities to consider innovative hybrid models of programme delivery. Such models would require an ecosystem inclusive of learner support, which could be formal, informal or social. Furthermore, the impact of the pandemic on teaching as one of the components of such an ecosystem highlights the need to be cautious of using pedagogical methods that were emergency-based as the point of departure for future decisions on learning and teaching plans (Hodges et al. 2020; Maphalala & Ajani 2023).

■ Oral health

Globally, 3.5 billion people are affected by oral diseases, which may have serious health and economic consequences and result in reduced quality of life (Peres et al. 2019). The most common oral diseases are dental caries, periodontal disease, tooth loss and cancers of the lip and oral cavity. These diseases are largely preventable and yet are widespread, especially in low-income and middle-income countries (LMICs). As with most non-communicable diseases, oral diseases reflect social and economic inequalities and inadequate funding for prevention and treatment in oral health care (Peres et al. 2019; Watt et al. 2015, 2019).

Cohen et al. (2017) maintain that 'globally the dental profession has had little direct impact on the scale of the problem'. Similarly, Watt et al. (2019) argue that a fundamentally different approach is required to address these challenges. Dentists are still largely trained to intervene once the disease has already started and then to react surgically. This disease-based or biomedical approach has long been criticised, as it results in a mismatch between the oral health needs of communities and the training of oral health care workers (Bedos, Apelian & Vergnes 2020).

In addition, the evidence-based approach that needs to be used in the teaching of many dental procedures is lacking; for example, the recommended annual dental visit for a scaling and polish in the management of gingival and periodontal diseases has not been proven. Similarly, evidence has shown that six-monthly or 12-monthly dental visits have no clinical patient benefits (Watt et al. 2019). The data are clear that if health practitioners use the best clinical evidence and expertise and align treatments with patient values, they will consistently realise better outcomes, which is congruent with adopting a person-centred treatment approach. The inclusion of evidence-based health care (EBHC) teaching within oral health programmes would support such a person-centred care approach, ultimately enhancing the learning experiences of students and empowering them to become lifelong learners (Frank et al. 2005). Moreover, an EBHC approach could ensure the translation of evidence into clinical practice if driven by frontline clinical academic staff. This EBHC approach highlights the role of institutions and their context dependency, as well as the need for EBHC to be embedded within multiple programmes to effect change in community health. Furthermore, adopting EBHC into teaching would provide and ensure a framework and the required rigour, emphasising the aspirations of universities to become research-led, including aspects of evidence creation. However, strategies for high-quality evidence integration and translation into practice would have to be included.

The improved utilisation of research to change practice and policy is not an automatic transition or implementation from robust research creation and evidence into practice. This highlights the role and influence of the current biomedical science model (Greenhalgh 2014), where different players and stakeholders (including teachers, clinical practitioners, policymakers, economists and politicians) will have different approaches to implementing research evidence. The scientifically driven nature or biomedical agenda of the EBHC approach encourages it to be used. The goal is to create a community of practice of professionals, such as researchers, academics and policymakers, whose approach, thinking and practices encompass principles of EBHC in the management of patients (Merijohn 2006). Future phases of dental education reform should include recruitment and selection strategies to ensure that candidates reflect the

broad socioeconomic and cultural diversities of the populations they will serve once they graduate (Watt et al. 2015). Moreover, an EBHC approach will guide researchers to a more appropriate, relevant and collaborative research agenda, which aligns to this very position of creating change in the oral health professions. Research during and after a pandemic should further inform the research agenda. The inclusion of social epidemiology, and investigating the social determinants of health and disease of a population to complement oral health data, may also better inform oral health strategies (Krieger 2001) and so enrich the EBHC approach.

Oral health professionals should be encouraged to consider a patient's environment and social determinants of health as part of the bio-psychosocial approach. 'Patient-centred' and 'person-centred' care have penetrated the dental education discourse.

■ Repositioning the oral health professions

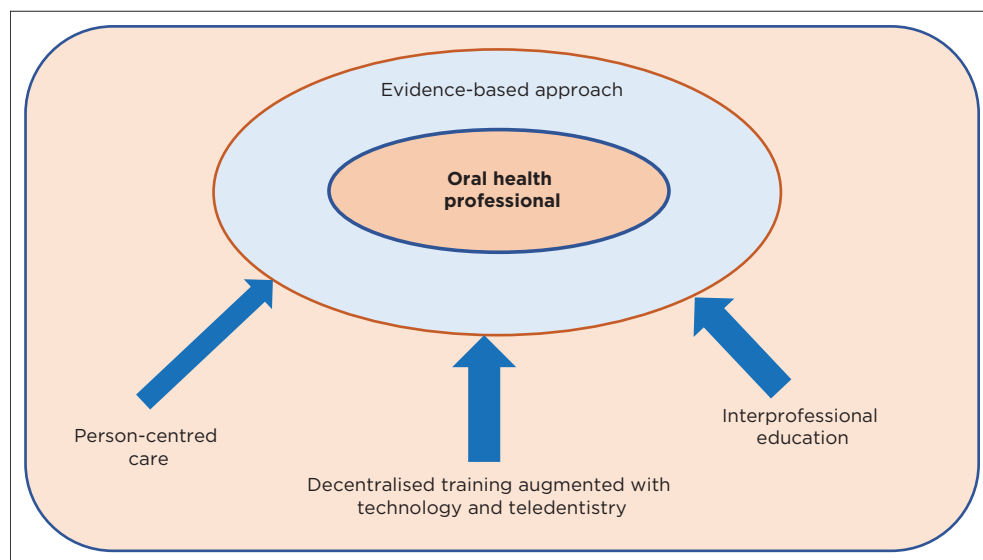
The pandemic has highlighted existing inequities and challenges regarding oral health professions in South Africa. To address these challenges, changes in a post-COVID-19 society are necessary. These changes will affect the training of the oral health workforce and the system in which they train and work with the application of technology, as the Fourth Industrial Revolution affects all aspects of everyday life.

■ The proposed model

The oral health care professions model (Figure 7.1) is founded on three concepts, namely: person-centred care, decentralisation and IPE. These concepts would be augmented through the use of technology, one such example being teledentistry.

■ Person-centred care model

A person-centred care approach, which places the person and their social well-being at the centre of decision-making and takes the social context of the individual into account, has been advocated in the health sciences and oral health (Lee et al. 2018; Noushi & Bedos 2020; Santana et al. 2018). A person-centred approach essentially is about promoting health, rather than treating disease (Lee et al. 2018). This approach encompasses the person or primary caretaker, the provider and the care designer, indicative of a multidisciplinary and a more holistic team. The person-provider as a team engages to understand the context surrounding and shaping the person's behaviour, their decisions and barriers to health and uses this knowledge to develop opportunities to obtain the best health outcomes within the particular context.



Source: Author's own work.

FIGURE 7.1: Proposed oral health professions model.

Health care designers would then need to design and operate a system of care with the necessary infrastructure to empower person-provider teams to meet set outcomes. A core aspect of this approach is for providers to relate oral health to other medical conditions, share findings with the person and other health care providers and plan for preventive interventions, treatment and behaviour modification as agreed on using available tools, techniques and clinical support. The care designers are expected to view person-centred models in dental and non-dental health care fields and use successful approaches to revise and expand their operations and services to achieve their mission (Lee et al. 2018).

This person-centred approach also provides a framework to move from a largely medical model, which is currently the dominant structure guiding the education and training of oral health professionals, to a more bio-psychosocial approach that has been advocated for professions in the health sciences for decades (Watt et al. 2019). It provides an opportunity to restructure training to move from hospital-based care to community-based care and to train oral health professionals within interdisciplinary teams to improve community health outcomes. Thus, the proposed model could foster the infusing of oral health into the training of other health professionals, which would also ensure that the oral impact of health conditions is understood and managed. The manner in which individuals live, learn, work and play significantly impacts their health and oral health outcomes (Chazin & Glover 2017), further strengthening the argument for the repositioning of a person-centred approach that is suited to the South African context.

However, the adoption of a person-centred approach will be challenging, as it will require a shift in mindset at different levels and with diverse stakeholders, and a complete overhaul of the current training programmes for oral health professionals. Inherent in a person-centred approach is the need to expand the education of oral health professionals beyond the hospital-based environment and to value the role of oral health professionals beyond clinical competence, embrace IPE and collaborative education, invest in technology and partner with communities and other stakeholders. The dental person-centred care model proposed by Lee et al. (2018) highlights the role of the care designer within the broader system. The authors suggest that the lack of success in previous person-centred models was because of a defined role that was limited to the care provider (Lee et al. 2018).

Globally and within South Africa, most dental schools have adjusted and adapted their dental training to prepare dental graduates for the 21st century. These suggested changes include ongoing incorporation of oral health services into primary care, IPE and the provision of medical services within dental practices (Weintraub 2017). The current 'notion of dentistry as a field separate from medicine is a historical phenomenon that has been [created and] reinforced through legislation, education, service delivery' and the funding of these programmes (Simon 2016). In spite of the interdisciplinary underpinnings of oral health and medicine, 'the creation of a distinct path of education and training for dentists served to definitively sever [dental] health from the rest of medical education' (Simon 2016). Traditional oral health education and its separation from general health are most detrimental to underserved groups who are at highest risk of having poor oral health (Simon 2016). 'Central to this movement is the acknowledgement that continued separation of these two fields disproportionately burdens vulnerable [patient] populations' (Simon 2016).

One of the more prominent changes anticipated in the training of oral professionals by 2040 is the integration of a more medically orientated curriculum into the traditional dental programme (Weintraub 2017). Globally, this may well be appropriate considering the specific context of the burden of disease. In the South African context, however, given the disease burden and specific health needs of the majority of the population as discussed, a more tailored approach to this proposition is required.

A study by Lambert et al. (2020) on medical professionals' perceptions of oral health in a local public health clinic indicated how they recognised the need for change in the education of both medical and dental experts. Public health education will perhaps play a more prominent role in the education of the oral health workforce (Quinn et al. 2020). The COVID-19 pandemic has resulted in a paradigm shift in education and future clinical provision. Aspects that would need review include the institutional vision for their oral health graduates, the current infrastructure, professional

accreditation standards, the curriculum (whether evidence-based or not), learning and teaching (including the view and measurement of competence), research and service delivery.

In these contexts, the value of oral health care teams, as regarded by general health colleagues, might encourage greater IPE (Quinn et al. 2020) as only one aspect of a newly proposed model. Other proposed aspects to be included will focus on the education and training of the oral health professional within the broader health care system (including IPE), the different platforms of training and the newly envisioned research agenda, which will be discussed in detail in the rest of this chapter.

■ Decentralised training as a strategy for the oral health professions

The need to produce health professionals for the 21st century, who have interprofessional skills, are culturally aware and more community-oriented, has also prompted reform in medical and dental education (Frenk et al. 2010). There is a growing body of literature supporting the use of decentralised training settings or community-based training sites in medical and dental education. Researchers have defined community-based training as:

[A] learning strategy that provides opportunities for students to apply theory learnt in a larger social and cultural context by being exposed to various community settings, new situations and circumstances. (Moodley & Singh 2018)

An exploration of opportunities for community-driven learning initiatives by dental academics found that there were multiple opportunities in the private and NGO (non-governmental organisation) sectors for such initiatives for undergraduate dental therapy students (Moodley & Singh 2018). Service learning initiatives have been found to increase dental hygiene students' awareness of the needs of underserved populations, cultural diversity and ethical patient care (Aston-Brown et al. 2009) as well as access to oral health services in underserved populations (Flick, Barrett & Carter-Hanson 2016); as well as positively impact on dental students' attitudes to community service (Coe et al. 2015) and enhance personal growth and social responsibility of dental students by exposing them to the needs of rural and urban communities (Bhayat et al. 2011). These settings or platforms may vary from public health clinics to mobile clinical units, hospital clinics and private practice. One of the biggest challenges for decentralisation is balancing the priorities of a dental school with respect to training students and providing health services with a limited budget and inadequate human resources (Talib et al. 2017).

Decentralised non-tertiary Kenyan health facilities were explored and found to meet the basic requirements for dental training (Muasya et al. 2016).

The WHO estimates that by 2030, 14 million additional health care workers will be required to meet the needs of communities worldwide (WHO 2016). Decentralised training or community-based education of health care workers may be used as a strategy for empowering institutions to meet this need. The WHO recommends decentralised placements for training as a strategy to expand the primary care and rural workforce (Talib et al. 2017).

A recent scoping review on decentralised training for medical students identified essential components for a decentralised training site (De Villiers et al. 2017):

1. *Student learning*: Research has indicated that most dental schools in the USA have adopted an approach that allowed for rotations at least 8 weeks long. Dental students in the fourth year participated; no assessments for clinical competence were included, but a post-reflection survey was usually completed (Mays 2016). Studies reported that students' clinical learning and confidence improved greatly by being immersed in the context (De Villiers et al. 2017). Mays and Maguire (2018) found that most dental schools were assessing knowledge on access to care issues, social determinants of health, interprofessional practice, health policy and social justice. The decentralised settings exposed students to everyday situations and they operated in a more comprehensive care setting, which enriched their learning experience.
2. *Enabling training environment*: Decentralised training is often costlier as the necessary infrastructure such as interactive communication technology and connectivity must be available to facilitate online access to learning resources, the availability of appropriately trained clinical teachers and student accommodation. For dentistry, the basic operating equipment and dental materials can initially be costly. The additional requirements for access to a dental laboratory may also impact on the range of services offered within the community, and this is also linked to the disease burden of the area. However, these costs may be mitigated by linking the levels of prevention to the decentralised context where, for example, health promotion, screenings, preventive and basic tertiary care may be less costly.
3. *Effective leadership oversight*: In order for a medical or dental school to successfully implement community-based training, visionary leadership and flexible, innovative governance are needed. The success of the partnerships depends largely on collaborative relationships between students, clinical teachers, primary health care staff, communities and households (De Villiers et al. 2017), but it must be guided by a leader who understands the requirements of this role.
4. *Community engagement*: Collaborative relationships are essential for students to reach the desired learning outcomes in a decentralised setting.

A study focusing on medical students' contribution to health care in decentralised settings reported that staff at the clinics were motivated to reflect on teaching sessions and read more, and that they were also energised and motivated (Van Schalkwyk et al. 2018). Some sites reported better patient outcomes and improved health indicators as students practised EBHC (Talib et al. 2017).

■ The use of technology for delivering oral health care

Technological innovations can have significant benefits for clinical practice. The integration of these advances in technology to transform oral health care programmes would require the necessary infrastructure and equipment to ensure success within the clinical environment. When referring to adopting a person-centred management approach, due consideration should be given to the position of the very people to be served. Thus, while the use of technology is highly recommended, the needs and socioeconomic demands of these communities we hope to serve must be evaluated before instituting such advancements (Sorenson et al. 2020).

■ Tele-dentistry

Tele-dentistry was an integral part of the global oral health care management strategy provided throughout the COVID-19 pandemic, except within developing countries (Brian & Weintraub 2020; Ghai 2020; Haider, Allana & Allana 2020; Telles-Araujo et al. 2020; Sycinska-Dziarnowska et al. 2021). Tele-medicine or tele-health and the platforms used required that health care workers be trained and supported with information and communication tools and skills while in training. These skills are empowering and could alleviate staff and resource shortages in the labour force. They also have the potential to assist patients in rural settings by increasing access and decreasing costs, thereby providing a more cost-effective management tool for future use (Tynan et al. 2018). Tele-medicine or tele-health must not be seen only as a stand-alone solution for emergency situations, but as part of a continuum or range of health care provision extending into non-crisis circumstances (Thomas et al. 2020). There are certain risks associated with teledentistry or tele-medicine, but these must be weighed against the risks of infection control, transmission of infection and poor access to care, especially during a pandemic (Ghai 2020; Deshpande et al. 2021).

The provision of tele-medicine or tele-health was already in existence in the public and private sectors even within the South African context, and the COVID-19 pandemic has renewed interest and demand for its use together with different digital platforms to render a much-needed service,

even though the evidence for or against its impact and efficacy is limited (Govender & Mars 2018; Muiruri et al. 2019). The goal of this approach and the renewed interest in its use, however, are based on its potential to improve access and delivery of care while ensuring the safety of vulnerable patients and essential health care workers. The current approach to tele-medicine in South Africa is different from other global providers that only consider distant consultations between practitioners (Percept 2020). During the COVID-19 pandemic, this approach was slightly modified for South Africa by the regulatory body; for example, where direct practitioner-to-patient services were included (Townsend, Mars & Scott 2020).

There has been considerable interest in the revival of tele-medicine or tele-health among several stakeholders, including health care funders, service providers and patients as users. This could be attributed to evidence indicating how preventive measures may improve population health and thus keep health care costs low (Ngubane 2018; Thomas et al. 2020). The interest of these stakeholders also highlights differences in remuneration strategies or models between face-to-face and virtual consultations, where the latter may be achieved at lower rates (Blandford et al. 2020; Percept 2020; Snoswell et al. 2020). Whether or not this is sustainable for health care providers needs further investigation, including finding equitable solutions in order for tele-medicine to continue as a safe platform (Gulube & Wynchank 2001; Monaghesh & Hajizadeh 2020; Percept 2020).

Dental practices are obliged to reorganise and introduce innovations that carry a minimal risk of cross-infection. For this to be realised, the innovations need to be structured and located within a dental programme so that they can be taught and practised appropriately. Moreover, the teachings, in terms of both concepts and practices, must be informed by evidence and used in appropriate circumstances to help dental practitioners and guide staff to manage patients as required. The COVID-19 pandemic has provided an opportunity to consider integrating tele-dentistry into normal routine dental care using a safe and evidence-based approach (Percept 2020; Thomas et al. 2020). The environment also allows this service to continue after the COVID-19 pandemic for patients who present routinely with emergency conditions, as well as offering patients advice and guidance as an after-hours facility.

Tele-dentistry is not only reserved for service delivery, but also has scope in dental education (Amin et al. 2021; Chen et al. 2003; McFarland et al. 2018) and is a good tool for undergraduate, postgraduate and continuing professional development. Furthermore, this technology lends itself to enhancing decentralised training. Numerous web-based platforms facilitate case discussions between students and colleagues located remotely from one another, the collection of patient information or giving lectures on relevant topics that can be discussed and shared (Ferro, Nicholson & Koka 2019).

Dental chat rooms not only provide ideal channels for exchanging information on various topics, but also allow engagement and feedback from teachers and peers.

■ Interprofessional education

Interprofessional collaborative practice (IPC) is widely viewed as an essential paradigm shift in health care to improve patient and population health outcomes (Davis et al. 2018). There is now a well-established relationship between oral health and systemic health (FDI World Dental Federation 2015). Dentists are often the first health care workers to be able to diagnose and treat oral and systemic conditions, highlighting the need for ‘an interprofessional team approach when providing comprehensive care for patients experiencing chronic diseases such as diabetes, coronary heart disease [or] chronic obstructive pulmonary disease’ (Davis et al. 2018). More recently, Patel and Sampson (2020) and Sampson, Kamona and Sampson (2020) explored the role of oral bacteria, oral hygiene and SARS-CoV-2 infections. This trend, among many others identified, highlights the need for dentists to collaborate with medical professionals. IPE of medical and dental students could assist in producing clinicians who work together and serve holistically to the benefit of their patients (Simon 2016).

Interprofessional education could be seen as a vehicle to achieve a collaborative workforce (Davis et al. 2018), which could encourage collaboration within the wider health care workforce, including oral health professionals, so as to enhance community care (Quinn et al. 2020). Upskilling health care workers, increasing their scope of practice and developing the ability to rapidly establish health care teams spanning a range of professions have been achieved in an extremely short time during the pandemic (Lackie et al. 2020).

Interprofessional education and service in oral health could also promote collaborative and non-hierarchical dental teams. This team approach should demonstrate an understanding and appreciation of health promotion strategies and prevention and clinical care interventions to reduce the burden of oral disease and enhance the oral health of the population and should focus on oral health outcomes rather than clinical competence (Watt 2005). Such an approach could contribute to breaking down the silos within which oral health professionals operate (Hamil 2017).

Therefore:

Constant adaptability and flexibility are required to prepare [*future*] academic [*programmes*] and progressive pedagogic approaches (Langlois et al. 2020). Upskilling and collaborative practice models have necessitated both collaboration and a willingness to consider more fluid boundaries regarding professional roles [(Langlois et al. 2020). For IPE, the] four Cs – collaboration, critical thinking,

communication and creativity [*- are*] essential transferable skills needed for work in the coming century. [*In addition,*] the modified learning context [using online teaching,] created by the disruptions of COVID-19 [*(Langlois et al. 2020), would be suited to teaching IPE.*] In online environments, IPE students need to be provided with additional resources and different ways to foster interprofessional [*socialisation (Langlois et al. 2020).*]

IPE must be viewed as a requisite curriculum [*and*] as important profession-specific programmes of study to ensure the development of resilient, capable and flexible healthcare providers [*(Langlois et al. 2020).*] While the pandemic may not last long, the impact of COVID-19 [*will bring about*] change [*in*] personal, professional and academic lives for years to come. Intentional critical reflection [*on new*] approaches, and envisioning what is to be learned, will be crucial to enabling future advancements in the field of IPE and collaborative practice [*(Langlois et al. 2020).*] Amid the headlines and statistics related to COVID-19, there appear to be substantive changes related to the philosophy and practice of teams and the [*organisations*] in which they work. [*(Michalec & Lamb 2020).*]

In addition, valued-based care has been a strong driver for the integration of the oral health care collaborative patient-centred approach (Simon 2016). Similarly, the adaptations as a consequence of COVID-19 would be an appropriate model or framework to drive the integration of oral health care into general medical care in South Africa and the inclusion of IPE programmes in the training curricula of all oral health care and other health professions. Given the South African context and experience with COVID-19, the person-centred approach driven by the IPE strategy is proposed to reposition the oral health professions post-pandemic.

■ Conclusion

Health programmes have been developed largely in isolation, and health professionals train respective groups individually and independently. The COVID-19 pandemic has taught us that communal responsibility takes precedence over individual needs while still being cognisant of ethical principles. It is imperative that a post-COVID-19 programme adopt an alternative health care training model in oral health that is not only person-centred but also evidence-based and encompasses appropriate socio-political aspects using an IPE and collaborative approach.

Post-COVID-19, changes in education at both undergraduate and postgraduate levels should propel the role of oral health professionals with expertise beyond the oral cavity to the whole person or community, integrate oral health more explicitly within overall health and locate the oral health professions as an integral part of the health sciences professions.

The TVET sector and economic rebound implications in the world of work

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■ Abstract

Background: The outbreak of the coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic represents one of the greatest disasters experienced across many nations. Its impacts have led to a global shutdown in various sectors and economies. The COVID-19 pandemic had major

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implications especially for lower-level or semi-skilled employees in different sectors, leading to varying levels of mild, moderate, large and severe decline in South Africa.

Aim: The chapter advances the argument that re-setting, re-working and re-organisation of technical vocational education and training (TVET) in relation to the workplace will contribute to the reconstruction and recovery of the South African economy post-COVID-19.

Methods: The method employed in this chapter covers the review of empirical articles, policy papers, theses and reports related to the partnership between TVET colleges and the workplace by employing the capability approach. The studies reviewed originate from countries both outside and within Africa, including Australia, Cambodia, the USA, Finland, Myanmar, Nigeria and South Africa among others.

Findings: The themes that emerged from the studies reviewed demonstrate the significance of TVET college-workplace partnerships. The findings highlight the mutual benefits of such collaboration to training institutions and the workplace, including knowledge exchange, the development of innovative skills, strengthening and sustaining of training programmes, addressing skills shortages, provision of resources, access to industry facilities, expertise and policy inputs.

Implications: Technical vocational education and training colleges were found to produce skilled graduates, leading to the achievement of TVET policies and increased productivity, thereby reducing unemployment and improving the economy.

Conclusion: The chapter concludes that the re-setting, reworking and re-organisation of TVET education concerning workplace settings/environment will contribute to the reconstruction and recovery of the South African economy post-COVID-19.

■ Introduction

The coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic is multifaceted, affecting all dimensions of human and social life and giving rise to complexities not only in health care systems but also in the education sector. As a result, many organisations and institutions throughout the world are facing dilemmas in relation to how to deal with diverse activities within their established programmes (Burgess & Sievertsen 2020). The adoption of lockdowns and social distancing, which are designed to dissuade individuals from congregating, flatten the infection curve and slow the spread of the COVID-19 pandemic, are among the difficulties resulting from the pandemic (Ferrel & Ryan 2020). This situation has not only disrupted traditional teaching and learning pedagogies, but has also

upset human life and world economies, and its impact has been experienced in every sector of the economy, resulting in uncertainty and unpredictability. Soudien (2020) believes that the world as we know it will never be the same again.

This chapter argues that a viable technical vocational education and training (TVET) sector linked to the workplace is crucial in the overall rehabilitation and recovery of the South African economy post-COVID-19, especially in providing opportunities for the cohort of the population ‘not in education, employment, or training’ (NEET), which has increased to more than eight million (Presidency 2020a).

The coronavirus exposed an economy that was already vulnerable, because of low levels of investment and growth (Republic of South Africa [RSA] 2020). To address this situation, the South African government has pledged to expedite economic reforms to unleash investment and development and to provide more job prospects for individuals who were unemployed before the pandemic or had given up seeking work (Presidency 2020b).

Concerted efforts to reform the TVET sector are central to political reform and social justice around the world to respond to the socioeconomic challenges of inequality, unemployment and poverty by driving economic development (Powell 2014). As a result, governments in many countries have been engaged in policies, plans and proposals to reconstruct TVET colleges to become the education institutions of choice for learners and young people (Powell & McGrath 2019). Premised on the foregoing, the chapter argues for concrete collaboration between the TVET sector and industry, based on training that is more robust and orientated towards new knowledge, skills and technological advancement as crucial in the context of the ‘new normal’. Industry involvement in these initiatives will not only aid in reskilling and upskilling TVET trainers but will facilitate the planning, delivery and effective implementation of impactful programmes. To achieve this, the chapter reviews the emergence of the COVID-19 pandemic, its impact on the South African economy, TVET education, challenges in the South Africa TVET system, TVET sector-industry partnerships and their significance, as well as the capability approach that was employed as a theoretical lens.

■ COVID-19 and its unprecedented impact

This section discusses the infectious COVID-19 and its impact on human life, arguing that the global outbreak of COVID-19 has recorded unprecedented death rates compared to previous endemics during the 21st century, and people continue to be infected daily at a rapid rate, with over 107m global recorded positive cases as of 10 February 2021. COVID-19 is unprecedented compared to previous pandemics this century, namely

the 2002 severe acute respiratory syndrome (SARS) outbreak, the 2009 H1N1 influenza commonly known as swine flu and the 2013 Ebola eruption, all of which were as destructive as COVID-19, although at a lesser extent. In the African context, South Africa is regarded as the epicentre with reported positive cases standing at a total of 1,479,253 as of 10 February 2021. In general, the emerging reports and literature show that COVID-19 originated from wild animals and has since been found in humans too, as discovered in November/December 2019 in the city of Wuhan in Hubei province in the People's Republic of China (Kakodkar, Kaka & Baig 2020; Mbuva & Marwala 2020). The rapid transmission of the virus caused worldwide concern as it spread through Asia, Europe, America and Africa, resulting in the World Health Organization (WHO) pronouncing this infectious virus as globally endemic (Mbuva & Marwala 2020). An analysis of the impact of the COVID-19 pandemic shows that various sectors of the South African economy experienced negative effects and crises caused by the virus (Arndt et al. 2020). The following section focuses on the impact of the COVID-19 pandemic on the South African economy.

■ Impact of COVID-19 on the South African economy

There is acknowledgement in the literature that the COVID-19 pandemic has caused major economic and public health devastation, and there are signs that the economic disruption will be far and wide throughout the world (Channing & Sherman 2020; Channing et al. 2020; United Nations Development Programme (UNDP) South Africa 2020; World Bank Group 2020). The representative of the UNDP based in South Africa confirmed that the COVID-19 pandemic has been the most significant shock to the international public health care system in the last millennium, with far-reaching consequences for economies and society, undoing decades of hard work on human development and hampering the accomplishment of the sustainable development goals (SDGs) by 2030.

COVID-19 has compounded an already precarious socioeconomic situation, and South Africa has had the highest COVID-19 infection rates in Africa and is among the 20 countries internationally with the highest infection rates. Because of the worsened low levels of investment and growth in the South African economy (RSA 2020), the coronavirus discovered an already weak economy. The primary reason for unemployment in South Africa is lack of growth, which has become a persistent element of the South African economy (Finnan 2023).

Accordingly, the national economy had already been experiencing sluggish growth, with cash growth rather than labour-intensive growth

(Allais & Nathan 2014). Others claim that South Africa's political transition was a disaster because of a malfunctioning economy that has seen an era of unending poverty, inequality, violence, health crises, corruption as well as long disenfranchised the masses of the population (Larson 2019; Stats SA 2018). While it is common cause to attribute the country's problems, particularly inequality and poverty, to racial apartheid (Mosala 2022), the impact of the COVID-19 pandemic is likely to aggravate socioeconomic conditions of poverty, unemployment and inequality in South Africa (UNDP South Africa 2020).

The necessary lockdown imposed by President Cyril Ramaphosa, the South African president, had a negative effect on the economy leading to further declines in investment and trade (Channing & Sherman 2020; Channing et al. 2020). Despite the pandemic threatening to drive unemployment to a precarious level, the unemployment levels in South Africa have dropped; however, the South African economy has shed 2.2m jobs in the second quarter of 2020 (Stats SA 2020). The unemployment trends in the economy suggest that the major destructive effects of COVID-19 have been especially severe for lower-level or semi-skilled employees in all sectors (Channing et al. 2020; Stats SA 2020; TIPS 2020). This suggests that poverty levels and inequality worsened as employees, especially the semi-skilled, are hardest hit by the virus. The lockdown thus impacted negatively on diverse aspect of the South African economy.

Agriculture, forestry and fishing; pharmaceuticals, hygiene and cleaning; electricity, gas and water; communication; finance and insurance; computer services and health services all saw minor declines ranging from 0% to 10%. Food and non-alcoholic drinks, petroleum, plastic, glass, real estate, legal and financial and other support services are among the sectors that witnessed a mild fall of between 10% and 30%. Paper, paper products, basic chemicals, fertiliser, paint; mining and quarrying; textiles, clothing, leather and footwear; wholesale, retail trade; transport and storage; rentals, research, manufacturing services and other business services experienced a large decline of between -30% and -60%. Intoxicating drinks and tobacco; textiles, clothing, leather and footwear; wood, wood products; tyres, rubber products; non-metallic minerals and products (cement, concrete, etc.); metal products; steel, iron; equipment and machinery; construction; accommodation, catering and recreation, other community services experienced a severe decline of more than -60% (Arndt et al. 2020, p. 5).

The levels of decline directly impact South Africa's gross domestic product (GDP) and thus impact negatively on the economy. In this regard, Channing and Sherman (2020) suggested the restructuring of the fiscal resources for future crises, and the revitalisation of the economy is important for the fiscal position. This chapter argues further that

strengthening the capabilities of the TVET sector is critical in the overall reconstruction of the economy post-COVID-19.

■ **Technical vocational education and training education: Key to South Africa's post-COVID-19 economic recovery**

Technical vocational education and training is regarded as an educational and skill development system that focuses on providing individuals with practical skills, knowledge and competencies related to specific trades, crafts and professions according to the African Center of Economic Transformation (ACET 2023). These skills guarantee them employment or means of livelihood (TVET Journal 2021). In line with global trends, South Africa, like other countries, views TVET as a system tasked with providing students with the skills and competencies required for finding jobs; technological, social and economic development; as well as reducing unemployment and poverty (Akoojee 2010; Department of Higher Education and Training [DHET] 2012; RSA 2008a). Terblanche (2017) agreed, claiming that TVET programmes will meet the country's human resource demands for personal, social, civic and economic growth. According to Kuehn (2019), TVET is critical for developing the skills required by the economy and, as a result, for a country's long-term economic success. This is because TVET is a broadly defined term that encompasses all aspects of the educational process, including, but not limited to, the study of science and technology, as well as the acquisition of practical skills, attitudes, understanding and knowledge related to professions in various sectors of the economy and society (RSA 2008b; 2013). This aspect of vocational training in South Africa is offered at TVET colleges. The establishment of TVET colleges resulted in the incorporation of all public Further Education and Training colleges by the Department of Higher Education and Training (DHET 2012).

Technical vocational education and training colleges as identified by the National Development Plan (NDP), are positioned as an important aspect of education with the mandate of addressing the skills shortages inherent in the country (Nhlapo 2017). According to Paterson, Keevy and Boka (2017), both the National Accredited Technical Education Diploma (NATED) and National Certificate (*Vocational*) programmes offered at TVET colleges are targeted at producing students with the skills required to secure employment and be useful to society. From the foregoing, and considering the potential of TVET, Australia positioned the TVET as the government's key to the post-COVID-19 economic recovery plan (Pilcher & Hurlley 2020). Similarly, in South Africa, skills development in TVET is one of the key enablers for implementing the South African Economic Reconstruction

and Recovery Plan (RSA 2020), which has, however, been confronted with several challenges since its inception (Terblanche 2017).

Employers have regarded TVET institutions as deficient in developing the abilities needed to perform effectively in the workplace for several reasons (DHET 2014). Some of these include incompatibility between the demand for and supply of skills, lack of collaboration between TVET training institutions and the world of work and lack of content and pedagogical knowledge among TVET lecturers (Mashiloane 2019; Sithole, Wissink & Chiwawa 2022). The next section unpacks some of the challenges that bedevil the TVET system in South Africa.

■ Challenges in the South African technical vocational education and training college system

In South Africa, the challenges confronting the TVET sector include fragmentation of the system, poor leadership and management skills, lack of collaboration, as well as deficiencies in lecturers' qualifications, competencies and experience (Badenhorst & Radile 2018; Van der Bijl & Oosthuizen 2019). In recent times, the challenges for South African TVET college students during the COVID-19 lockdown, include a lack of access to e-learning, accommodation and allowances from the National Student Financial Aid Scheme (NSFAS) (Mafolo 2020). To corroborate this, Samuels (2020) avers that the government has made online courses available for TVET colleges, but access to data and devices remains the major problem because of lack of funds, and according to her, TVET college students were not provided with funds in the same way as the government did for university students. These challenges are multifaceted; some are human-based, while others are material as evident in several studies reviewed in this chapter. Some of the human-based challenges in the South African TVET sector indicate that about 34% of lecturers are deficient in skills, qualifications and experience, while 60% lack professional training (Baatjes, Baduza & Sibiyi 2014; SAQA 2016; Van der Bijl & Oosthuizen 2019). These figures point to a broader problem in the sector, namely the capability of college lecturers to teach their subjects, particularly the practical components of the curriculum, which has an influence on the quality of the graduates produced by such institutions.

Other challenges that impede TVET programmes include an unsupportive training environment because of variations in the technologies used in training, shortage of computer laboratories, lack of offices for lecturers, lack of software because of funds, as well as insufficient computers, data projectors and printers (Mbambo 2017; Naidoo & Dawuwa 2019; Zinn, Raisch & Reimann 2019). As a result, the production of TVET graduates

without the requisite skills for employment in the North-West province, for example, is attributed to there being little engagement between colleges and the workplace (Thlomeli 2018). Consequently, the government's 2013 White Paper on Post-School Education and Training emphasises the need for public TVET colleges to strengthen relationships with the workplace because of its significance (DHET 2014). Such relationships would improve learners' chances of obtaining both practical training experience and longer-term employment. Thus, the following section argues the significance of collaboration between industry and colleges to produce a workforce that is not only skilled but also productive.

■ Significance of technical vocational education and training college-workplace partnerships

Collaboration between training institutions and the workplace has proved to be of great significance to both parties in the production of skilled graduates and a productive workforce (Legg-Jack & Ndebele 2022). Some of the benefits include knowledge exchange, development of innovative skills, strengthening and sustaining of the training programme, addressing skills shortages, provision of resources, access to industry facilities, expertise and policy inputs (Legg-Jack 2018). A partnership between TVET training institutions and the workplace yields mutual benefits in terms of the exchange of resources, policies and programmes between the collaborating organisations (Ohno et al. 2024). Studies reveal that such knowledge transfer proves beneficial for both training institutions and industry, among teachers and students as well as industry staff (ACET 2023; Ohno et al. 2024). It is argued that collaborations such as these create major value for the industry (Garba, Dawha & Sini 2020).

The involvement of TVET training institutions with workplace settings could strengthen and sustain their programmes (Garba et al. 2020). Strengthening the TVET sector in South Africa has been described as the DHET's 'highest priority' (DHET 2012; 2013; 2014). Studies have reported that the need for such partnerships is to balance theory and practice as well as influence the holistic sustainability of institutional programmes (Garba et al. 2020; Hamid & Yi 2023). From the foregoing, it is evident that collaboration between TVET training institutions yields huge potential for economic development as well as recovery for a country such as South Africa whose economy is faced with devastating crises such as those posed by the COVID-19 pandemic. Therefore, it is on this premise that the chapter argues that TVET colleges in South Africa should collaborate with the workplace to bring about the needed rapid post-COVID-19 economic recovery in the country.

As indicated earlier, the chapter uses the capability approach as a theoretical framework, and the section below expands on the usefulness of this theory in interpreting some policy proposals.

■ Using the capability approach as a theoretical framework

This chapter is framed around the capability approach theory, which has its roots in a series of papers on Sen (1974, 1979a, 1979b) and criticises the minimal knowledge foundation of conventional economic models, including utilitarianism and resourcism. In this chapter, the authors consider ways of defining the impacts of COVID-19 and interpreting some of the core policy responses in the capability approach, as developed by Sen (1999). A growing number of economists and other social scientists have voiced their concerns from the 1980s onwards about the need for a paradigm that more specifically integrates ethical considerations into economic and social studies. They discovered that an economic growth approach that precisely examines human impact, as well as using the lens of income, is required. As a worldwide catastrophe, the COVID-19 pandemic justifies this viewpoint, because the health, budgetary, social and political agendas have all enhanced the demand for life and livelihood security. The capability approach itself is at the centre of a structure that may be used to combine policy analysis with ethical underpinnings in a variety of ways (Anand et al. 2020).

According to Buheji (2020), this structure offers a good chance to focus positively on the COVID-19 crisis and divert investment towards the preparation of non-perishable human capital assets that can be better equipped to face future crises. Because of its provision of a framework that matches scientific evidence and experience as well as theoretical requirements, the capability approach is especially beneficial. Many of these consequences are attributable to political acts as well as private decisions that have intensified fundamental inequality and suffering throughout many nations (Van Dorn, Cooney & Sabin 2020). In order to protect those liberties that they have to cause to admire, many communities have had to voluntarily give up those freedoms. People throughout the world have shared intangible acts of gratitude and even celebrated these achievements, while frontline health personnel have performed under stress and in circumstances of increased danger (Dewey et al. 2020). A reconsideration of the market and cultural trends has also been suggested, although it would have to be monitored whether these feelings translate into longer-term consequences (Anand et al. 2009).

■ **Capability risks during the ‘new normal’**

The post-COVID-19 era will not be comparable to the pre-COVID-19 years (Buheji 2020). It will have an impact on life's most important concerns, in terms of our thoughts and beliefs, and generally, we envisage our presence and existence in the world, and how the next generation will respond to future life problems (Buheji 2020). Levenson (2020) argues that there will be a need for a new approach to organise and maintain employability capabilities. In the ‘new normal’, we might expect improvements in the pace and quality of training for remote personnel (Meister 2020).

During this difficult time, the present emergency demands profound contemplation about what we can learn from the situation. The preparation we receive is to relinquish personal liberty of association and participation to protect the well-being as well as the long life of the neediest. The relation between individual and collective capabilities has been stressed. In certain countries, for example, people working in the non-formal sector and disadvantaged demographic groups are expected to face disproportionate pressures amidst emergencies that usually intensify pre-existing inequality and opportunistic activities.

From the literature, we have seen the extent to which the coronavirus disease 2019 has changed the growth trajectory of nations and sought to undo substantial capability and viable human development milestones, with ramifications for the world of work and public health. Manley (2020) emphasises how COVID-19 has hampered development around the world. The situation is worsened when there is a lack of certain abilities such as resilience and connection (Manley 2020). The resultant effect could lead to the dire need for strategies that are premised on human development and possibly greater willingness within society to consider strategies focusing on human development based on the capability approach. According to Anand et al. (2020), the capability approach suggests that tackling economic problems with the focus on people assists in defining policy goals throughout the spectrum of human interest and need. Moreover, pandemic prevention and fighting is a genuinely universal public interest that calls for more organised global response and intervention. Ongoing discussion of the capability approach policy framework and partnerships is needed on a wide scale.

■ **Technical vocational education and training sector-industry partnerships in moving towards the future world of work**

The ultimate goal of German development policy, according to the policy guidelines for development cooperation in the field of vocational training, has been to improve the economic and social conditions of people in

developing nations, as well as their innovative capabilities (BMZ/Federal Ministry for Economic Co-operation and Development 1992). The goal of the vocational training assistance was to improve and expand the quality performance of current vocational training programmes to have a positive impact on vocational expertise and skills, as well as social habits and behaviour, in various sectors of the economy of developing countries. Two techniques have been adopted, namely (1) initial and advanced training that is coordinated and practice-oriented for the development of professionals and managers in a variety of industries and sectors of the economy, advancing towards becoming moderately skilled and (2) specific vocational training programmes to fulfil the needs of the informal sector, particularly disadvantaged demographic groups, so as to improve their earning potential and living conditions; in the context of the subsistence economy, this preparation will contribute to effective livelihoods.

While South Africa has a lot to learn and benefit from big international economies, the National Skills Development Strategy promotes collaboration at the national level, although the link between TVET colleges and employers at both provincial and local levels remains weak. Therefore, to strengthen such cooperation, DHET suggested the concept of a Lead Sector Education and Training Authority (SETA). In 2012, the Lead SETA-TVET project was launched, with the intention of resolving the lack of coordination and synchronisation. The goal of the project was to improve strategic collaboration levels between public TVET colleges and employers in both the public and private sectors (Spies & Garisch 2014). In addition, occupational learning would become a structured component of institutional learning, rather than an add-on or substitute.

'Adopt a TVET College' is an initiative of the Human Resource Development Council of South Africa (HRDC) that facilitates collaboration between TVET colleges and other stakeholders, especially the private sector, to augment the performance of the TVET sector (HRDC 2014). The point of departure for this initiative was the recognition that inadequate human capital growth (including education, training, skills and research) among the previously deprived group of persons without a job, as well as a high level of joblessness particularly among young people aged 15-24, continue to be significant challenges for South Africa. Through partnerships between training institutions and industry, the TVET sector could enhance capabilities in various ways, as discussed in the following sections.

■ **Production and supply of personal protective equipment during and after COVID-19**

A general scarcity of personal protective equipment (PPE) occurred globally during the COVID-19 pandemic, resulting in reduced efficiency of

measures to reduce the transmission of infection and placing medical staff and hospital patients at great risk. To overcome this, Majumdar and Araiztegui (2020) argue that TVET colleges should be actively involved in manufacturing safety equipment, including items such as masks and sanitisers. The establishment of community production schools in collaboration with industry could help fund the restoration and maintenance of some of the devices used in health care facilities.

The current economic meltdown has highlighted fresh potential for the TVET industry through TVET students. To promote product and service design, production and delivery, TVET colleges could be valuable collaborators in bridging the divide between education and industry. The value proposition that TVET can bring is to improve the knowledge, expertise and competencies of students for potential jobs and work (Majumdar & Araiztegui 2020). The TVET sector could also be a helpful partner in the production, delivery and distribution of services and products that are often capital-intensive for businesses.

The TVET sector could also facilitate practical training by connecting enterprises, organisations and students who desire continual training by investing in business intelligence methods and reinventing their position in the supply chain of product and service design and manufacturing. In the medium term, the response should involve all efforts that TVET colleges ought to take to plan appropriately for any possible comparable scenario and to gradually prepare for any post-pandemic disruptions or prospects that might arise.

Many nations that dispatch migrant workers are preparing for large-scale repatriation of eligible employees. Huge numbers of people would need to be replaced, re-skilled or re-trained in new jobs because of impending workplace retrenchments (Majumdar & Araiztegui 2020). Based on the possible long-term influence of the COVID-19 pandemic on the industry, TVET colleges could play an essential role in reducing unemployment, developing expertise among urban unemployed people, as well as preparing migrant workers to return and benefit from new job opportunities.

A significant endeavour must be launched in relation to addressing the mid-term projections for employment, advice and rehabilitation.

Strengthening local businesses

The COVID-19 pandemic has demonstrated that it is not always easy to access health and other service-oriented facilities in an area where there is regulated mobility, restricted service flow and strong dependency on local providers, as identified by Majumdar and Araiztegui (2020). Sadly, in areas

where services are lacking, this trend is creating a new standard. In certain situations, the best way to cut prices and reduce dependency on non-domestic service providers may be to set up distribution hubs, which might be unlikely in a crisis. These could be solutions that include a reform plan for the long term.

■ Conclusion

The chapter concludes that to recover from the impact of the COVID-19 lockdown on the South African economy, it is necessary to institute and strengthen robust partnerships between the TVET sector and the industries. Technical vocational education and training's partnership with the industry appears as a viable option for rapid South African economic recovery and was reviewed alongside the capability approach as a framework. Thus, re-organisation of technical and vocational education and training concerning the workplace will contribute to the reconstruction and recovery of the South African economy. Importantly, the rebound needs to be more inclusive, marked by a commitment to a shared future that seeks to achieve mutually beneficial outcomes for economic agents, including individuals, communities, the TVET sector, the informal sector, small and medium enterprises and the private and public sectors. This implies that collaboration between TVET institutions and the industry has the potential to produce graduates with the requisite competence that meets the requirements of the world of work. It is evident that collaboration between TVET colleges and the workplace also has the potential for the realisation of policy goals.

Partnerships between these two groups of stakeholders would bring about the realisation of TVET policy goals to boost the turnover of the public sector, thereby strengthening the economy. Another benefit would be that enterprises in both the formal and informal sectors would experience increased productivity because of working with skilled personnel. Partnerships between TVET institutions and the workplace could play a significant role in the altered circumstances of the 'new normal' post-COVID-19, using the capability approach as a framework.

Post-COVID-19 world of work for early-career mothers in academia: The remote working model

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■ Abstract

Background: The concept of remote working, while familiar in large corporates, has not been extensively studied in academic settings. Especially, its effects on early-career mothers (ECMs) during and post the coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic are not well understood.

Aim: This study aims to shed light on the effects of remote working model on ECMs in academia and to delineate the challenges they encountered during and after the COVID-19 pandemic.

Methods: Through a systematic literature review of articles published between 2020 and 2024, this study identifies the challenges brought by the remote working model among ECMs in academia during the pandemic.

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Findings: The research reveals the significant challenges faced, particularly in the publication process, increased teaching workload because of transitioning to online, increased virtual meetings and the resulting impact on research publications and career progression. Additionally, the study highlights the impact of home schooling, caregiving and household responsibilities on the daily productivity of ECMs. To meet publishing targets, ECMs resorted to late-night and early-morning writing sessions. Some ECMs successfully managed these challenges by implementing innovative time management strategies and utilising available support systems within academia and among extended family members.

Conclusion: Recognising the unique needs of ECMs in academia and offering targeted support mechanisms can empower ECMs to excel in their academic careers while fulfilling their vital roles as caregivers. The study found that tailored assistance, which may involve implementing flexible working arrangements and providing access to resources that facilitate a harmonious integration of professional responsibilities with familial roles, is essential for supporting ECMs in academia. Finally, acknowledging the social and cultural norms, where women are often seen as primary caregivers, can help tailor inclusive policies specifically for mothers in academia. This will ensure that ECMs are not left behind but are given opportunities to compete and grow, just like their male and childfree women colleagues.

■ Introduction

The rise of remote work and flexible scheduling has become more common, particularly in the context of the Fourth Industrial Revolution and the internationalisation of the labour force (Hunter 2019). The coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic has further propelled this shift as social distancing and lockdown protocols have forced many global businesses to adopt remote work practices (Matli 2020; Wang et al. 2021). This pandemic has disrupted conventional work models, leading to an increase in remote work setups and a greater dependence on digital platforms. This shift has had a significant impact on global economic activities (Aloisi & De Stefano 2022; Buchanan et al. 2021; Van Zoonen et al. 2021; Wang et al. 2021). This chapter explores the implications of the remote work model on early-career mothers (ECMs) in academia during the COVID-19 pandemic. It argues that while remote work is not a new phenomenon in the professional world, its current application has widened the inequality gap between ECMs in academia and their peers. In the academic world, ECMs also had to adjust to remote work in line with COVID-19 guidelines (Cardel, Dean & Montoya-Williams 2020; Meri-Yilan 2024; Segeral 2020). For these individuals, remote work meant balancing

their professional duties at home while cohabiting with family members such as children, spouses, parents or extended family (CohenMiller & Leveto 2022; Sherman 2020). This change has presented unique challenges for academic professionals who are also mothers, particularly those in the early stages of their careers (Lopes, Ferreira & Santos 2023). It is crucial to examine how these individuals have managed this new dynamic in their academic endeavours while juggling family responsibilities.

In societies across Africa, where traditional gender roles often assign women the primary responsibilities of caregiving and household tasks, the effects have been notably significant (Bam, Walters & Jansen 2023; Kriger et al. 2022). Early-career mothers find themselves grappling with the intricate task of balancing virtual instruction, online meetings and research commitments with caregiving duties in the midst of a global crisis (Hardman et al. 2020). This intersection of responsibilities poses unique challenges for ECMs as they navigate their professional and personal roles. The task of balancing family obligations with professional duties presents a formidable hurdle for these committed ECMs (Manzo & Minello 2020). This chapter investigates the consequences of the remote work model for ECMs in academia during the COVID-19 pandemic. It delves into the difficulties they face while trying to maintain a balance between family and work responsibilities. The chapter concludes by examining the potential future of work environments for ECMs in academia post-COVID-19. This examination underscores the importance of implementing strategic measures to effectively tackle the challenges that may emerge in this scenario. Through a systematic review of literature, this chapter offers a thorough understanding of how these strategies could influence the future work landscape for ECMs in the post-pandemic world.

The chapter begins by investigating the effects of the COVID-19 pandemic and the ensuing transition to remote work. It paints a vivid picture of the current societal and workplace landscapes, providing a basis for imagining possible future scenarios as we move towards a new normal. The chapter then conducts an in-depth analysis of the professional landscape for ECMs in academia. After this, it provides a thorough review of the research methods, results, findings and discussions. It then proposes thoughtful suggestions and wraps up with a discussion on the limitations of the study.

■ Underpinning theory

The *Gender Role Theory* (Eagly & Wood 2012; Pleck 1995) offers a framework for comprehending the impact of societal norms and maternal responsibilities on the remote working model and the experiences of ECMs. It suggests that an individual's actions and behaviours are heavily

influenced by their gender, subsequently shaping their societal roles and occupations (Franke, Crown & Spake 1997; Reichelt, Makovi & Sargsyan 2021). This theory also proposes a gender-based division of labour, with men typically occupying task-oriented roles and women engaging in socioemotional roles (Eagly & Wood 2012). Early-career mothers, especially those with young children, encounter unique challenges. They often experience reduced work hours, decreased productivity and increased career disruptions compared to their male counterparts (Hunter 2019). The unequal distribution of maternal responsibilities and societal norms that place a disproportionate burden of caregiving on women exacerbate these challenges (Sherman 2020; Stumbitz & Jaga 2020). However, it's important to recognise that gender roles are not fixed and evolve with societal changes (Kray et al. 2017). In sub-Saharan Africa, traditional gender roles for ECMs are being challenged by the increasing prevalence of remote work. Research indicates that women in this region often serve as primary caregivers, significantly impacting their professional lives (Gross 2020; Petersen, Penner & Høgsnes 2014).

■ COVID-19 and the remote working model

■ COVID-19 pandemic

In late 2019, the rise of COVID-19 in Wuhan, China appeared remote and insignificant to Africa. Despite its swift worldwide spread, it was initially dismissed. However, by March 2020, the severity of the situation was undeniable as COVID-19 was declared a global pandemic (Swails & McKenzie 2020). Countries around the world enforced lockdowns to control the virus. In just a month, COVID-19 affected over two million people in 185 countries, with roughly 150,000 deaths (Mehta & Mathibe 2020). The World Health Organization (WHO) estimated that this pandemic could last for up to five years (Meredith 2020). During lockdowns, most businesses halted operations, with the exception of essential services such as pharmacies and supermarkets (Cardel et al. 2020; Meri-Yilan 2024; Ritchie et al. 2024; Segeral 2020). Some businesses shifted to remote work arrangements for continuity and sustainability (Aloisi & De Stefano 2022; Buchanan et al. 2021; Van Zoonen et al. 2021; Wang et al. 2021).

In the midst of the transition to remote work arrangements for business continuity and sustainability, academic institutions were also forced to shut down in compliance with social distancing regulations (Hardman et al. 2020). Academics had to adapt to online teaching while balancing other work-related tasks and research duties. For ECMs in academia, this transition presented challenges as it overlapped with their family responsibilities, leading to a complex interplay between home and work life

(Manzo & Minello 2020). This significant shift has introduced unique challenges for these academics as they navigate the crossroads of professional obligations and personal commitments in the context of remote teaching.

■ Remote working model

The concept of remote work, also referred to as telecommuting, was first introduced in the United States in the 1970s as a response to issues such as traffic congestion and the costs associated with traditional office spaces (Hardill & Green 2003). As societal norms shifted and the demand for work-life balance and flexibility grew, this model of work evolved (Hunter 2019). Remote work presents a variety of advantages and challenges. One of the key benefits is the flexibility it offers, enabling individuals to tailor their work schedules to accommodate personal commitments, thereby achieving a better balance between their professional and personal lives. Moreover, by eliminating the need for daily commuting, remote work contributes to a decrease in carbon emissions, promoting environmental sustainability (Appleyard et al. 2018; Marz & Şen 2022). There are benefits of remote work model. Firstly, remote work has encouraged employees to become more disciplined and self-reliant, as they learn to understand and implement their job specifications without constant supervision (Mathibe & Metah 2020). This newfound independence has empowered employees to work autonomously and seek help only when necessary (Felstead & Henseke 2017; Smith 2020). Secondly, remote working has accelerated employees' career growth by fostering independence, responsibility and accountability. It has also built confidence and trust in the relationship between employees and their supervisors. Thirdly, remote work offers employees the chance to spend more time with their families, leading to an improved work-life balance and a decrease in carbon emissions from daily commuting. The adaptability of remote work enables mothers to juggle their professional duties with childcare responsibilities. This could result in heightened job satisfaction and lower stress levels, ultimately promoting a healthier work-life balance (Erasmus 2020).

Conversely, remote work comes with its own set of hurdles. Firstly, the lack of face-to-face interaction can cause employees to feel isolated, which could potentially affect team morale and dynamics within organisations. Furthermore, remote work necessitates the use of appropriate and user-friendly technology (Nickson & Siddons 2012). Yet, the abrupt transition to remote work because of COVID-19 caught many businesses and employees off guard. Connectivity issues, particularly in countries with inadequate infrastructure (Dadoo 2020; Gordine 2020; Radi 2020), and the lack of

physical interaction could lead to feelings of isolation among employees. Secondly, setting boundaries between work and leisure can be difficult when working from home (Lundberg & Cooper 2010; Sang et al. 2013). The increase in virtual meetings during lockdown has sparked worries about potential burnout, high data costs and the struggle to maintain a work-life balance. Limited access to reliable internet and technological resources could hinder efficient task completion from home. Thirdly, the blurring of work and personal life boundaries could intensify burnout. It's important to note that while remote work has been shown to boost productivity (Felstead & Henseke 2017; Smith 2020), this might not hold true for mothers dealing with the complex demands of work and home responsibilities.

Exploring the impact of remote working on ECMs in academia offers valuable insights into gender dynamics, work-life balance and career implications. This examination presents a unique opportunity to gain a deeper understanding of how remote work has influenced the experiences of ECMs during the pandemic.

■ The world of work for early-career mothers in academia

■ World of work for mothers and the pandemic

The COVID-19 pandemic necessitated many businesses to alter their operational strategies in order to maintain functionality and remain viable. In South Africa, for instance, 70% of organisations allowed their employees temporarily to work remotely, while around 18% of organisations have their employees permanently working remotely (West 2020). It is evident that the world of work post-COVID-19 may gravitate towards virtual offices rather than physical offices in buildings (Keursten 2020). These virtual offices could be mostly in homes shared with families and could comprise spaces including bedrooms or kitchen tables. These offices could also be converted to classrooms for home-schooling purposes (Keursten 2020; Toyana 2020). This blurs the boundaries between the office, school and home, particularly in contexts where women are traditionally assigned primary responsibilities at home.

In Africa, for instance, culture and society exert a profound influence on the experiences of working mothers. Conventional gender norms frequently delegate the main responsibilities of domestic chores, childcare and family tasks to women (Franke et al. 1997; Reichelt et al. 2021), leading to an imbalanced division of caregiving duties between men and women. The data from Manzo and Minello (2020) reveal that 76% of mothers engaged in remote work during the pandemic have identified childcare as a primary challenge, a figure that contrasts sharply with the 54% of men who report

the same. This highlights the complexity of juggling multiple roles, particularly for working mothers striving to fulfil diverse responsibilities while maintaining a delicate equilibrium between their professional and personal lives (Chisale & Gubba 2018; Mason, Wolfinger & Goulden 2013; Mirick & Wladkowski 2018). This disparity can exacerbate the challenges faced by women in juggling work and home responsibilities, impacting their employment status and overall well-being (Mathibe & Chinyamurindi 2021). The caregiving duties significantly mould the employment and health outcomes of early-career mothers.

■ The early-career mothers in academia

The 20th century saw a notable rise in the participation of women in areas such as the workforce, educational institutions and scholarly pursuits (Wu & Cheng 2016). Despite the increasing research on women in academia, over recent decades (Huopalainen & Satama 2019; Toffoletti & Starr 2016), the emerging literature on ECMs has not yet been fully explored (Lund 2012; Lund et al. 2015), especially with the focus to challenges that ECMs faced during the pandemic and the effects of remote working model on their growth as academics or scholars (Sherman 2020). The term ECMs, while not having a universally accepted definition, is typically used to describe women who are in the initial phases of their careers and are also mothers to young children (Poduval & Poduval 2009). The prevailing definition of early career in academia typically assumes stable employment with ongoing research and professional growth (Fulweiler et al. 2021). Measure for ECMs in academia can include publications, grants, reports, prize metrics and teaching responsibilities (Bostock 2014). This phase can be particularly challenging as these women are trying to advance in their careers while also managing the responsibilities of motherhood (Bam et al. 2023; Mirick & Wladkowski 2018). A survey by the Pew Research Centre reveals a divided public opinion on the ideal time for professionally ambitious women to have children. Some advocate for early motherhood in a woman's career, while others suggest waiting until she has firmly established her career (Livingston 2015). For women between the ages of 40 and 50 with a master's degree or higher, the median age for first-time motherhood is now 30, indicating a trend of delayed motherhood among highly educated women (Livingston 2015). However, it's crucial to consider the balance between professional life and the demands of caring for a baby for women aspiring to progress in their careers (Mason et al. 2013; Mirick & Wladkowski 2021). It's important to remember that each woman's experience is unique, and the effect of motherhood on a woman's career can greatly vary depending on individual circumstances, support systems and employer policies. The motherhood penalty is a term that describes the challenges and potential setbacks women may face in their careers

after becoming mothers. This can include reduced earning potential, slower career advancement and the need to balance work responsibilities with childcare (Kriger et al. 2022; Mirick & Wladkowski 2018).

The early-career phase poses unique challenges for women in academia as they strive to advance in their careers and maintain high productivity (Mason et al. 2013; Mirick & Wladkowski 2021). Academic women often feel pressured to work longer hours than the standard schedule, leading to limitations in travel and late-hour commitments and higher rates of absence from family obligations (Maume, Sebastian & Bardo 2010; Offer & Schneider 2011). This increased workload and stress can impact their home relationships while they manage their professional responsibilities (Hawkins, Cole & Law 2008). Furthermore, achieving financial independence through stable employment is a priority for these professionals, as their job provides them with a sense of security and independence (Barnett 2004; Heilman & Okimoto 2008). The closure of schools and daycare facilities during lockdowns has added to their challenges by placing additional childcare burdens on already stretched caregivers (Yamamura & Tsustsui 2021). Balancing full-time careers with homeschooling or constant child supervision demands exceptional multitasking skills. Additionally, social support networks have been strained because of restrictions on gatherings and physical distancing measures (Adebiyi et al. 2021).

In the academic sphere, ECMs encounter a distinct array of obstacles as they endeavour to ascend the ranks and attain professorship, all while juggling their scholarly activities with the duties of caregiving. The journey to becoming a renowned scholar is often filled with obstacles, especially for those navigating the demands of motherhood (Miller & Leveto 2022).

■ **Early-career mothers and the effect of remote working model amidst COVID-19 pandemic**

The challenges faced by ECMs in maintaining their academic progress have been intensified by the COVID-19 pandemic. While there are arguments that remote work could reduce stress and improve job performance (Sherman et al. 2020), the lockdown measures imposed because of COVID-19 have created numerous hurdles for ECMs in academia. The worldwide COVID-19 pandemic has drastically altered the work environment for people in diverse industries and at all career stages (Guy & Arthur 2020; Staniscuaski et al. 2021). Early-career mothers, in particular, have encountered unique challenges while working remotely from their homes. Balancing professional responsibilities with childcare, home-schooling and household chores has become a complex juggling act for these mothers (Aiken et al. 2024; Cardel et al. 2022; Gregor et al. 2024; Lopez et al. 2023;

Miller & Leveto 2022). A recent online study by Manzo and Minello (2020) centred on ECMs in the academic field who were balancing remote work and childcare. The study gathered data from social media and conducted interviews via Zoom and Skype with 50 mother participants. The findings showed that these women had to juggle numerous roles, including shift work, meal preparation, house cleaning and caring for and entertaining their children. Recent research on academic mothers has shown a decline in journal submissions by female scholars compared to their male counterparts (Flaherty 2020; Meri-Yilan 2024).

In response to this new reality of remote work intertwined with family life during the pandemic crisis, many of these academic moms had to reorganise their living spaces and adjust their daily routines accordingly (Adebiyi et al. 2021; Van Zoonen et al. 2021). It's crucial to highlight that this study does not suggest that the effects of the COVID-19 crisis were solely confined to ECMs in academia, as it has influenced everyone in different facets of life (Möhring et al. 2021; Yamamura & Tsustsui 2021). This experience sheds light on the significant adjustments made by ECMs amidst this unprecedented period (Hardman et al. 2022; Walter et al. 2022). The chapter examines the unique experiences of ECMs in academia while working remotely and the challenges they encountered during COVID-19 lockdowns. This research is particularly significant as it sheds light on a demographic that has received limited attention within academia.

■ Methodology

The research methodology employed in this chapter is exploratory in nature and adopts a qualitative approach. The investigation was carried out in two phases. The first phase involved a systematic literature review (SLR) (Kitchenham et al. 2009; Xiao & Watson 2019), focusing on the work environment for ECMs in academia following the COVID-19 pandemic and the impacts of the remote working model. This formed the foundation of the study. In the second phase, the insights from the SLR were utilised to evaluate potential strategies to assist ECMs in academia in balancing their family and academic lives. The literature review initially concentrated on ECMs within the African context, the COVID-19 pandemic and the effects of the remote working model. However, because of a lack of available data, the term 'Africa' was removed from the criteria, and the scope of the study was expanded to examine ECMs worldwide in academic institutions.

The journals used in the system literature review search were sourced from major journal repositories such as Ebscohost, ScienceDirect, Emerald, Google Scholar and Scopus. The specific journals included for synthesis were:

Journal of Family Studies, Gender, Work and Organization, National Income Dynamic Study, Australian Journal of Basic and Applied Sciences, Journal of Work-Applied Management, Annales médico-psychologiques, Scholarship of Teaching and Learning in the South, International Journal of Sociology, South African Journal of Higher Education, Journal of the Motherhood Initiative for Research and Community Involvement, Perspectives in Education, PLoS One, Higher Education, Annals of the American Thoracic Society; and World Trade Institute Advanced Studies, Social Sciences, The Counseling Psychologist, Women in Scholarly Publishing, Leading Change in Gender and Diversity in Higher Education from Margins to Mainstream, Australian and New Zealand Property Journal.

The limitations on the search for journal articles were based on their comprehensive peer-review processes, which contribute to the knowledge base. A variety of word combinations were used to establish a search criterion, thereby refining the body of work for the SLR. The search criteria used are as follows: 'ECMS and/or womanhood and career', 'remote working and/or working from home', 'COVID-19' and 'academia' were employed to compile literature. As the research centred on ECMs in academia from an African viewpoint during the COVID-19 pandemic, additional search criteria were used to gather data on the relationship between ECMs, motherhood and career, academia, Africa, remote working and the COVID-19 pandemic.

The search parameters for this study were defined by several key phrases, including 'ECMS AND/OR motherhood and career' and 'academia AND/OR higher education'. The final literature search focused on the concept of 'remote working AND/OR working from home AND/OR telecommuting', with additional terms such as 'Africa' and 'COVID-19 pandemic' included. The search was limited to peer-reviewed articles published between 2020 and 2024, reflecting the period during and after the pandemic. Any articles cited in this research that were published before 2020 were used to provide context for the study. The data collected on the experiences of ECMS in academia were taken from articles published between 2020 and 2024. The study only included articles written in English. Finally, only full-text articles were selected for further synthesis, analysis and reporting.

■ Data collection and analysis

Initially, the search criteria yielded 100 articles. Subsequently, we excluded duplicates, doctoral and master's theses, reports and articles that only had titles and abstracts. Some articles were excluded for eligibility, articles not focusing on African context. After this exclusion, articles with key words such as 'women', 'mothers' 'early career', 'COVID-19', 'Africa' and 'remote working' were kept and they totalled 49. To narrow down the number in line with the research topic, the word 'women' was removed, and words such as 'early career', 'academia', 'mothers', 'remote working', 'COVID-19' and 'Africa' were used. Only five articles focusing on South Africa were

found. The researcher found that the study could lack validity and generalisation. As a result, the researcher removed the word 'Africa' as a criteria. A total of 15 articles were found and analysed. Based on this final analysis, these 15 articles were used for synthesis and final reporting.

■ Discussion

This research delves into the impact of remote work on ECMs in the academic field, illuminating the intricate difficulties these mothers encounter while attempting to balance their scholarly duties with familial roles. The study's outcomes align with prior research that sought to comprehend the hurdles encountered by working mothers (Reichelt et al. 2021). Uniquely, this research illustrates the influence of the remote work structure and the COVID-19 pandemic on ECMs, particularly in terms of their career progression after the pandemic.

Refer to Table 9.1 for a detailed overview of the reviewed articles and their key findings.

The study's summarised findings, as depicted in Table 9.1, are presented through the narrative of Dr. Sina. This narrative delves into the experiences, challenges and concerns of ECMs in their pursuit of a future in academia, particularly amidst the challenges brought about by the pandemic and remote working:

Dr Sina, a newly minted doctorate in Management, has commenced her scholarly journey, simultaneously navigating the complexities of motherhood. The advent of the COVID-19 pandemic has introduced unexpected challenges. As the global community grapples with the pandemic, organizations, including academic institutions, have transitioned to remote operations, endorsing a work-from-home culture.

In this altered landscape, Dr Sina an Early Career Mother (ECM) with young dependents, confronts the formidable task of harmonizing her scholarly endeavors with domestic and homeschooling duties. Her daily routine encompasses a myriad of activities, including online lectures, research projects, increased virtual meetings and university committee meetings, all while ensuring her children's well-being

Despite her unwavering commitment, Dr Sina faces a multitude of hurdles, ranging from procuring funding for research projects to managing deadlines amidst parental responsibilities. Her fervour for knowledge propels her ambition, yet the imposed lockdown and remote working conditions have impeded her career progression. Her publication rate has suffered, and she experiences isolation, deprived of opportunities to establish networks or collaborate with seasoned scholars who could provide mentorship. Moreover, her institution lacks policies specifically designed to support ECMs, leaving her anxious about her future in academia. As she perseveres towards establishing herself as a distinguished scholar, Dr Sina wrestles with the intersectionality of family, homeschooling, and work responsibilities, yearning for the requisite support and resources to realize her aspirations (Mathibe 2022).

TABLE 9.1: Articles and chapters reviewed for data collection and analysis.

Authors	Topic	Methodology	Main findings	Journal/book
1. Kriger, S, Walters, C, Bam, A & Jansen, J 2022	The impact of the COVID-19 pandemic on female academics with young children in South Africa	Quantitative, 12 Likert-scale: Online	Pressure of children and care-giving, home schooling, struggled to complete work, future prospects affected	<i>Learning in the South</i> , vol. 6, no. 3, pp. 142-154
2. Bam, A, Walters, C & Jansen, J 2023	Care and academic work in a pandemic lockdown: a study of women academics in South Africa	Quantitative: Survey	Extended roles at home as carers, expectations by institutions are too high	<i>Higher Education</i> , pp. 1-17
3. Walters, C, Ronnie, L, Jansen, J & Kriger, S 2023	The changing meaning of 'home' in the work of South African women academics during the pandemic-enforced lockdown	Quantitative, 13 Likert-scale: Online	Home as a competitive and congested place of work, struggle to balance children, spouse and work	<i>PLoS One</i> , 18(1), p.e0280179
4. Kriger, S, Walters, C & Jansen, J 2022	How COVID-19 reconfigured family relationships: Explaining the work of academic women through the lens of complexity theory	Qualitative: Innovative study conducted between 2020 and 2021	Threats to: life-long learning, well-being, gender inequality and decent work	<i>Perspectives in Education</i> , vol. 40, no. 3, pp. 62-77
5. Hardman, J, Shankar, K, Crick, T, McCaughey, F, Watermeyer, R, Suri, VR, Knight, C & Chung, R 2022	'Does anyone even notice us?' COVID-19's impact on academics' well-being in a developing country	Quantitative: Survey	Forced online teaching had negative impact on sense of well-being, support from colleagues had significant outcome	<i>South African Journal of Higher Education</i> , vol. 36, no. 1, pp. 1-19
6. Martucci, S, Minello, A & Manzo, LKC 2020	The Unequal Ivory Tower	Quantitative: Survey	Spatial collision, redeveloping courses for online, struggle to find time for research agenda	<i>World Trade Institute Advanced Studies</i> , vol. 23, no. 1, p. 159
7. Cohen Miller A & Leveo, JA 2022	Centreing voices of motherscholars during the COVID-19 pandemic shows overwhelming responsibilities, ingrained gender roles and blurred boundaries	Qualitative: Innovative study conducted between 2020 and 2021	Caregiving challenges, struggle to balance between work and family, lost grant funding. Delayed research projects or put on hold.	CohenMiller, A & Leveto, JA 2022, 'Centering voices of motherscholars during the COVID-19 pandemic shows overwhelming responsibilities, ingrained gender roles and blurred boundaries', in A CohenMiller, T Hinton-Smith, FD Mazanderani and N Samuel (eds.), <i>Leading change in gender and diversity in higher education from margins to mainstream</i> , pp. 179-207, Routledge, London
8. Cardel, MI, Dean, N & Montoya-Williams, D 2022	Preventing a secondary epidemic of lost early career scientists. Effects of COVID-19 pandemic on women with children	Quantitative: Online survey	Pressure of children and care-giving, home schooling, struggled to complete work, future prospects affected	<i>Annals of the American Thoracic Society</i> , vol. 17, no. 11, pp. 1366-1370.

Table 9.1 continues on the next page→

TABLE 9.1 (cont.): Articles and chapters reviewed for data collection and analysis.

Authors	Topic	Methodology	Main findings	Journal/book
9. Segal, N 2020	Academic single mothering during a pandemic	Qualitative: Autoethnography	Pressure of children and care-giving, home schooling, struggled to complete work, future prospects affected	<i>Journal of the Motherhood Initiative for Research and Community Involvement</i>
10. Lopes, M, Ferreira, V & Santos, C 2023	Gendered micropolitics in academic work environments: Uncovering microaggressions during the COVID-19 pandemic	Mixed methods (Qual-Quant)	Single mothers and mothers with young kids had more caregiving and homeschooling responsibilities. Virtual platforms brought disempowerment and discrimination, lack of support.	<i>Social Sciences</i> , vol. 12, no. 8, p. 443
11. Gregor, MA, Burke, KA, Campbell-Halfaker, D, Dunn, MG & Bhatia, A 2024	'I need a break or I might quit': STEM academics' pandemic experiences	Qualitative: Interviews	Research disruption, lack of balancing work/family, burnout and mental health affected. Lack of time navigating work and family.	<i>The Counseling Psychologist</i> , vol. 52, no. 1, pp. 88-123
12. Meri-Yilan, S 2024	The impact of COVID-19 on scholarly publication practices of Turkish female and male scholars	Qualitative: Interviews	Pandemic benefited male researchers. Their publications increased. Women home duties increased, research projects struggled.	Meri-Yilan S 2024, 'The impact of COVID-19 on scholarly publication practices of Turkish female and male scholars', in AK Hultgren & P Habibie (eds.), <i>Women in scholarly publishing</i> , pp. 83-96, Routledge, London
13. Aiken, V & Blaj-Ward, L 2024	Making the home a site for slow, caring scholarship: Gendered experiences of writing for publication in COVID-19 times and beyond	Qualitative: Autoethnography	Research disruption, lack of balancing work/family, burnout and mental health affected. Lack of time navigating work and family.	Aiken, V & Blaj-Ward, L 2024, 'Making the home a site for slow, caring scholarship: Gendered experiences of writing for publication in COVID-19 times and beyond', in AK Hultgren & P Habibie (eds.), <i>Women in scholarly publishing</i> , pp. 175-188, Routledge, London
14. Ritchie, L, Sutley, E, Gibb, C, Gill, D, Sibley, M, Husain, J & Hamilton, K 2024	'And then COVID-19 happened': Impacts of the pandemic on hazard and disaster researchers	Qualitative: Interviews	Caregiving challenges, struggle to balance between work and family, delayed research projects or put on hold. Challenges of virtual teachings.	<i>Natural Hazards Review</i> , vol. 25, no. 1, p.04023051
15. Halvitigala, HG, Callanan, J & Leshinsky, R 2023	Towards more inclusive equality and diversity for the Australian valuation industry.	-	Occupational segregation by gender, diversity and inclusion	<i>Australian Property Institute</i>

Source: Mathibe, MS 2022, 'Academic mothers: A conundrum', *Acumen*, November, no. 42.

Through an SLR of 15 articles, the study found that, as ECMs immerse themselves in their work and strive to make significant contributions to their field, they encounter moments of self-doubt and exhaustion, leading to stress and emotional exhaustion (Tarab 2023). The necessity to work during irregular hours, coupled with the demands of family and motherhood, has led to heightened stress and a sense of insufficiency. An augmented workload and insufficient work support could precipitate stress and burnout among employees (Adebiyi et al. 2021; Chinyamurindi, Mathibe & Marange 2023). The COVID-19 pandemic and the shift to remote work exacerbate an already challenging scenario, as these committed academics adjust to online teaching while ensuring their children are well-cared for during lockdowns (Yamamura & Tsustsui 2021).

The findings show that EMCs face difficulties in distinguishing between work and family time (Keursten 2020; Toyana 2020), often staying up late to finish tasks. Balancing late-night research with caring for a sick child or managing homeschooling requires unwavering resilience (Aiken et al. 2024; Gregor et al. 2024; Lopez et al. 2023). The lack of set work hours has negatively affected their health (Mathibe & Chinyamurindi 2021) and family time (Cardel et al. 2022; Miller & Leveto 2022). The trend towards remote work is increasingly seen as the future of employment (Ozimek 2020). While remote work brings numerous benefits for both employers and employees, it's essential to recognise the challenges ECMs face. Dr. Sina's experiences highlight these challenges, which could have a significant impact on academia post-COVID-19 if not addressed. Therefore, it's crucial to reassess the remote work model to prevent ECMs from falling behind.

■ Conclusion

The research sought to investigate the impact of remote work on ECMs in the academic sector, with a particular emphasis on the difficulties they encounter while juggling scholarly obligations and familial roles amidst the COVID-19 pandemic. The results highlighted considerable obstacles associated with the process of publication, an augmented teaching workload, online meetings and their subsequent effects on career progression. The study provided a comprehensive understanding of the intricate web of responsibilities these mothers grapple with daily. The study makes three recommendations. Firstly, in the post-COVID-19 world of work, the landscape for ECMs in academia is undergoing a significant transformation. The remote working model presents an opportunity to reimagine the traditional structures of academic work and create a more inclusive and flexible environment for scholars with caregiving responsibilities. Secondly, the ideal remote working model for ECMs in academia should prioritise a seamless integration of technology to

facilitate virtual collaboration, research and teaching. This model should embrace a hybrid approach, allowing ECMs to balance their academic pursuits with their family responsibilities. This model should incorporate key elements such as flexible working hours and the option to work remotely, including from home. This would empower mothers to balance their professional responsibilities and personal obligations efficiently.

Thirdly, the remote working model should emphasise the importance of mentorship and support networks for ECMs. Virtual mentorship programmes, peer support groups and professional development opportunities tailored to the unique needs of academic mothers can foster a sense of community and empowerment. In this post-COVID-19 world, the remote working model for ECMs in academia should reflect a commitment to equity and diversity, ensuring that all scholars have the opportunity to thrive in their academic pursuits while maintaining a healthy work-life balance. By embracing innovation and flexibility, academia can harness the full potential of its ECMs, contributing to a more vibrant and inclusive scholarly community.

This research is centred on examining the effects of remote work on ECMs in the academic field, specifically the challenges they face in balancing their scholarly duties and familial roles during the COVID-19 pandemic. The study employs a systematic review of literature as its methodology, with a significant portion of the literature reviewed being quantitative. Future studies could utilise a qualitative method to delve deeper into the feelings and experiences of ECMs. Furthermore, it would be advantageous to explore the specific assistance required by ECMs and assess the inclusivity of current academic institution policies towards ECMs. Considering the limited research on ECMs in unique environments like Africa, which has its own unique gender, work and family-related cultural and societal challenges, there is a pressing need for more research in this domain. This would enhance our understanding of ECMs' experiences in various contexts.

COVID-19 triggered flexible working arrangements in Zimbabwe: A systematic literature review

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■ Abstract

Background: This chapter explicates responses to the coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic on flexible work arrangements in Zimbabwean businesses and discusses future reflections in the post-COVID-19 era.

Aims: The chapter aims to explore COVID-19-induced business survival responses regarding work organisation in Zimbabwean businesses.

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Methods: The findings of this chapter were gathered from media reports, publications and literature reviews. A total of 18 articles from Zimbabwe were included in the analysis.

Findings: Coronavirus disease caused by SARS-CoV-2 virus has caused untold suffering for the human race across the globe, presenting not only a health crisis but also a major societal catastrophe. Zimbabwean businesses were not spared from the vagaries of the pandemic whose flip side may not be as deplorable. Apart from the massive death rate, the most affected activity in every country worldwide has been the organisation of work. Lockdowns and stay-home orders because of the spread of the coronavirus had mixed impacts on human activities globally and consequently led to a rethinking of how work could be executed while preserving lives. Major ground-breaking work practices that had never been fathomed prior to the pandemic were unleashed as a result of the pandemic. The pandemic plunged industries into unimaginable levels of unplanned and in some cases full-time use of smart working arrangements for both routine and non-routine tasks. Working from home, which seemed like a distant dream for some businesses, as evidenced by use of terms like ‘shirking from home’ or ‘working on a beach’, has become the new design when approaching the way work was to be done. The pandemic has fast-tracked teleworking to be the new normal and positioned it as the future of work among 21st-century Zimbabwean businesses whose citizens are likely to be more digital than their predecessors. Risky interactions are likely to be reduced as, in the gig economy, ‘work’ is not a place, but is a web-based task that can be done from any location that allows for broadband internet connectivity. This chapter strives to suggest possible remedies for retooling the ‘new normal’ in the future.

Implications: The chapter shows the importance of the philosophy of ‘live and let live’, because the onus is on us to safeguard the work environment. Businesses may have to develop policies regarding teleworkers as well as train people managers on how to manage employees who may not be physically present much of the time.

Conclusions: It is projected that the unprecedented changes in work organisation in a developing nation like Zimbabwe will get entrenched into work practices post the pandemic. It is however flagged that developing countries may need to up their game because most are still grappling with the medieval challenges of digitalisation, technology uptake and internet connectivity. The chapter makes disciplinary contributions to the post-COVID-19 era in terms of interventions that inform environmental policy and practices.

■ Introduction

The coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic was declared a world health crisis because it has affected all countries globally. The ways in which people used to transact, work, shop, make payments and deliver goods and services had been radically changed by this pandemic (United Nations Conference on Trade and Development [UNCTAD] 2020). Most businesses moved towards digitalisation as a result. However, digitalisation has its pros and cons. Businesses are compelled to lay off employees, invest in technology and human resource development and sensitise employees with respect to the new developments to ensure a seamless shift from traditional ways of operating to the 'new normal' in which digitalisation becomes the centre of all business operations (EHL Insights 2020). Many countries banned social gatherings to reduce COVID-19 transmissions and pushed for zero-touch options for most business transactions (Global Humanitarian Response Plan COVID-19 2020); hence, both employees and customers had to adapt to virtual working environments. The Fourth Industrial Revolution is upon us, and the illiterate of the era will not be those who cannot read, but those who cannot learn, unlearn and relearn.

Most governments world over have given directives that public entities, private companies and institutions of learning should have to work remotely. Although this could be regarded as a temporary measure, a number of questions could be raised: To what extent will this change the nature of work and the occupations that people have? How would employees interact with one another? How is the employment relationship affected? Will this change VISA requirements now that employees will be working from home? How then is productivity to be measured? Can employees continue to find value in work if so much of it becomes digital? How will expenses for home offices be handled? How will the use of company equipment and systems be monitored? (Dubai Future Foundation 2020; Mathis & Jackson 2008).

The 'new normal' posed several prospects and challenges regarding the organisation of work, as work transitioned to more digitally enabled platforms. Employers had to adopt work arrangements that allow employees to work from home or other locations that are not a physical office. Flexible working arrangements include weekend work, overtime, shift work, annual hours contract, job-sharing, part-time work, flexi-time, temporary/casual work, fixed-term contracts, telework, home-based work and compressed work week (Austin-Egole, Iheriohanma & Nwokorie 2020). Flexible working arrangements could manifest themselves through flexibility in the schedules of working hours, flexibility in the duration of the work or flexibility in

location. Although each of the aforesaid arrangements could be used independently, they are often combined in order to complement each other (Chung 2009).

These arrangements were not birthed as a result of the COVID-19 pandemic but became more pervasive and were some of the more viable alternatives around which work could be organised during the pandemic. Below are some of the flexible working arrangements flagged by Klindzic and Marić (2019).

■ Remote working

Remote work gained much traction as a result of the COVID-19 pandemic as a significant number of employees were forced to quarantine and work from home. The growing number of remote workers and the positive results of remote working have popularised this option among employers. 'Remote working' is rather an umbrella term that includes:

- Working from home
- Working from co-working spaces or cafés
- Working remotely and yet on a flexible schedule
- Working remotely and yet coming to the office from time to time (Kissflow Inc. 2024).

It is these aforementioned distinctions in remote work that gave rise to other slightly overlapping terms like flex work, work from home and telecommuting.

■ Telecommuting

The concept of telework, or telecommuting, an American equivalent of teleworking, started during the oil crisis of the early 1970s when Jack Nilles and his American colleagues published their findings on the savings to the national economy likely to be realised from reduced commuting (Nilles et al. 1976). Telecommuting means that employees would be working remotely but come to the office from time to time (Kissflow Inc. 2024). Employees will have to use video calls, instant messaging and digital workplace platforms to remain connected with their co-workers at office (Kissflow Inc. 2024). Many businesses had to implement telecommuting in order to protect their employees' health and curtail the spread of the corona virus. Being a key element of the new normal, telecommuting has popularised online collaborations and opened many communication options for employees. Teleworking has the advantage of decongesting workplaces, allowing for physical distancing (Belzunegui-Eraso & Erro-Garcés 2020). Since there is no need to travel to the physical workplace,

teleworking has the potential to increase employee productivity and boost a country's gross domestic product (Belzunegui-Eraso & Erro-Garcés 2020). Despite its advantages, teleworking also has the potential to demotivate and cause employee dissatisfaction if employees fail to separate work time from family time (Espinoza & Reznikova 2020). Employee headcount could also be reduced if employers realise that they can still meet targets with fewer employees, leading to uncertainties and job losses (Espinoza & Reznikova 2020).

■ Working from home

Without the support of ICT, working away from the physical office becomes working from home. For instance, if a tailor who used to operate from premises in town shifts to working at home because of COVID-19 regulations, that is not teleworking but working from home. However, if a salesperson is working in the field but is connected to workplace systems through ICT, that would be considered teleworking (Baruch 2000).

■ Job-sharing

This happens when work is split between two employees in a manner that their joint working hours each week equals the standard working hours of one employee per week (Kottey & Sharma 2016).

■ Compressed work week

This happens when employees work for longer periods of time per shift or day in exchange for some days off (Canadian Centre for Occupational Health and Safety 2024). For instance, for a 40-hour work week, an employee could work 10 hours per day, four days a week.

■ Reduced hours/part-time

This type of arrangement allows employees to work fewer hours than the standard weekly hours. Working hours may either be negotiated or may be arranged in such a way to coincide with peak workload hours (Canadian Centre for Occupational Health and Safety 2024).

■ Context of the study

The COVID-19 pandemic did not spare the Zimbabwean economy. In addition to border controls, bans on recreational and entertainment activities, bans on public gatherings and restricted hospital visits, the government declared the pandemic a national disaster (Zimbabwe

Congress of Trade Unions [ZCTU] 2020). According to the US Embassy in Zimbabwe (2021) as at 06 June 2021, the country had 39,189 confirmed COVID-19 cases and 1,606 deaths. In response, lockdowns of varying levels of severity were enforced.

The COVID-19 pandemic created many opportunities and challenges for Zimbabwean businesses. Initially, 90% of Zimbabwean businesses are informal and the closure of these enterprises as a result of the lockdowns severely affected their productivity, making many households vulnerable (ZCTU 2020). According to a report by the International Trade Centre (ITC 2020), 75% of small African firms experienced reduced sales, and 54% experienced a reduction in their access to inputs. Chaora (2020) identified that a crucial issue for small, medium and micro enterprises was the loss of customers and revenue because of the COVID-19 pandemic, even though this issue could have been addressed through simple training on digital functions and software applications to keep enterprises in touch with their customer base.

As a result of the COVID-19 pandemic and associated lockdowns, average sales across businesses in sub-Saharan Africa dropped by 49% (World Bank Group 2021). According to the *Africa's Pulse* publication of the World Bank Group (2021), most businesses in the region had to reduce hours and wages rather than lay off workers. The report indicates that African entrepreneurs had to reduce working hours by about 39%, cut wages by at least (31%) or grant leave of absence by about 38% to respond to this situation.

Furthermore, the COVID-19 pandemic ushered in new ways of transacting business, and organisations had to change the ways in which they operate by embracing more technology. Technology enables collaboration in work environments as it facilitates agile workplace interactions (De Lucas Ancillo, Del Val Nunez & Gavrilă 2020). According to De Lucas Ancillo et al. (2020), the COVID-19 pandemic initiated a revolution that has significantly changed the way businesses operate and will continue to do so, requiring them to reinvent their customary functions and adopt new mechanisms, thus causing profound changes in work processes.

COVID-19 abruptly disrupted normal work schedules and accelerated the migration of work to online platforms. The implications for HR were that 'round peg-round hole' approaches to managing human capital, tenable during stable periods needed to be interrogated. There was a need for job re-engineering or re-designing, organisational restructuring and employee re-skilling. Although telework has been known to be feasible for: tasks that require thinking and writing, such as reviewing grants or cases, data analysis, writing regulations or reports; telephone-intensive tasks, such as contacting customers and computer-oriented tasks, such as data entry, word processing

and programming (Viack undated), the uncharted waters of the pandemic demanded innovation and agility and adapting to fast-changing systems and regulations. For instance, under remote or hybrid workplace scenarios, there could be advantages for both businesses and employees if employees are allowed to work from home or from a remote office close to home, rather than having to commute to the office at the main headquarters (Harvard Business Review 2020). Teleworking has greater chances of success if all the employees involved are cognisant of what to anticipate and are prepared to deal with any fears or problems associated with the new work ethic from the onset (Pyöriä 2011). Unfortunately, given the speed with which businesses around the world adopted telecommuting in the face of the COVID-19 threat, without sufficient preparation, this mode of working gave rise to a number of serious employment relations concerns. As has been observed way back by Pyöriä (2011), apart from regional policy and geographical concerns, a major factor that militates against the uptake of telecommuting is the lack of an established contractual framework or a 'culture' of teleworking. Unsurprisingly, this became a challenge for most businesses, whose adoption of flexible work arrangements was not only ad hoc but was unplanned as well.

■ Research question

Through a systematic literature review (SLR), the research is guided by the following research questions:

1. What COVID-19 triggered business survival responses regarding work organisation were adopted by Zimbabwean businesses?
2. To what extent were the survival responses sustainable post the COVID-19 pandemic?

■ Theoretical literature

Consistent with the idea of flexible work arrangements are Clark's (2000) border and Ashforth, Kreiner and Fugate (2000) boundary management theories (Kossek, Perrigino & Lautsch 2023). Ashforth and fellow researchers (2000) opined that establishments must permit for a reasonable degree of employee autonomy in the negotiation of role segmentation-integration, while Clark (2000) felt that organisational policies about work and time, being structural factors, were fertile ground for further research. In view of the above, work-family boundary ambiguity or work-family blurring can be understood as that confusion or challenge that arises as one tries to distinguish their work from their family roles in such settings where these roles are regarded as being highly integrated, like doing paid work at home (Desrochers, Hilton & Larwood 2002).

Consequently, the integration-segmentation nexus, rather than being a dichotomy, is considered a continuum according to the boundary theory. These theories help shed light pertaining to the many ways by which organisations could avail their employees the freedom needed to arrange how they could possibly delineate work from non-work roles.

The main tenets in the border theory are the home-work characteristics, flexibility, participation of border crossers and permeability of the borders (Clark 2000). The theory holds that there are temporal, physical and psychological borders between home and work. It flags that interconnectedness exists between home and work. According to Clark (2000), the home-work transition can vary from extreme to marginal depending on the individuals involved.

Clark (2000) explicated that work and home – though different domains, influence each other even if they differ in purpose and culture. Their contrasting purposes and cultures create borders between them. Flexibility and permeability between work and home borders can increase a person's work-life balance and result in greater satisfaction (Kossek & Lautsch 2018). On one hand, flexibility avails to employees that autonomy to choose the starting and ending times of their work and where to execute the work (Hall & Richter 1988).

On the other hand, permeability refers to the degree to which an individual physically situated in one domain might be concerned with the other domain psychologically (Hall & Richter 1988). With permeable boundaries, obligations from one role can easily penetrate the other role's domain (Allen, Cho & Meier 2014). While high-level work permeability means that situations from home may interrupt one during the work domain, high-level home permeability is when activities related to work happen in the home domain (Seeber & Erhardt 2023). For instance, a surgeon may not be allowed to interact via phone calls with their spouse at work – that is impermeable work boundaries, but can still respond to emails and do documentation from their home office (permeable home boundaries).

The border theory applies very well to flexible work arrangements, whether triggered by such pandemics as the COVID-19 or as developmental human resource management tools. The theory as well goes a long way to incubate all HR policies that promote employee satisfaction through blending permeability and flexibility between the two domains of work and home. It also goes without saying that flexible work arrangement initiatives have the potential to: reduce employee stress levels; improve the general well-being of employees; improve their self-worth and levels of concentration; provide employees with quality time for social life and increase profitability and productivity at the same time (Thompson & Aspinwall 2009).

■ Methodology

■ Research design

The study conducted a SLR to gather information related to COVID-19-induced flexible work arrangements in Zimbabwe.

■ Research paradigm

The study adopted an interpretivist research paradigm. The interpretivist paradigm enabled researchers to gain much depth as it seeks for perceptions and even experiences of a particular social context (Alharahsheh & Pius 2020).

■ Ethical considerations

In light of the advice from Wager and Wiffen (2011), the SLR ensured the proper acknowledgement of contributors, declarations of conflicts of interest, if any, were made, and that the review rids itself of plagiarised material.

■ Data collection procedure

Steps in SLR as highlighted by Khan et al. (2003) are as follows: framing the question, identifying relevant work, assessing the quality of studies, summarising evidence and interpreting the findings.

□ Framing the question

The research question framed was, What COVID-19-triggered business survival responses regarding work organisation were adopted by Zimbabwean businesses?

□ Identifying relevant work

Primary databases used to retrieve information included (1) Google, (2) ScienceDirect and (3) SciELO. Search items used on selected electronic databases included words and phrases such as (1) 'flexible work arrangements', (2) 'work organisation and (3) 'smart working arrangements'. The aforementioned searches were often followed by the word additional set of words: '+ COVID-19 in Zimbabwe' to narrow the focus of the review to Zimbabwe.

The inclusion criteria comprised those studies conducted in Zimbabwe. Furthermore, only studies that focussed on work arrangements triggered

by the COVID-19 pandemic were considered. Published theses and dissertations were also included. Regarding the exclusion criteria, studies done only in English were considered. Furthermore, newspaper articles and commentaries were excluded. Books and reports were also excluded for the reason that some may not have undergone rigorous peer reviews.

▣ **Assessing the quality of studies**

The research question guided the screening criteria. A report on each publication was generated whether it got included or rejected. Reasons for rejection were also proffered. Publications that have undergone rigorous peer reviews were only considered as a way of ensuring the quality of the review.

▣ **Summarising evidence**

Evidence was summarised through data extraction and data analysis. Regarding data extraction, the research question was instrumental in setting parameters. The evidence was summarised following these headings: nature of study (whether empirical or anecdotal), sector under study, COVID-19 era challenges and COVID-19-triggered work organisation capabilities. Concerning data analysis, logical and analytical reasoning was employed in the process of accepting and eliminating information as per step number two.

▣ **Interpreting the findings**

Based on the above steps, a summary table depicting COVID-19 era work organisation challenges and COVID-19 triggered work organisation capabilities was created. Table 10.1 details the studies used for this SLR as per the outlined steps.

■ **Findings**

The study acknowledges that the notion of flexible working arrangements had been prevalent and well implemented mostly in developed economies, whereas in most African economies, of which Zimbabwe is no exception, COVID-19, triggered ad hoc adoptions of such arrangements. The current study explores the studies alluding to such adoptions during the pandemic and prospects for sustainability post the pandemic. Table 10.1 summarises the COVID-19-triggered flexible working arrangements as part of Zimbabwe's SLR of work organisation research.

TABLE 10.1: Summary of studies consulted ($n = 18$).

Author(s)	Sector	Source (database used)	Nature of study	COVID-19 era challenges	COVID-19 triggered work capabilities/ recommended initiatives
Dudzai, C & Wamara, CK 2021	Informal sector of Hopley Community of Harare South	Journal	Empirical	Suspension of operations of enterprises such as vending and commuting, plunging operators into poverty	Shifting the business models of operators to produce COVID-19 paraphernalia from home
Mazikana, AT 2022	Zimbabwean organisations	Journal	Desktop	Lack of training on how to work from home. Internet connectivity challenges.	Capacitating employees to work from home
Machowe, R, Mawonde, D & Pande, C 2021	THE	Journal	Empirical	Staff and students could not meet physically in classes as the tradition because of the virulent COVID-19 pandemic	Shifting from face-to-face to other flexible work arrangements such as teleworking and remote working
Nkala, B 2020	Health sector	Journal	Empirical	Staff testing and screening for COVID-19 was difficult because of shift working and understaffing in public hospitals	There is a need to come up with policies and procedures that anchor the shift work already in place. There is also a need to avail adequate resources for nurses in order to guarantee their safety.
Bhebhe, T, Muzori, J, Chikazhe, L & Makaza, CM 2022	Local authority	Journal	Empirical	Employees were introduced to working from home without prior training. There is other work that could not be done from home like refuse collection, town cleaning and roads maintenance.	Train employees ICTs skills to working at home easy. Increase the use of ICTs in all functions of local authorities or city councils.
Zvavahera, P & Chirima, NE 2023	THE	Journal	Empirical	Female researchers find it difficult to find time to research because of gender roles	There is a need for support systems and processes that support female researchers in order to increase their research output and career growth in the new hybrid work environment
Gatsi, O, Devi, A & Devi, R (2021)	Professional work	Journal	Empirical	Female employees find it difficult to fulfill assigned task because of gender roles	Policies that support female employees working from home should be put in place

Table 10.1 continues on the next page→

TABLE 10.1 (cont.): Summary of studies consulted ($n = 18$).

Author(s)	Sector	Source (database used)	Nature of study	COVID-19 era challenges	COVID-19 triggered work capabilities/ recommended initiatives
Sanhokwe, H, Takawira, S & Maunganidze, F 2022	NGO	Journal	Empirical	Employees were not comfortable with teleworking because of lack of support from the organisation in terms of resources and requisite support	Continuous technological training is vital to equip employees for the new normal, hybrid work environment
Magaisa, E, Moyo, T, Wilson, EC, Makokororo, PP & Shava, G 2023	THE	Journal	Literature review	There was delayed coverage of module outlines, lack of technological skills in staff and students, poor internet connectivity and unavailability of funds to purchase technological accessories by both staff and students	Continuous use of technology in teaching and learning post-COVID-19 and also training on technological skills for both staff and students is crucial
Sebele, F & Mpofu, A 2023	THE	Journal	Empirical	Lack of access to internet connections. Poor technological infrastructure.	Investment in digital infrastructure was recommended. HRD for staff and also training for students on the use of technological gadgets should be prioritised.
Makamure, C & Tsekeni, M 2020	THE	Journal	Empirical	Institutions were technologically unprepared, which affected teaching and learning process of STEM	Need to invest in training in the use of 4 IR technologies in the teaching of STEM
Chitungo, I, Dzinamara, T, Tungwarara, N, Chimene, M, Mukwenha, S, Kunonga, E, Musuka, G & Murewanhema, G 2022	All sectors	Journal	Desktop	Inequality in terms of service access (especially health and education) because of inadequate technology. A poorly technologically resourced health care system was also a challenge that led to high mortality rates during the pandemic.	Government to subsidise and invest heavily in technology so that majority can access important services like health and education Online learning. Telehealth was also recommended.

Table 10.1 continues on the next page→

TABLE 10.1 (cont.): Summary of studies consulted ($n = 18$).

Author(s)	Sector	Source (database used)	Nature of study	COVID-19 era challenges	COVID-19 triggered work capabilities/ recommended initiatives
Nani, GV & Ndhlovu, I 2022	SMEs	Journal	Empirical	Because of COVID-19 lockdown rule that restricted to move around, majority of SMEs were faced with liquidity crises as they could not do business	Adoption of digital marketing or e-commerce to ensure business continuity
Matsiwira, L, Marembo, M, Chamburuka, M, Mugoni, E & Shumbanhete, B 2023	Finance sector	Journal	Empirical	During lockdown MFIs could not proceed with their economic activities	Online business transactions And shift work was recommended as a survival strategy.
Nyazenga, G, Ndlovu, MJ & Paulos, L 2023	Business	Journal	Empirical	Lack of ICT infrastructure, non-availability of electricity, slow internet, lack of technological skills and lack of technical support	Investment in technology, especially 5G technology. Training of employees in technological skills. Backup of power supply with solar energy.
Chirume, E & Kaseke, N 2020	SMEs	Journal	Empirical	SMEs were faced with liquidity challenges because of COVID-19 lockdown. There were no sales.	Embrace digital technology or e-commerce in doing business
Muparadzi, T & Rodze, L 2021	Financial/commercial banks sector	Journal	Desktop	Commercial banks had reduced interactions with stakeholders because of the COVID-19 triggered lockdown	ICT digital resilience is crucial for business continuity. These make bank employees to be more productive since majority of processes in the bank require mediation. Training employees on Business Continuity Management is important for business continuity. Virtualising bank products is also crucial.

Source: Data analysis.

Key: COVID-19, coronavirus disease caused by SARS-CoV-2 virus; THE, tertiary and higher education; NGO, non-governmental organisation; STEM, science, technology, engineering and mathematics; ICT; SMEs, small and medium-sized enterprises; MFIs, microfinance institutions; information and communication technology.

Based on findings from Table 10.1, inferences can be made regarding the most popular flexible working arrangements adopted by Zimbabwean organisations in the face of the COVID-19 pandemic. The use of shift work (although there was lack of clear policies to anchor the arrangement), teleworking and telehealth, working from home, online meetings and online delivery of tuition were among the most popular arrangements for most organisations to stay afloat. Although very limited flexible working arrangements were adopted with some considerable success because of issues associated with organisational culture, manpower skilling, internet connectivity, power outages, inequalities resulting in lack of funds to acquire gadgets and data, among others, it is evident that the pandemic triggered desperate measures to deal with desperate times. Moreover, true to the spirit of the border theory, the home and work domains became more permeable. Firstly, high-level home permeability was witnessed as more work-related activities had to be executed within the home domain. However, this was not quite effective in many organisations (especially those offering health or education services and even SMEs) because of the aforementioned constraints. Secondly, high-level work permeability was also witnessed as employees could not ignore emergencies from family as a result of the pandemic.

■ Discussion

Many flexible working arrangement options were at the disposal of many organisations during the pandemic, but the reviewed Zimbabwean literature confirmed the widespread use of working from home, teleworking (and telehealth) and the compressed work week. The COVID-19 pandemic introduced a new normal where employees found themselves working from home. However, women experienced the most challenges as a result of the many distractions because of the gender roles they have to fill (Gatsi, Devi & Devi 2021; Mazikana 2022). Many organisations could still leverage on working from home post the pandemic, if they could invest more in internet connectivity, up skilling and motivation of staff. However, Bhebhe et al. (2022) lamented over some jobs that could not be executed remotely because of their nature. Among them were refuse collection, cleaning and road maintenance, which would require massive investments in automation for their execution during and post-COVID-19.

Regarding teleworking, the good news is that it resulted in high productivity, especially in managerial employees. Teleworking was nothing new to them since they used to telework prior to the COVID-19 pandemic (Sanhokwe et al. 2022). However, the story was different with junior members of staff whose workload reduced during the pandemic as most of their tasks required contact. Teleworking proved to be the major antidote

to the COVID-19-induced disruptions in most organisations and especially in the higher and tertiary education sector (Mhlophe & Chinjova 2022; Nyazenga, Ndhlovu & Paulos 2023; Sebele & Mpofu 2023). Kuwonu (2020) sheds more light into the challenges of teleworking in the provision of education in sub-Saharan Africa. The survey revealed that 98% of students in rural areas did not have access to a computer, smart phone, radio or television at home. These students had limited to no access to education from the onset of the pandemic (Kuwonu 2020). Given how voluminous the new primary and secondary curricula are, poor rural dwellers got disadvantaged because national examinations for all levels were to continue as scheduled (Organisation for Economic Co-operation and Development [OECD] 2020c). Well-wishers had to distribute study packs in Zimbabwean rural areas to assist students to continue learning and try to narrow the gap between students in urban and rural areas (UN Zimbabwe 2020). Although the uptake was minimal, the Higherlife Foundation played a key role by providing free access to its online Ruzivo platform for students to continue with their studies (World Bank 2020). Many students and tutors failed to use the platform because of lack of technological skills, while others found the cost of data bundles prohibitive (Mattes et al. 2020). Some highlighted connectivity challenges and others intermittent power cuts as serious impediments to accessing online learning during the COVID-19 pandemic (Kuwonu 2020). The COVID-19 pandemic has exposed the unpreparedness of nations for such unforeseen disasters. The infrastructure, tools, skills and knowledge to allow the smooth flow of distance learning are not in place, with negative consequences for the quality of tuition.

Another case at hand regarding the efficacy of teleworking was when the Zimbabwean Public Service Commission (PSC) had to reduce the number of employees reporting for duty from 30% to 10% for the period 21 January to 03 February 2021, with the exception of the Ministry of Health and Child Care and certain designated critical services (Xinhua 2021). Prior to that, a PSC memo dated 21 January 2021 indicated that employees would be equipped with all requisite tools and equipment to enable them to work from home, but lack of budgetary support meant that most employees were idle till the pandemic subsided (Zhou 2021). As observed by the Afrobarometer Survey (Mattes et al. 2020), the Zimbabwean ICT infrastructure is largely underdeveloped and needs massive financial investment. In addition, power cuts, poor internet connectivity and resource incapacitation by a largely informal sector further compounded the efficacy of teleworking in Zimbabwe.

Closely related to teleworking was the use of telehealth. In Zimbabwe, the most commonly used telehealth platform was Maisha owned by Econet. On this platform, people could text their symptoms and Maisha could reply with a prescription and what the patient must do without visiting the

medical facility. This helped to minimise physical interactions. However, the platform was not very popular among Zimbabweans facing information and communication technology (ICT) challenges, who prefer face-to-face interaction.

It is encouraging to note that the compressed work week and flexi-time were some of the viable options for some sectors (Muchowe, Mawonde & Pande 2021). However, Nkala (2020) observed a number of challenges such as backaches, headaches, stress and family problems among nurses at the Parirenyatwa Group of hospitals because of extended hours of work. More education and training on managing flexi-time and working on a compressed week could be required if these options are to be sustainable post the pandemic hours (Nkala 2020). A study by Matsiwira et al. (2023) on the strategies implemented by the microfinance sector for survival during the pandemic also indicated successful implementation of the compressed work week. The practice has survived post the COVID-19 pandemic.

■ Contribution

The chapter makes some critical contributions in that it explores the flexible work arrangement options that organisations could use in the face of pandemics like COVID-19. Its major contribution is that it explicates the feasibility of such options in Zimbabwe. While acknowledging the utility of technology-enhanced work arrangements, this chapter helps to unravel Zimbabwean-specific challenges that render them ineffective. Although online or technology-enhanced work arrangements are not new, for many organisations in Zimbabwe that use traditional approaches to work, access to devices, power, the internet and competencies may be scarce in certain contexts and going virtual exposes the yawning cracks of numerous inequalities at the intersection of class, gender and race (Ivancheva & Swartz 2020; Mukhopadhyay & Mukhopadhyay 2020). For instance, while examinations were administered online at South African higher education institutions such as the University of the Witwatersrand, this was not possible in Zimbabwe because of the lack of adequate resources and infrastructure (Ivancheva & Swartz 2020). Furthermore, apart from COVID-19, Zimbabweans faced a myriad of political and economic challenges, worsened by natural disasters, which undermined the motivation of both students and instructors (World Bank 2020).

■ Limitations and future research

The following limitations dogged the current study: firstly, the SLR was aimed at analysing published research related to flexible work arrangements in Zimbabwe. Some published research should have been included in our

quest to distil published material addressing the theme. The sources consulted for the current analysis do not represent all published material under the flexible work arrangements theme. Secondly, there is a need for more clarity of terms within the literature around the research theme. Terms like 'flexible employment', 'flexitime' or 'flexible work schedules' are used in some contexts. This poses some challenges in doing the SLR. This conflation in terminology poses some challenges towards arriving at a unified definition. We encourage future researchers to improve on this. Thirdly, future studies are encouraged to conduct a bibliometric analysis of the identified studies against outcome variables like productivity, profitability or other such variables that measure either objective or subjective business performance. Finally, theoretical lenses for future SLRs could be widened to include theories like the Social Exchange, Flexible Firm or the Spill Over theories. These may illuminate other insights to flexible work arrangements overlooked by the border theory.

■ Conclusion

The COVID-19 pandemic has introduced new ways of organising work in Zimbabwe and across the world. However, their uptake is still limited in Zimbabwe because of poor ICT infrastructure, power cuts, the prohibitive cost of internet data and unstable internet connectivity in an already fragile economy. For businesses to survive future pandemics, there is a need to invest heavily in technology and at the national level, a national consensus regarding infrastructural development should be reached. As observed by Nyamadzawo (2011), ICT infrastructure in Zimbabwe remains compromised as the average teledensity, broadband and internet penetration and mobile access rates are below the African average. Addressing these infrastructural inequalities and improving broadband, internet penetration and mobile access rates would help in embracing digitalisation and designing policies and support mechanisms for more intense adoption.

The government should employ a raft of measures to support businesses. Firstly, it could provide funds or grants to businesses (and especially informal businesses) for emergency responses to the new demands posed by such pandemics. Secondly, government could waive customs and tax payment penalties for businesses during the pandemic as a way of capacitating them to deal with future 'new normal'. Thirdly, Zimbabwean businesses and institutions of learning should be assisted to aggressively forge alliances with network providers such as Econet, Telone and other players to offer zero-rated access to certain educational websites and then capacitate users with subsidised smart phones or personal computers and monthly data bundles, if the benefits of digitalisation are to be fully realised during future pandemics.

Reimagining South African education post-COVID-19: Shifting towards the Fourth Industrial Revolution

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■ Abstract

Background: There has been slow progress in technological advancement in most developing countries, especially in rural and township schools. The South African education system continues to reflect the legacies of the apartheid government that was based on racial marginalisation and class domination. The effects of the coronavirus disease caused by SARS-CoV-2

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virus (COVID-19) virus and regulations to control the spread of the virus have affected most schools in developing countries, especially those that are technologically backward, as the teaching and learning programme had to be moved online. Yet in South Africa, the success of the online teaching and learning project, especially under COVID-19 restrictions, is highly dependent on the unequal access to technological tools that are at the disposal of each school or university and those that can be provided from the homes of the learners or students.

Aim: This chapter seeks to explore the readiness of the South African education system to meet the demands of the Fourth Industrial Revolution (4IR) as influenced by the impact of COVID-19 restrictions on the education system. The chapter examines three key issues: the historical context of the South African education system that informs the challenges associated with migration to online teaching; the opportunities presented by COVID-19 to explore the readiness of the South African education system to meet the demands of the 4IR and ways in which technological advancement for online learning and teaching poses a risk of further fracturing the already unequal South African society.

Methods: The chapter draws primarily on an extensive reading and analysis of the *South African Schools Act (No. 84 of 1996)* and the constitutional rights and obligations of learners, educators, parents and caregivers regarding access to education. The chapter also draws on secondary data published on COVID-19 and the literature on the 4IR and implications for schooling during the COVID-19 pandemic. Both authors are educators within the South African higher education system, and their teaching experiences and reflections have contributed to the analysis of the data and conclusions drawn.

Findings: In this chapter, we argue that the detrimental effect of the pandemic, and the lockdown in particular, on the economy and people's socioeconomic conditions in general has pushed the contemporary education system to explore the possibility of aligning the teaching and learning project with the demands of the 4IR. However, the prospects of moving towards the 4IR should be considered in the context of their potential to consolidate pre-existing structural and systemic socioeconomic inequalities.

■ Introduction

This chapter explores the readiness of the South African education system to meet the demands of the Fourth Industrial Revolution (4IR) as influenced by the coronavirus disease caused by SARS-CoV-2 virus (COVID-19) lockdown. The chapter examines three key issues: the historical context of

the South African education system that informs the challenges associated with migration to online teaching, the opportunities presented by COVID-19 for exploring the readiness of the South African education system to meet the demands of the 4IR and ways in which technological advancement for online learning and teaching poses a risk of further fracturing the already unequal South African society. Drawing from our experiences of teaching in the higher education sector and the analysis of secondary data, we argue in this chapter that while the pandemic, and the lockdown in particular, has had detrimental effects on the economy and people's socioeconomic conditions in general, it has consequently pushed the contemporary education system to explore the possibility of aligning the teaching and learning project with the demands of the 4IR. However, the prospects of moving towards the 4IR should be considered in the context of their potential to consolidate pre-existing structural and systemic socioeconomic inequalities.

South Africa confirmed its first COVID-19 case on 05 March 2020. Subsequently, on 12 March the World Health Organization (WHO) classified the outbreak as a global pandemic (WHO 2020). In response, on 15 March, the President of South Africa invoked the *Disaster Management Act (No. 57 of 2002)*, declaring a national state of disaster to combat the COVID-19 outbreak (*Government Gazette* 15 March 2020). The country was set to undergo a lockdown for an initial period of 21 days, a decision informed by WHO recommendations and observations from countries like China and Italy, which were already grappling with severe impacts of the pandemic. However, because of a rapid increase in COVID-19 cases during the first two weeks of the lockdown, the South African government found it necessary to prolong this period, introducing a five-level strategy to regulate and mitigate the spread of the virus. The primary goal was to augment the capacity of the health care by curbing human mobility, thereby reducing the virus transmission, which was understood to spread via human movement (*Government Gazette* 09 April 2020).

The country-wide lockdown measures significantly impacted various economic sectors and personal lives, notably by altering daily social interactions and economic activities. Crucially, the abrupt cessation of economic operations and human movement profoundly affected the education sector, which traditionally relied on in-person teaching and learning methods (Alex 2022; Le Grange 2021). Despite considerable technological advancements in recent years, including developments in hardware and software applications (Mpungose 2020), the COVID-19 pandemic revealed that the South African education system falls short of the immediate needs posed by the 4IR. This unprecedented moment demanded the incorporation of information technology into education, advocating for modern educational approaches like e-learning and virtual classrooms. The swift shift towards online education during the

pandemic laid bare deep-seated issues within the South African educational framework, highlighting the persistent social and economic disparities.

■ Structure of the South African education system

The education system in South Africa is structured across three main tiers: the elementary phase, the secondary phase and the tertiary phase. The oversight of elementary and secondary education falls under the Department of Basic Education (DBE), with the Umalusi Council for Quality Assurance in General and Further Education and Training ensuring regulatory compliance and standards. Post-secondary education, encompassing academic studies at universities and vocational training at technical and vocational education and training (TVET) colleges, is managed by the Department of Higher Education and Training (DHET). The quality and recognition of higher education qualifications are maintained by two key bodies: the Council on Higher Education (CHE) and the South African Qualifications Authority (SAQA). Moreover, educators across all levels are mandated to register with the South African Council for Educators (SACE), which upholds a code of professional conduct among its members. The foundational principles of the South African education system are rooted in the *Constitution of the Republic of South Africa No. 108 of 1996*, reflecting the country's commitment to the right to basic education and the imperative to enhance educational quality and accessibility.

The right to basic education is enshrined in section 29(1)(a) of the South African Constitution, obligating the government to gradually realise the right to education by implementing 'reasonable measures'. This constitutional provision ensures that the right to basic education is accessible not only to citizens but also to non-citizens residing within South Africa. Furthermore, section 29(1)(b) stipulates that the state, through reasonable measures, must make further education progressively available and accessible to all individuals in the country, thereby extending the commitment to education beyond basic education to include tertiary and further educational opportunities.

■ Constitutional obligation for schooling

In South Africa, the obligation to attend school is entrenched in the constitution, specifically outlined in section 3 of the *South African Schools Act 84 of 1996*. This section mandates that learners in Grades 1 through 9, or those aged between seven and 15, must regularly attend school (*South African Schools Act 84 of 1996*). It is the constitutional duty of parents to ensure their children's school attendance. Should a parent not

comply with this requirement, either by failing to enrol their child in school or by the child's consistent absence, section 5 of the *South African Schools Act 84 of 1996* is invoked. This necessitates an investigation by the head of department, probing the reasons behind the child's absence from school and the identifying suitable interventions to address the issue *South African Schools Act 84 of 1996*. This legislative framework highlights the importance of education and the responsibility of parents and guardians to adhere to this constitutional mandate.

If a parent continually fails to follow through with any proposed solutions for ensuring their child's school attendance, the head of the department is required to issue a formal written warning, urging compliance with the subsection (1) of the *South African Schools Act 84 of 1996*. Section 6 of the same act outlines the consequences for non-compliance: (1) A parent who does not comply with the attendance requirements, despite receiving a written notice and without valid reason, commits an offence and is subject to legal penalties, which may include a fine or imprisonment for up to six months. (2) Similarly, any individual who unjustifiably hinders a learner from fulfilling the compulsory school attendance is also committing an offence, with the same potential penalties (*South African Schools Act 84 of 1996*). In addition, the *South African Schools Act 84 of 1996* mandates learners to adhere to the school's code of conduct regarding attendance, as per section 4(4) (*South African Schools Act 84 of 1996*). The responsibility to enforce this code lies with the school's governing body. According to the code, a learner's absence from school for three consecutive days without a valid excuse is considered a violation, subjecting the learner to disciplinary action. However, it is important to note that the *Constitution of the Republic of South Africa No. 108 of 1996* prioritises the best interests of the child in any legal matter that affects their rights. This principle ensures that even when there are conflicts between the rights of the child and the mandates of the state, the welfare of the child remains paramount (*Constitution of the Republic of South Africa No. 108 of 1996*).

■ Alternative model to mainstream schooling

Home schooling serves as a viable alternative to conventional schooling, recognised within the framework of the South African educational system. Section 51 of the *South African Schools Act 84 of 1996* accommodates home schooling by defining it as an educational programme primarily conducted in the child's home environment, offering an alternative to enrolment in public or independent schools *South African Schools Act 84 of 1996*. This educational approach is regulated by specific registration requirements outlined in the Act. Parents opting for home education are therefore tasked with the responsibility of providing education and also adhering to administrative requirements set by the Act. They must formally

register their child for home education with the head of the provincial Department of Basic Education (*South African Schools Act 84 of 1996*). Additionally, parents are obligated to maintain comprehensive records of the child's attendance and academic progress. This includes keeping a portfolio of the learner's work and conducting continuous assessments or end-of-year examinations, with particular attention to the results at pivotal grades such as 3, 6 and 9 (*South African Schools Act 84 of 1996*). Importantly, the Act mandates that the quality of home education should not fall short of the standards upheld in the compulsory phases of schooling (Grades 1–9), ensuring that children receiving home education are afforded a quality of learning that is comparable to that of their peers in traditional school settings (*South African Schools Act 84 of 1996*). This provision suggests a commitment to maintaining educational standards across different modes of learning, ensuring all children receive standardised education, and therefore presents challenges for equal access to education during the COVID-19 pandemic.

While the constitutional mandates might appear routine and methodical, their real-world impact and significance were put to the test by the COVID-19 pandemic and the resulting lockdown measures. This situation has unveiled longstanding inequalities that were previously masked by the notion of choice. Following the prolongation of the initial lockdown in South Africa, numerous private and home-schooling setups quickly transitioned to online platforms, thereby ensuring the continuity of their educational programmes during the global crisis (Dlamini, Maharaj & Dunn 2021). Crucially, the option for private or home education is deeply intertwined with socioeconomic status, aligning individuals and families within specific social strata based on their financial capability to afford such education. As private institutions persisted with their curriculum, the public education sector found itself entangled in a contentious dispute that led to the closure of public schools from March to June 2020 (Dlamini et al. 2021). Although these insights pertain primarily to basic education, they also influence the perception and experience of tertiary education.

The difference between contact and distance learning has been a subject of debate for the past decade. Learner attendance has been observed by several researchers and policy advocates as an essential advantage for learner performance at all levels of teaching and learning (Chen & Lin 2008; Durden & Ellis 1995; Romer 1993). In South Africa, traditional in-person attendance has been highly regarded as the predominant and most effective approach, with home schooling positioned as a secondary option. Proponents of contact learning argue that being physically present in the classroom increases the learners' chances of performing well academically.

Evidence supporting this perspective includes findings from multiple studies, such as those by Romer (1993), Durden and Ellis (1995) and Chen and Lin (2008), which demonstrate a clear correlation between high lecture attendance rates and improved student success. Further research, including works by Chansarkar and Michaeloudis (2001) and Moore, Armstrong and Pearson (2008), reinforces the idea that there is a positive and statistically significant link between attending lectures and achieving higher academic outcomes. These studies collectively suggest that the interaction, engagement and immediacy provided by contact learning environments contribute significantly to the academic achievements of learners.

While these debates are not new, the COVID-19 pandemic brought these discussions into sharper focus as it necessitated a sudden shift from traditional teaching methods to online alternatives (Mutlokwa 2022), prompting even those who previously championed in-person learning to adapt to virtual platforms. However, given the historical context of the higher education system, the debate goes beyond arguments on the effectiveness of contact teaching and learning. This transition did not only address immediate educational continuity but also prompted a re-evaluation of the South African higher education system within its historical context. The pandemic forced the South African higher education system to interrogate the legacies of its historical past on how it impacts on the current virtual learning system, particularly in the context of preparing for the demands of the 4IR (Chisango & Marongwe 2021). This critical examination is essential for understanding and navigating the future of higher education amidst ongoing technological advancements.

■ Historical context of the South African education system

In South Africa during the apartheid era, the education system was structured along racial lines. Menon and Castrillón (2019) show how the apartheid higher education qualifications were modelled in ways that met certain racial prescriptions imposed by the apartheid government. For instance, the University of Cape Town (UCT) and the University of the Witwatersrand (Wits) were reserved to service white students only; the University of the Western Cape was for coloured students, while the University of Fort Hare was for black African students (Menon & Castrillón 2019). The curricula were also racially structured to provide students with different skills and training. Menon and Castrillón (2019) note that since 1994, there have been several structural and systemic changes to the higher education system aimed at broadening the political agenda and addressing structural injustices of the past.

While institutions historically dominated by white demographics assert their progress in diversifying student bodies, enduring systemic barriers perpetuate racial disparities. The high cost of tuition essentially ensures access to higher education primarily for economically privileged white students and a minority of middle-class black students, leaving the majority of black students marginalised (Yende 2021). This reality contradicts the ideal of a unified, multicultural 'rainbow nation'. Additionally, the composition of academic staff, including both international and South African members, remains predominantly white, and the academic content is largely Eurocentric (Ndlovu 2018). This discrepancy leads to cultural dissonance. The widespread reluctance among academic staff to integrate Afrocentric approaches to knowledge creation in terms of ontology and epistemology further exacerbates the educational challenges faced by black students from underprivileged communities.

■ Recent developments in the South African education system

In recent years, South Africa has witnessed a student-led movement, arguably unprecedented since the 1976 Soweto uprising. The #FeesMustFall campaign emerged in 2015 and spilled over into 2016, centred on demands for free, quality education and the need for transformation and decolonisation within higher education institutions (HEIs) (Ndlovu 2017). This movement encompassed all public universities and was notable for the solidarity between students and university staff who were previously outsourced. The heart of this activism was a direct challenge to the shortcomings of the democratic transition and the questioning of the 'rainbow nation' narrative that had been promoted in South Africa since post-1994 (Ndlovu 2017).

The #FeesMustFall movement was sparked by a critical interrogation of democracy and the demystification of the 'rainbow nation' – as a myth, rather than a reality. Many historically white institutions, such as Wits and UCT, have claimed significant strides in diversifying their student bodies by admitting more black students (Ndlovu 2018). However, the situation on the ground paints a different picture. These institutions rank as some of the most expensive in South Africa and are criticised for perpetuating cultural and epistemological biases (Langa et al. 2017). Despite an increase in the enrolment of black students, these HEIs still systematically marginalise students from economically disadvantaged backgrounds, excluding them on the basis of social, geographical, cultural and economic factors.

The movement emerged to challenge systemic exclusion and advocate for equitable access to free, high-quality education, along with the

transformation and decolonisation of academia and university life. Notably, historically black institutions like the University of Fort Hare (a popular alma mater for many African liberation icons) have been engaged in this fight for the longest time post-1994 (Ndlovu 2017). Yet, it was the media's glorification of predominantly white universities in South Africa that thrust this battle into the global limelight, inaccurately suggesting that the movement originated at Wits (eds. Chinguno et al. 2017). Crucially, the #FeesMustFall movement followed closely on the #RhodesMustFall campaign at UCT, which had already spotlighted the need for curriculum transformation and the decolonisation of the higher education sector (eds. Chinguno et al. 2017). These movements, deeply entwined with the decolonisation agenda, critiqued the global trend towards the commercialisation and marketisation of higher education, arguing that it undermined true ontological and epistemological progress.

■ The Fourth Industrial Revolution and the higher education system

The concept of the Fourth Industrial Revolution (4IR) originates from Klaus Schwab, who is both a founder and the Executive Chairman of the World Economic Forum, as well as the author of a book entitled *The Fourth Industrial Revolution* (Schwab 2016). The essence of the 4IR lies in a transformative adjustment to how individuals live, work and interact both among themselves and globally (Xu, David & Kim 2018). It is envisioned as a forward-looking framework for numerous countries engaged with advanced technologies like artificial intelligence (AI) and robotics. However, the 4IR's approach is holistic, not merely focusing on these technologies in isolation but promoting their integration into the fabric of our physical and biological realms. What sets the 4IR apart from its predecessors are its unprecedented pace, scope, complexity and capacity for transformation. The advent of the 4IR, with its rapid and extensive changes, has brought to light significant challenges for South Africa, particularly in the realms of government, industry and education.

The momentum of the 4IR is largely driven by four key technological advancements: high-speed mobile internet, AI and automation, big data analytics and cloud computing. The swift and expansive changes brought by these technologies have exerted considerable pressure on various sectors worldwide, including the South African government, economy and educational system, challenging them to keep pace with the evolving technological landscape (Oke & Fernandes 2020). Despite this urgency, numerous educational experts have highlighted the South African education system's sluggish response to these technological shifts. There has been a notable absence of emphasis on technology within the education sector.

The 2021 ICT Skills Survey further highlights this issue, identifying a 'chronic shortage' of essential digital skills and competencies needed to thrive in the digital economy within South Africa (Schofield & Dwolatzky 2021).

In 2018, the DHET revealed a concerning trend: a minimal focus on technology across both public and private HEIs, as well as among students in post-school programmes, especially in fields like science, engineering and technology. According to the data, less than 30% of all student enrolments were in technology-related programmes. This issue was even more pronounced at TVET colleges, where merely 5% of students were registered in information technology and computer science courses (DHET 2018). This lack of emphasis on technological education posed significant challenges, particularly as HEIs transitioned to online modes of teaching and learning. Moreover, this gap could hinder the ability of students and the broader educational system to meet the forthcoming demands of a technologically driven global landscape.

It is worth noting that prior to the challenges presented by the COVID-19 pandemic, efforts to enhance technological education in South Africa were already underway. Menon and Castrillón (2019, pp. 6-7) highlighted the government's proactive measures in addressing technological advancements, echoing Klaus Schwab's (2016) observation that HEIs were starting to adapt to the rapid pace of change to what he characterised as a revolution happening 'at an exponential rather than a linear pace'. In a significant move to embed technology more deeply into the educational fabric, the Minister of Basic Education announced in 2019 the inclusion of coding and robotics in the curriculum for learners from Grade R to Grade 9 (DBE n.d.). This initiative reflects a strategic approach to equip younger generations with foundational skills in technology, preparing them for a future where digital literacy is indispensable.

Among other strategic innovations, the integration of liberal arts with STEM (science, technology, engineering and mathematics) programmes marks a strategic innovation in education, recognising the value of a holistic skill set that combines technical expertise with critical thinking, creativity and communication skills (DHET 2018). This approach, along with adapting to the digital transformation of libraries, understanding global youth mobility trends and developing lifelong learning initiatives, forms part of a broader strategy to prepare populations for evolving labour market demands. Gleason (2018) highlights case studies from China, Singapore, South Africa and Costa Rica, offering insights into how these nations are gearing up for significant shifts in employment sectors and skills requirements.

These efforts suggest a collaborative model where government, industry and educational institutions work together to stay ahead in a rapidly

changing technological landscape. Notably, Gleason (2018) emphasises the importance of such collaborations in navigating the challenges and opportunities presented by technological advancements in education. The involvement of major technology companies like Google in developing learning platforms, coupled with commitments from leading academic institutions in South Africa to contribute to teacher training, exemplifies the kind of partnership that could drive successful adaptation to the demands of the 4IR. While the outcome of these initiatives is yet to be fully realised, the focus on enriching basic education with vital ICT skills is a critical step towards equipping the South African workforce to thrive in the global digital economy.

The COVID-19 pandemic has put enormous pressure on the higher education system to accelerate the move towards 4IR demands. However, this shift has been challenging at many levels. Initially, the South African higher education system, like the basic education system, remains highly unequal. The legacies of apartheid continue to affect the distribution of certain privileges and disadvantages (Chisango & Marongwe 2021). During apartheid rule, South African universities were divided along racial lines. The previously white and Afrikaans universities continue to enjoy the same kind of privilege they enjoyed during apartheid despite the changing demographics at their institutions, while previously black universities continue to face many challenges despite transformation and the changing democratic dispensation (Muswede 2017). The migration to online teaching and learning has therefore been characterised by similar privileges and challenges.

The traditional distance/online (virtual) model of education is offered by various academic and mostly private institutions. The University of South Africa (Unisa) is the largest public institution offering online learning. It might thus have been expected that Unisa would have been fully prepared for the 'new normal' at the outbreak of COVID-19 and the lockdown regulations that forced HEIs to reconsider face-to-face learning. However, it is important to note that while Unisa specialises in online learning it is also heavily reliant on contact venues for examinations. The COVID-19 regulations saw Unisa struggling to initiate online examinations and students complaining about network traffic jams while downloading and uploading examination material (Obadire, Mashau & Misumi 2020). This shows that while some South African institutions have been investing in technological development, they are not fully prepared to meet the demands of the 4IR as exposed by the effects of COVID-19.

Furthermore, like many other HEIs across the country, Unisa was affected by the socioeconomic conditions of students. As the largest online institution in South Africa, Unisa does not rely solely on online technologies

for the distribution and dissemination of teaching material (Obadire et al. 2020). The institution has relied on both online and physical printed material that is delivered by couriers and post office services to different parts of the country. During lockdown, with restrictions on the rapid movement of people and reduction in the transmission of physical material, there was also limited circulation of study material. This disproportionately affected students from rural areas with limited access to electricity and internet connectivity and those from townships who could not afford laptops and data.

Mhlanga and Moloi (2020) describe the collaborative efforts between the Departments of Communications and Digital Technologies and Basic Education in South Africa to support online learning amidst the national lockdown period. This initiative received backing from the Minister of Higher Education, sparking widespread debate on social media, notably under hashtags like #SaveTheAcademicYear and #SaveLives. The push to continue the academic calendar, despite the circumstances, highlighted immediate hurdles such as the need for laptops and internet access. Yet, the broader challenges faced by students in rural or disadvantaged areas (Yende 2021), grappling with the impacts of the pandemic on their daily lives and the additional burden of transitioning to online education, remain largely overlooked.

Universities that were historically more privileged, such as Wits, UCT, Stellenbosch University and the University of Pretoria, swiftly transitioned to online education when traditional in-person classes were halted. This shift occurred despite numerous students voicing concerns about their inability to adapt to an online learning model (Wagner et al. 2024). In response, these institutions collaborated with telecommunications service providers to ensure students had the necessary data and provided laptops to those lacking the means to participate in remote learning (Wagner et al. 2024). Conversely, TVET colleges and historically black universities faced delays, dependent on a government initiative for the distribution of laptops, particularly targeting NSFAS-funded students from less affluent backgrounds (Mabunda 2023). While these measures aimed to minimise educational disruptions, they inadvertently risked widening the educational divide, not only between universities with greater autonomy and those under direct DHET oversight, such as TVET colleges, but also within the student population itself (Mabunda 2023). As the authors of this chapter, we noted how our return to work differed from institutions such as Wits, which swiftly moved the remainder of the academic year online during the COVID-19 lockdown period, while Buffalo City College along with other TVET colleges continued to wait for command instructions from the Minister of Higher Education.

■ A shift towards 4IR?

In this chapter, we argue that preparedness to meet the demands of the 4IR is an urgent need for the South African education system. Nothing has exposed this urgent need as much as the effects of the COVID-19 pandemic lockdown regulations. However, we argue that the broader socioeconomic conditions in South Africa remain a setback in rolling out the technological infrastructure required to facilitate a smooth shift towards the 4IR. We argue that if the 4IR technologies are rolled out in the context of the current socioeconomic inequalities, especially in the education system, these are poised to create further fractures in South African communities where the advantaged continue to benefit, while the disadvantaged remain excluded from participation in the broader economy. Advantaged universities will continue to attract learners from privileged communities, while the previously disadvantaged universities and TVET colleges continue to enrol students from disadvantaged backgrounds and furthermore fail to equip them for the changing world order.

Mhlanga and Moloi (2020, p. 1) note that the South African educational system's adaptation to COVID-19 reveals certain areas of excellence that could potentially usher the sector into the 4IR, thereby enhancing accessibility. Yet, as argued throughout this chapter, the integration of technological advancements must also be critically examined for their potential to deepen socioeconomic disparities. Consequently, there is a need to pay attention to how the economic divisions can be exacerbated by the economic divisions within the higher education system. Furthermore, if the higher education system is to meet the demands of the 4IR, it must respond to the changing global order by effecting radical curriculum transformation that will meet the demands of the 21st century. The call for decolonisation by the #FeesMustFall student movement has raised important questions around ways in which the South African education system has remained untransformed in a changing world order. Menon and Castrillón (2019, p. 6) discuss the transformation within South African higher education since 1994, emphasising the need for innovative curricula and teaching methods suited to diverse environments, moving beyond a narrow focus on skills. They suggest a creative overhaul of the curriculum to meet students' present and future needs, which has important implications for the distinct curricula across universities and TVET colleges.

■ Conclusion

The effects of the coronavirus demand a complete revision of the contemporary attendance policy in South Africa. This outbreak has also exposed the fragility of the South African education system, which is based

on conventional methods of teaching and learning and requires the physical attendance of learners in the teaching space. In this system, educators are required to conduct teaching and learning in a classroom filled with learners. At colleges, the learner attendance policy is monitored through a class register on which an educator is expected to mark learners absent or present. While attendance is not generally strictly monitored at universities, students are strongly encouraged to attend. At some universities, there are incentives for regular attendees through class presentations and participation marks.

Most importantly, the 2020 academic year presented an alarming historical test or trial to the South African education system. Countrywide lockdown meant that students and learners were unable to physically attend classes. The extension of the lockdown period and uncertainty over alternatives means of controlling the spread of the virus forced universities and colleges to reimagine the academic programme and think of innovative ways that would allow the academic project to continue. This meant that universities and colleges had to move towards online and e-learning models, which are still underdeveloped in many institutions.

A note on ethics: this study is based on secondary data sources and the personal experiences of the authors. While every effort has been made to ensure the accuracy and reliability of the information, the findings and conclusions drawn from these sources are subject to the inherent limitations and potential biases of secondary analysis and personal reflections. Readers are encouraged to consider these factors when interpreting the study's outcomes and implications.

Teaching and research in the central African subregion post-COVID-19

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■ Abstract

Background: The coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic took the world by storm and developing countries with poor infrastructure were badly affected, especially universities and research institutions. They had to adjust fast, with some shutting down completely while others continued timidly as they tried to work out how to address the situation. The transition to online education was problematic

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because of socioeconomic and technological factors. This chapter reviews what transpired and how universities and research institutions prepared to embrace the 'new normal'.

Aim: The aim of this chapter is to review the challenges of the COVID-19 pandemic for the universities and research communities in the Central African sub-region and document their resilience in moving forward into the post-COVID era.

Methods: A narrative inquiry method was used in the study and consisted of personal accounts and literature reviews complemented by document analysis.

Findings: Universities and research institutions in the Central African sub-region were caught off guard by the magnitude of the COVID-19 pandemic and were responding on the go, as necessary while the situation evolved. The institutions were not ready to switch to online or distance modes of education or work because of poor information infrastructure. While faculty members struggled, students struggled even more as their poor socioeconomic status meant that they were unable to afford the necessary technological gadgets required for distance education, talk less of the high cost of internet access and low bandwidth.

Implications: The wave of the future precipitated by the pandemic calls for synergistic collaboration between the various actors at university and research institutions and in the external community, in using technology in the service of research, scholarship and institutional and community engagement. This involves substantial capital investment in the information infrastructure.

Conclusion: Building back better information infrastructure as well as a sustainable emergency management plan to enhance teaching, learning and research is an essential reform necessary to avert future disruptions as exemplified by the COVID-19 pandemic.

■ Introduction

The coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic caught universities and research centres globally, especially those in the Central African subregion off guard and caused pandemonium across board, as institutions scrambled in search of solutions while the crisis deepened, learning about its mode of transmission and putting preventive measures in place on the fly. This unprecedented disruption resulted in some restrictions in the normal functioning of academia, with major disruptions in teaching, learning, research, library services, collections development and general knowledge management. The pandemic has

thus exposed how unprepared the world is in general, and the Central African subregion in particular, in managing disasters of such magnitude, both natural and man-made.

The COVID-19 health pandemic can also be considered an information crisis or 'infodemic', as access to credible information remains an integral part of the solution. As university faculty needs information to facilitate teaching and research, students also need access to information resources for learning. Medical researchers in turn need information to make progress towards finding a cure, while medical doctors and health care workers need urgent access to credible information for timely diagnosis of patients. Public health workers need information to sensitise populations in both rural and urban areas to stay safe and well, while policymakers need critical information to formulate broad-based policies that impact the socioeconomic, cultural and educational well-being of their countries and regions. Information therefore remains a critical and universal component of the infrastructure for pandemic solutions.

On 31 December 2019, with the COVID-19 situation in China worsening and the imminent shutting down of the city of Wuhan, the World Health Organization (WHO 2020) announced a Chinese call for a lockdown in Wuhan, which was followed in quick succession by other countries around the world. Sub-Saharan Africa followed the example without due consideration for local realities or a safety net for the populations where over 60% live a hand-to-mouth existence. Universities and research centres as well as civil services followed suit without knowing how long this uncertainty would last. Implementing such measures on the fly in nations without a social safety net nor a comprehensive disaster management plan meant reimagining teaching, learning and working spaces in laboratories and classrooms and lectures and tutorials going online without supporting infrastructure and other crude measures. Babbar and Gupta (2022) portray a chaotic inter-country response by educational institutions globally, while international scholarly organisations like the International Federation of Library Associations and Institutions (IFLA) and the American Library Association's International Relations Round Table (ALA-IRRT) published studies such as Nadi-Ravandi and Batooli (2023) and International Leeds special volume on Libraries around the world (ALA-IRRT 2021), respectively. The above analysis is in agreement with Radecki and Schonfeld (2020) who posit that the COVID-19 pandemic has had a huge financial impact on universities and related research institutions, disrupting research and scholarly communications as well as disastrous human impact on job security, local and international students and scholars while accentuating gender disparities in production as the few females had to add home and care giver functions to their usual routines, especially working from home during the lockdown.

This chapter explores the challenges of teaching and research in the Central African sub-region in the post-COVID-19 era through the prism of information infrastructure, research management, research commercialisation and technology transfer. It looks at the state of research, teaching and learning in the pre-COVID-19 era and the measures that were implemented with shifting targets as the situation deteriorated. This situation has implications for scholarly output and for the future of research, teaching and the broader educational enterprise in the subregion.

■ Context

The Central African subregion comprises the following countries of the Central African Economic and Monetary Community (CEMAC) economic zone: Cameroon, Central African Republic, Chad, Republic of the Congo, Equatorial Guinea and Gabon. Central African Economic and Monetary Community aims to promote economic integration among countries that share a common colonial heritage linked to France and its policy of assimilation (Njoh 2000, pp. 161–162), as well as a common currency, the Central Africa franc (CFA). The exception in this group is Equatorial Guinea, which has a Spanish colonial history and is Spanish speaking, and to a lesser extent Cameroon, which is a majority French-speaking state with a politically vibrant English-speaking minority.

According to the UN Office of the Special Adviser on Africa, in the Central African subregion similar to the rest of the continent, almost 60% of the population is under the age of 25, making Africa the world's youngest continent with a projected median age of 19.8 in 2021. The implication is that the educational infrastructure at elementary, secondary and tertiary levels needs to be adequate and growing to cater for the requirements of the teeming youthful population. Unfortunately, that has not been the case, as can be seen in Table 12.1. There was no data for the Republic of the Congo, since the schools in that country were partially open unlike the rest of the region, which was on full lockdown.

Table 12.1 shows that despite improved access to primary or elementary education, there is a declining trend in moving to secondary education and an even sharper decline in the numbers continuing to tertiary education, especially for females. The reasons for the gender imbalance at tertiary level can be attributed to economic and sociocultural values that place a premium on further education for young males in the hope that they might become the breadwinner of the family, while encouraging or even coercing young females into early marriages or becoming stay-at-home mothers, raising children at the expense of their educational dreams (Isike 2016; Kansayisa et al. 2018; Shabaya & Konadu-Agyemang 2004). Apart from the

TABLE 12.1: School enrolments by level of education and gender.

Country	School type	Females	Males	Total	School age Pop (2023)
Cameroon	Pre-primary	258,035	257,879	515,914	1,594,513
	Primary	1,975,531	2,226,475	4,201,988	4,419, 733
	Secondary	4,804,054	5,510,738	10,314,796	4,380,972
	Tertiary	608,519	904,852	1,513,371	2,318,544
Chad	Pre-primary	6,735	7,379	14,114	1,690,058
	Primary	959,692	1,253,531	2,213,223	431,937
	Secondary	167,333	367,771	535,112	2,971,914
	Tertiary	9,354	12,467	41,821	
Central African Republic	Pre-primary	6,337	6,152	12,489	431,937
	Primary	354,910	458,857	813,767	431,937
	Secondary	55,317	82,527	137,844	894,458
	Tertiary	3,369	9,153	12,522	416,333
Republic of the Congo	N/A	N/A	N/A	N/A	N/A
Gabon	Pre-primary	22,809	22,416	45,225	188,577
	Primary	155,238	162,708	317,946	279,268
	Secondary	51,543	53,648	105,191	309,581
	Tertiary	3,662	64,14	10,076	179,211
Democratic Republic of the Congo (DRC)	Pre-primary	173,713	164,945	338,658	9,185,818
	Primary	6,807,874	6,955,322	13,763,196	2,977,694
	Secondary	1,792,174	2,826,721	4,618,895	13,034,615
	Tertiary	166,032	298,646	646,678	8,061,434
Equatorial Guinea	Pre-primary	19,707	19,889	39,596	113,113
	Primary	45,855	47,541	93,396	197,188
	Secondary	10,654	14,890	25,554	161,782
	Tertiary	304	699	1,003	100,935

Source: Extracted from UNESCO (2020 and ISCED 2024).

socioeconomic and cultural factors that hamper the mobility of females towards furthering their education, another factor is the lack of adequate funding for research and infrastructural development relative to the increase in the youthful population wishing to enter the tertiary education system. Not only are there limited spaces for entry into state-run universities, but there is also a lack of enough teaching venues and research facilities, as well as high ratios of students to academic staff. Most significantly, there is a lack of public-private partnerships to add value to the training by providing needs-based assessment to guide the emphasis of training towards addressing the requirements of industry and the private sector while developing critical thinking and problem-solving skills.

Research output and the quality of training are a function of the financial investments made to attain the stated goals. Private for-profit funding would be minimal or limited for research and university education, which require heavy capital investment with slow return on investment. The onus

therefore lies with governments to undertake national capital investment into research and development (R&D). Unfortunately, this has not been the case in the Central African subregion or the African continent as a whole. According to the recommendations of the African Union (AU), member countries should be spending at least 1% of their gross domestic product (GDP) on R&D by 2020, but this has not happened in any of the countries in the Central African region because R&D is not high on the list of spending priorities, unlike defence and diplomacy, and this is reflected in the poor quality of research output and training. This means that universities in the sub-region will rank low on university research rankings on the African continent as well as globally. According to the SCImago scientific journal rankings, which are part of the global assessment toolkit for evaluating countries based on journal article publications and other scientific indicators, countries in the subregion ranked very low in 2020 in terms of the output of published journal articles (Table 12.2).

The figures in Table 12.2 are incomplete based on a review of Google Scholar articles and may exclude articles published behind paywalls. However, it should be noted that most of the countries in the Central African subregion are predominantly French-speaking, with Equatorial Guinea being Spanish and few scientists, especially the younger generation, publish in English. English is generally considered to be the language of the scientific community, with a predominance of scholarship in the northern hemisphere. Historical, political and economic factors have favoured English as the language of science over other languages such as Chinese, French, German, Spanish or Russian (Kirchik, Gingras & Larivière 2012; Tardy 2004). The numbers shown in Table 12.2 might have been higher if databases in French, from francophone sources, were consulted. If scholars publishing in a language other than English were to include abstracts in English, this could facilitate indexing and improve the visibility of their papers. The proliferation of translation services might lead to greater visibility, higher metric counts and improved potential usage. Countries in the Central African subregion therefore need to be deliberate and strategic in their efforts to increase funding for R&D as well as choosing scholarly communication outlets for their research outputs to ensure global visibility.

TABLE 12.2: Ranking of countries in the Central African subregion according to published journal articles.

Country	Total documents published	Global rankings	African rankings
Cameroon	25,999	90	12
Republic of the Congo	6,727	121	23
Rwanda	6,603	124	24
Gabon	3,772	137	30
Equatorial Guinea	305	202	53

Source: Scopus data of April 2023.

■ Discussion

The period that preceded the COVID-19 pandemic was characterised by an open-house style of teaching, learning and research, with large class sizes especially in amphitheatres, lecturing for hours and sometimes dictating notes to students and teaching assistants involved in smaller tutorial sessions especially for undergraduates. Graduate classes were much smaller, and some had the use of technology such as projectors for PowerPoint display and YouTube videos or other freely available Creative Commons videos of relevance to the courses being taught. Classes began as early as 07:00 and continued until as late as 20:00 because of challenges of inadequate space in classrooms or lecture halls to accommodate the expanding university populations. It is also interesting to note the huge drop in the total population seeking a place at tertiary education institutions, partly because of government policies limiting intake into the few available state universities that are cheaper than the more expensive private institutions. Governments utilised schemes such as imposing age limits and minimum qualifying grades as well as limiting the number of places available, especially in more professional courses in the fields of science, technology, engineering and mathematics.

For those employed at research institutions, the usual routine involved coming to work in an office, meetings in open spaces in close proximity, working with colleagues and students in laboratories, as well as working in external open-air experimental research spaces or greenhouses, alone or in research groups. In agricultural research, for example, where research is based on seasonal crops, open-air experimentation could take place during the growing season, and greenhouses could be used in the off season. During the COVID-19 pandemic, research institutes have had to reinvent their working models to take into consideration meeting modalities (Zoom, WhatsApp or Microsoft Teams), laboratory space adjustment as well as fieldwork engagements. This has also been a time of paradigm shifts in university teaching and learning. Issues of space and access to information resources for research need to be altogether reconfigured.

The onset of the COVID-19 pandemic has altered every aspect of the educational landscape and experience, challenging the very nature and structure of the fragile educational system in the Central African subregion and reshaping the expectations of students. These challenges can be grouped into three broad categories:

1. Information infrastructure and the role of information professionals in the provision and dissemination of credible information.
2. Research infrastructure for maximising resource sharing and collaboration.

3. Research management, which includes research commercialisation and technology transfer.

Information infrastructure refers to the complex set of institutions and ideologies, including human and material resources essential to the generation and dissemination of scholarly information, as well as physical entities put in place primarily for information purposes, which require continuous upgrading for technologically intensive appliances and applications.

Rogers (2003) proposed the diffusion of innovations theory as one of the oldest social science theories, with its origins in communication, to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a population or social system. Universities and research institutions are in the business of ideation, or knowledge creation, management, spread and innovation and should therefore be considered innovators or early adopters of technology, but adoption has been slow in Africa, especially in the Central African subregion. African institutions opted for a slow and steady approach to internet-based technologies for teaching and learning but had to learn to operate these technologies at full capacity because of government-imposed lockdowns. Online learning thus became the primary method of instruction, even though institutions were not prepared for this. Apart from institutional unpreparedness, academics, staff and students were taken by surprise and needed more time to consider what technology to adopt, especially as there were no tailored or unified learning management systems (LMSs). Van der Merwe, Serote and Maloma (2023) highlight the challenges faced in the e-learning implementation in sub-Saharan Africa as being mainly ICT infrastructure, poor internet network and technical support and poor bandwidth. Furthermore, there was no specific LMS that was recommended for use other than what students could readily afford, depending on the technology availability and ease of access. Asynchronous technologies that were prominently used included (in no particular order): email, chat (Flock, WhatsApp, Google Hangouts) and document/file transfer (Google Drive, Dropbox, LinkedIn, SlideShare, Figshare, etc.), while synchronous technologies included Zoom, Skype, Google Meet and Microsoft Teams.

Despite this, broadband access remains a barrier to remote learning because of poor connectivity. Cost is an additional burden as very few students can afford to pay for internet access. Other challenges include the more critical aspect of access to the required devices (smartphone, laptop, radio or television), as well as basic computer literacy and soft skills. The pandemic has therefore shown how the information infrastructure is highly inadequate to ensure smooth transition from synchronous to asynchronous learning or even a hybrid model. Another area of concern is the impact of

distance education for people with visual impairments; apart from the social exclusion created by such an impairment, there is the bigger problem of configuring technology through accessibility settings so that it is receptive to their peculiar needs (Liakou & Manousou 2020).

Libraries provide resources to facilitate teaching, learning and research. Before the pandemic, libraries not only provided knowledge but also served a social support function and operated as a hub, but access to libraries was restricted during the COVID-19 lockdown. Unfortunately, virtual services are not commonly available because of the lack of the required infrastructure, yet global trends point to a move towards online or distance education because of the following advantages suggested by Stern, Powell and Frensley (2022):

- *Convenience*: 24/7 access from any online computer; accommodates busy schedules; no commuting, no searching for parking.
- *Enhanced learning*: Research shows increased depth of understanding and retention of course content; more meaningful discussions; emphasis on writing skills, technology skills and life skills such as time management, independence and self-discipline.
- *Levelling of the playing field*: Students can take more time to think and reflect before communicating; shy students tend to thrive online; anonymity of the online environment.
- *Interaction*: Increased student-to-teacher and student-to-student interaction and discussion; a more student-centred learning environment; less passive listening and more active learning; a greater sense of connectedness and synergy.
- *Innovative teaching*: Student-centred approaches; increased variety and creativity of learning activities; addressing different learning styles; changes and improvements can translate to physically taught courses as well.
- *Improved administration*: Time to examine student work more thoroughly; ability to document and record online interactions; ability to manage grading online.
- *Savings*: Accommodate more students; increased student satisfaction, resulting in higher retention and fewer repeats or dropouts.
- *Maximising physical resources*: Lessening the demand for limited campus infrastructure and thus decreasing congestion on campus and in parking lots.
- *Outreach*: Giving students options; reaching new student markets; appealing to current students and thereby increasing enrolments.

A robust library system is needed to support the emerging online/distance educational niche, and this calls for fundamental restructuring of the current academic and research library infrastructure across the subregion. Academic and research libraries and information centres would need a

regular online presence through dynamic and interactive websites that provide a comprehensive entry point for the information and research needs of research and teaching faculty, students, staff and community users. Library websites should also be configured to facilitate use by people with diverse abilities, disabilities or challenges, especially as regards accessibility, but this is unfortunately not usually the case. Other challenges documented by Ifijeh and Yusuf (2020), Tammaro (2020) and Coetzee et al. (2021) include the need for Continuous Educational (CE) training for professional librarians who will be required to play a more blended role in future. Bell and Shank (2004) define a blended librarian:

[A]s an academic librarian who combines the traditional skill set of librarianship with the information technologist's hardware/software skills, and the instructional or educational designer's ability to apply technology appropriately in the teaching-learning process. (p.4)

The role of blended librarians has become increasingly relevant in the post-pandemic era in which technology has been incorporated into higher education on a large scale and appears likely to stay in the long term. Higher education institutions also have to adapt rapidly. Bell and Shank (2004) further elaborated on the principles of blended librarianship whose application cuts across academic and research institutions; the following core tenets of this approach could be termed the 'blended librarian's manifesto':

1. Taking leadership positions as campus innovators and change agents is critical to the success of delivering library services in today's 'information society'.
2. Committing to developing campus-wide information literacy initiatives on campuses is necessary in order to facilitate ongoing involvement in the teaching and learning process.
3. Designing instructional and educational programmes and classes to assist patrons in using library services and learning information literacy is absolutely essential to gaining the necessary skills of the trade and knowledge of the profession for lifelong success.
4. Collaborating and engaging in dialogue with instructional technologists and designers is vital to the development of the programmes, services and resources needed to facilitate the instructional mission of academic libraries.
5. Implementing adaptive, creative, proactive and innovative change in library instruction can be enhanced by communicating and collaborating with newly created instructional technology/design librarians and existing instructional designers and technologists.
6. Transforming the relationship with academics requires concerted efforts to assist in integrating technology and library resources into courses in

a hybrid or blended model. Librarians must also add to their traditional role a new capacity for collaboration to improve student learning and outcome assessment in the areas of information access, retrieval and integration.

It is imperative that the universities and research authorities in the sub-region undertake major investment in academic libraries and information centres in order to acquire the necessary technology to facilitate access to current textbooks, media, research artefacts, databases and essential resources needed for research. If possible, investments should be made in sustainable database acquisitions, and there should be negotiations with providers and donor agencies such as the WHO and the Food and Agriculture Organization (FAO) of the United Nations system. Professional librarians and subject specialists need to be trained in public outreach and encouraged to embrace the role of embedded librarians working on outreach and engagement with faculty, graduate students and research groups. It is of paramount importance that administrators recognise the role that librarians play in institutions and in the broader scholarly communications sphere (Quinn & Awasom 2020).

With the costs of serials spiralling out of control, it is important for libraries within the subregion to consider working together to form a consortium so as to be able to take part in collective bargaining with vendors and publishing houses. With the potential projected increases in student enrolments, it is important to consider open access resources, open educational resources (OERs), e-books and e-journals, as well as developing local or consortia-run digital libraries or repositories. Not only would this save space to be used for other educational and instructional activities in the 'library as a place' concept, but it would also minimise the 'shackled to the library and print collection' mentality (Wolfe, Naylor & Drueke 2010), since e-resources provide access via the internet anytime and anywhere, as the COVID-19 pandemic has revealed the limits to the presence of librarians in physical libraries. With the advancement of technology, there have been developments in areas such as digital scholarship, e-science and the digital humanities, and the various open access initiatives have grown in recognition and importance.

Decreased funding to libraries amidst the rising cost of serials and databases has led to legal confrontations between publishing giants such as Elsevier and education consortiums and universities in France, Germany and the USA. In the last two decades, countries in sub-Saharan Africa have experienced a steady decline in library funding allocations and therefore very few scholarly subscriptions. It might be expected that scholars would embrace open access and OERs. However, that is not necessarily the case;

not only do they sometimes fall prey to unscrupulous predatory journals, but articles published in open access journals may be held in low regard compared to articles published in mainstream journals with a high impact factor. Textbooks prices have also risen and become out of reach for many students; hence, they depend on the library for the few copies that they are able to purchase. When students are fortunate to lay their hands on a copy, they often photocopy the entire book, oblivious of copyright rules and regulations. These are issues of ethical concern that librarians need to take cognisance of and work to address.

The challenges could be mitigated through collaboration between the office of the rector in charge of research and the university library in order to establish a library publishing initiative to oversee OER ventures as part of a digital libraries' initiative. To make this a reality, there is a need to work towards including open access and OER publications and research artefacts in the promotion and tenure dossiers. McKinney and Coolidge (2021) argue that although the criteria for promotion and tenure vary widely between institutions and departments, there could still be common ground. They therefore propose a matrix that could be used to vet the quality of open access or OER scholarship for inclusion in the promotion and tenure dossier.

According to the European Commission's Research and Innovation Strategy 2020–2024, research infrastructures are defined as facilities that provide resources and services for research communities to conduct research and foster innovation. They can be used beyond research (e.g. for education or public services) and they may be single-sited, distributed or virtual. 'Research infrastructure' is therefore a broad term covering human and material resources (including offices, classrooms, laboratories, libraries, transportation and safety) that facilitate the smooth conduct of teaching, research and knowledge creation in any teaching and research institution. These activities are usually monitored from a central position, with the bulk of the funding granted at national or regional levels. It is important to have short-, medium- and long-term goals projected from the scientific vision and mission of the institutions concerned. Ministries play this role, and at regional level, intergovernmental organisations work together to raise funding from public-private partnerships, work on common projects and liaise with international and intergovernmental partners.

Government funding of research is far from adequate as countries in the Central African subregion spend far below the AU's recommended allocation of 1% of their GDP on R&D, despite the GDP growth rates shown in Table 12.3.

In 2018, the average R&D expenditure in Africa as a percentage of GDP was 0.33% based on figures for six countries, with the highest percentage

TABLE 12.3: Real gross domestic product growth rates by African subregion.

Region	2014–2020 (%)	2021 (%)	2022 (%)	2023 (%)	2024 (%)
West Africa	2.7	4.4	3.8	3.9	4.2
Central Africa	2.2	4.8	3.0	4.9	4.6
East Africa	5.2	4.7	4.4	5.1	5.8
North Africa	2.8	5.4	34.1	4.6	4.6
Southern Africa	0.4	4.4	2.7	1.6	2.7

Source: African Development Bank: Economic Outlook 2023.

being Egypt at 0.72% and the lowest being Mauritania at 0.01%. Data on this indicator are available for the period between 1996 and 2018 (Global Economy 2021).

For any meaningful growth in teaching, scientific R&D, governments would have to invest more in research infrastructure and collaborate or partner with the private sector for major investments in scientific research. According to the vice-chancellor of the University of Mauritius and fellow of the African Academy of Sciences, Professor Dhanjay Jhurry, ‘championing the vision of a research engaged and entrepreneurial university requires working in close partnership with public and private sectors as well as with the community to foster innovation’. As a matter of national development policy, the private sector should work with universities to train candidates for its workforce, involve researchers and faculty in its R&D programmes, provide internships for students and advise on areas of strength and weaknesses for universities to improve upon. This would ultimately lead to initiatives to develop human, intellectual, business and social capital through an inclusive and open approach. Universities and research institutions are encouraged to work on the concept of educational internationalisation, science advice and diplomacy as well as building cultural exchange programmes with other universities in Africa and further abroad.

A report by the African Academy of Sciences (2018) shows that research management is not well institutionalised across African continent as many institutions are not able to comply with funding requirements, especially when those responsible for managing research projects leave the institutions through retirement, job mobility or death. The implications are that a research management administration must be put in place to monitor the system and be aware of who is performing which roles, so that in the event of a natural or unnatural disaster or pandemic, there will be something to look back to and serve as a foundation to build on. Research management teams are responsible for providing administrative and management services for sponsored projects derived from local,

national and international grants, contracts and cooperative agreements, from both the public and private sectors, that support research, instructional and service projects. They will also provide support in finding funding, proposal development, proposal reviews and in the case of successful grants, managing the award process and ultimately closing out after the project. This is an important challenge facing academic and research staff. Relieving them of these responsibilities would allow them to concentrate on what they know best, namely conducting research, teaching, outreach and engagement geared towards training scholars and producing new knowledge. The African Academy of Sciences Research Management Programme in Africa (ReMPro Africa) was established in 2016 and is developing and revamping standards of good practice to facilitate benchmarking, improving research systems by addressing institutional leadership, sustainability and standards and building the individual capacities of research management staff.

Research commercialisation and technology transfer involve the transformation of research ideas into innovations or discoveries that can be patented and eventually result in some cash flow for the researcher and the institution. From the outset, scholars are immersed in the promotion and tenure system, which has traditionally embraced the 'publish or perish' syndrome. In this process, unfortunately, research is carried out, written up and submitted for free to publishers, who package it and sell it back to institutions at exorbitant prices. An academic might have a great concept that addresses a market need or solves a business challenge but might not know how to find the resources or technology to take the idea to fruition. Awasom (2017, 2018) highlights the docile role played by local researchers when it comes to the issue of ethics in funder-recipient relationship in international research collaboration. Because of funding pressures, local researchers do not protect authors as well as intellectual property rights in their Memorandum of Understanding (MoUs). It is all about survival, especially as there is no training in Intellectual Property (IP) rights, patents, etc. despite having the regional African Office for the protection of Intellectual Property Rights (OAPI) in the Cameroons in the Central African sub-region.

How functional are the offices of the Vice Rectors in charge of research? What roles do Librarians play in faculty collaboration and in liaising with the offices of technology transfer and collaboration? These discussions led to the discussions and some scholarly societies in the sub region such as Cameroon Bioscience Society had as theme of the conference research and entrepreneurship. I was excited about this development as I developed proposals for workshops on science ethics, science communication and public scholarship.

For scholars who are entrepreneurs working on a commercial strategy for an exciting technology coming out of their research laboratory, the challenge is to have a functional office for research commercialisation and technology transfer that operates to stem the mentality of ‘exporting raw products’ and substitutes the notion of refining products locally and taking them to the international market as finished scholarship products or artefacts. Such an office could take care of processes with the potential to generate revenue for researchers and the institution instead of giving knowledge away for free, as has been the norm. This is the global model (Cullen, Calitz & Chetty 2020; Lars, Baraldi & Larsson 2015; Xuhua, Chen & Fong 2016) and the challenge that researchers in Africa need to address.

Scholarly societies within the subregion, such as the various academies of science and young scientists, have a critical role to play in effectively assisting with science advice, public policy formulation and the crafting of legislation that could lead to sustainable societal development and stewardship. These proposals would require overhauling the information infrastructure.

The post-COVID-19 era is uncharted territory and calls on researchers not only to rethink old ways of doing things, but to be creative and make changes that universities and research institutes have had in the pipeline but have been reluctant to put forward. Researchers need to move beyond ‘islands of innovations’ to bring about ‘comprehensive innovation’ (Avidov-Ungar 2010), which involves not only a change management plan but also a comprehensive disaster management plan. Institutions should be knowledge creators, innovators and early adaptors of any such change management, which according to Minishi-Majanja and Kiplang’at (2005) is also culturally specific.

Synchronous learning is any learning activity in which all learners are simultaneously participating; thus, it is real-time, highly interactive and very social. This type of learning may resume as soon as the population attains herd immunity or is vaccinated against COVID-19, whichever comes first. However, remote online learning or distance education is very likely to be the wave of the future. It is therefore imperative that the necessary information and technology infrastructure be put in place to cater for a hybrid model of learning that includes the ‘flipped classroom’ and other pedagogic methods worthy of consideration. Other areas of concern that could define the future of education in the sub-region include cloud-based learning, increased focus on the experience and overall wellness of academics, staff and students, the use and embracing of alternative metrics or ‘altmetrics’ and artificial intelligence as a disruptive technology that promises to fill gaps in teaching and learning. Mobile learning is likely to

become important as increasing numbers of students have smart phones, which now outnumber land lines. The use of virtual and augmented reality is also expected to grow. Educational leaders at all levels, including policymakers in government, must address these considerations in their long-term plans.

Despite the challenges that COVID-19 has imposed on the research and educational sector, resilient citizens have overcome the odds and are working hard to improve the situation for the future. The gains that have been made will need to be marketed using all available channels and means so that students, faculty, staff and the community can take advantage of them, and taking into consideration that the best marketing tool is service quality. If academics or researchers are doing their best with whatever resources they have as well as mentoring junior colleagues on their career path or if librarians are welcoming and go out of their way to help a patron in distress, such acts or gestures do not go unnoticed, and the beneficiaries of quality service could become its best advocates. Word of mouth remains the best marketing tool (Alire 2007).

■ Conclusion

This chapter has reviewed the unfortunate circumstances confronting universities and research institutions in the Central African subregion. It offers a comprehensive disaster management plan that entails upgrading and maintaining information infrastructure and implementing research management administration to free up researchers and teachers to concentrate on what they do best. The commercialisation of research and technology helps to maximise the economic potential of products that cater for the needs of units within the broader higher education, teaching and research ecosystem. Emerging technology has impacted on the research and tertiary education system worldwide. Sub-Saharan Africa is gradually catching up, but the COVID-19 pandemic has forced administrators to think innovatively and implement progressive measures much faster than anticipated, which is a good thing. Technology adds value to library and information products and services, as students, academics and researchers contribute to the learning and knowledge-production enterprise. This synergistic collaboration between students, faculty, staff, researchers, librarians and the external university community, through engagement with technology in the service of research, scholarship, institutional and community engagement, is the wave of the future precipitated by the COVID-19 pandemic. For institutions in the tropical Central African subregion to overcome the adversities of the COVID-19 pandemic will require much more than resilience. Therefore, there is an

urgent need according to Fosci et al. (2020) to protect research capacity by ensuring access to credible research information at all times, providing enough budgetary cushion for expanding library and information services. It is also important to put in place the infrastructure for the gradual transition to open science so as to provide equitable access through investing in the necessary information infrastructure, negotiating with telecom providers for academic bundles for universities and students to use smart phones. Finally, it is very important to secure research funding for the long term, making sure that governments follow the AU mandate to spend at least 1% of GDP on R&D (ECA 2018).

Reimagining knowledge production and dissemination post-COVID-19

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■ Abstract

Background: The coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic has provided an opportunity to assess the effects of the pandemic on research, science, the economy, technology, education and health, considering the lessons from the pandemic to our current post-pandemic era. As the impact of the 2019 pandemic continues to affect research, teaching and learning for the foreseeable future, there is an urgent need to align with the World Bank and United Nations Educational, Scientific and Cultural Organization (UNESCO) mapped out strategies aimed at developing a more sustainable approach for the current and future workplace.

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Aim: To address the obstacles brought about by the COVID-19 epidemic and investigate ways in which science and education might use creative approaches to fulfil the demands of the post-COVID-19 workforce.

Method: Data were retrieved from credible search databases such as PubMed, ScienceDirect, Scopus, Education Resources Information Centre (ERIC) and COVID-19 index prints. In addition, policy data on science and education were gathered from government websites and evaluating, and a discourse analysis was applied.

Findings: The results show that the majority of educational and occupational institutions have seized the opportunity brought by the 2019 pandemic to examine internal procedures and practices, restructure strategies and prepare for the new realities that many have termed named 'new normal'.

Conclusion: The COVID-19 pandemic did not only highlight the deficiencies in scientific and educational settings but has also offered an opportunity to review and adopt a flexible and personalised approach to scientific research, education and business as it supports affordable technology, student access and participation, business resilience and financial sustainability in higher education (HE).

■ Introduction

The coronavirus disease 2019, which caused serious respiratory problems started towards the end of 2019 and posed a serious threat worldwide with wide-ranging global impacts. Apart from the death rates because of the infection, research in fields including science, economics, technology, education and health was drastically affected. The pandemic interrupted every aspect of life. Many struggled to find ways to carry out the normal activities of their daily lives. Researchers in science and education also struggled to see how this global disruption and its significant challenges could be tackled.

This chapter examines works on the 2019 pandemic's effects from a scientific and educational perspective. It also suggests actions to take into account for the anticipated rethinking of how knowledge is produced in research and education. This chapter is organised in two parts. Part one includes the impact of the coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic on operational concerns in the scientific community, the challenges related to research funding, changes in publication timeliness and the communication of science through open access and reimagining with technology. This section also proffers a dissemination approach in the post-COVID-19 era.

The second part reviews the current challenges of transitioning through the Corona pandemic and reimagining the educational outlook post-pandemic. There is shared recognition of the rapid transition from physical classroom to virtual classroom as a response to the effects of the virus. This section explores the challenges of the pandemic for educational institutions and recommends sustainable approaches towards the reimagining of the curriculum and the sector in general.

■ Transition through the pandemic: The future of science

The onset of the gig economy because of 2019 pandemic, the relation between doing science and doing daily human activities changed towards equating the two with the notion of being positively and complementarily relevant in all fields of life and all jobs. In almost every field of life, the events of 2020 in connection with the COVID-19 pandemic have dramatically increased the pace of this change (Centre of Excellence n.d.; Marr 2020). Within the scientific community, the impact has been perceived more negatively than in certain other sectors because of the negative impacts of the Corona virus outbreak, which resulted in the emergency closure of institutions of learning, research centres and laboratories. Scientific events that were already scheduled, such as international conferences, training programmes and symposia, were adversely affected too. Job losses were on the increase, with businesses struggling to cope with some of the strategies implemented in order to combat and address the virus's effects (Bardelli 2020; Drake 2020; Macias et al. 2022; Subramanya, Lama & Acharya 2020).

In the course of the pandemic, the closed fertile grounds such as universities, research centres and laboratories mean jeopardising developments, innovative ideas, further expansion and scientific progress. It also means closing scientific events, which entails halting scientific networking for collaboration, dissemination of research findings, new skills acquisition and seeking of career opportunities (Subramanya et al. 2020).

Even the consequences of the COVID-19 pandemic seem to be showing positive effects, however. For instance, despite the adverse impacts on scientific communities, the pandemic has also ratified expectations of science to lead human endeavours in the face of the rapidly changing world, and institutions have resolved to use virtual training instead of onsite learning. Most participants in these virtual training events have found the transition to be successful and effective, as virtual training required shortened sessions, trimmed content and marked increases in staffing. Nevertheless, participants in most virtual activities did not hide their passion over physical peer communication and learning opportunities.

The costs of activity content and peer connection for these virtual engagements are also noteworthy (Fernandez et al. 2021; Macias et al. 2022).

The 2019 pandemic shutdown necessitated the use of online lectures and workshops so that scientists can maintain scientific interaction and exchange during the pandemic period (e.g. <https://researchseminars.org/>). These online scientific engagements have proved effective and successful, with the potential to be sustainable (Bottanelli et al. 2020) and can also be an encouraging avenue for the presentation of work by early-career researchers, people who cannot afford a trip abroad for international conferences and underprivileged sections within scientific communities (Achakulvisut et al. 2020; Omeluzor, Okonoko & Anene 2023).

The 2019 pandemic era addressed the much-anticipated reformatting of the progressively weak ecological footprint characterised by obstinate inequality between scientific communities. It also depicted how to access scientific networks in different countries, especially African countries. With events taking place virtually, the academic landscape is ready to implement these general and flexible new ways of communicating science (Bottanelli et al. 2020). It was also a call to learn and to strengthen scientific communication (Subramanya et al. 2020) and seek for innovative approaches that the upcoming generation of doctors and scientists is taught, in order to effectively prepare them for potential pandemic scenarios like unplanned outbreaks. It was also a chance for science to continue to take the lead in seeking for novel solutions to the problems facing the COVID-19 pandemic and the post-pandemic period.

Science, technology and innovation strategies will certainly form part of the COVID-19 recovery plan as well as action plans to deliver on several governmental and organisational agendas for sustainable development (UN, COVID-19 recovery 2022). In the post-COVID-19 period, science can meet the needs of researchers and society at large if a few issues can be resolved, as will be covered in the sections that follow.

■ Research funding models

One of the very important facts that the 2019 pandemic revealed is the significant role of scientific research, especially research into infectious diseases for global health security. During the outbreak of the pandemic, government and funding agencies worldwide mapped out considerable funds for research proposals employing unusually swift funding round strategies (Hordósy & McLean 2022; Prudêncio & Costa 2020). The pandemic era has also witnessed rapid responses from funding system in obtaining COVID-19-related grant applications for research. Usually, grant

application reviews take between seven and eight months. For research related to the 2019 pandemic, grant decisions were sometimes made within 48 hours and research institutions receive the funding within days (World Economic Forum [WEF] 2020). This illustrates the need to re-evaluate research funding strategies. Fast processing strategies for grant proposals bring enthusiasm and resolve for the proposed idea. However, fast-tracking research funding, projects and activities calls attention towards the integrity, quality, impact, risk and value of such funding and research for the communities, society, participants and funders involved (Watermeyer et al. 2021). The urgency of these grants tends to marginalise disciplines, especially those that have nothing to do with COVID-19. This situation ensures that disciplines related to COVID-19 are better managed, recognised and well-funded, with possible adverse implications if such funding systems continue post-COVID-19 without addressing existing inequalities. Once this is rectified, the types of research funding systems used during times of crisis could also be applied under normal conditions. As we look to the future, we also need to reevaluate the STEM research system for current applications.

Another important potential outcome of the pandemic period is that the pandemic-induced mobility restrictions could have direct and devastating impacts on the financing of universities. For instance, UK universities projected a reduction in tuition fee income of £2.47 billion; Australia encountered a \$4.6bn loss in similar circumstances and the USA estimated a loss of \$23bn (WEF 2020). Because of deferments brought on by the pandemic, universities saw a sharp decline in student enrolment during the 2020–2021 school year.

In the UK funding model, tuition makes up a large proportion of research funding. In countries such as South Africa, tuition makes up only a small proportion of research funding, most of which comes from government subsidies and other research funding sources including government, national research foundations and private funding. This sad reality could be more devastating for universities involved in STEM research.

It is clearer than ever, that to guarantee a healthy life for everyone in the post-COVID-19 era, it is necessary for funders to maintain acceptable, rational and unrelenting research and development funding (Fernandez et al. 2021) in order to combat all infectious diseases, especially given that regions such as Africa still face challenges with their health sectors. Short-term funding has been allocated to research on infectious diseases in the past in a similar manner to the funding that was made available for COVID-19-related research, yet we still lack fully effective and reliable treatment for these diseases. For instance, studies have reported the long-standing ‘big three killer’ diseases as human immunodeficiency virus

(HIV) and acquired immunodeficiency syndrome (AIDS), tuberculosis and malaria (Prudêncio & Costa 2020). These illnesses cause 8.6% of fatalities in low- and lower-middle-income (LLMI) regions and 1.3% of deaths in upper-middle- and high-income (UMHI) regions (WHO 2018).

Poverty and impoverishment caused by these diseases have also been reported (Sarma et al. 2019; Singh et al. 2019). To eradicate poverty because of these three big killers will involve constant sustained global funding for research and effective and affordable funding strategies to combat the diseases and the present COVID-19 pandemic.

Scientific evidence has influenced public behaviour and government responses during the COVID-19 epidemic. What are the current positive societal impacts of research, and how reliable are these observed scientific facts? The questions now are, what will the current 'new normal' imply for global research? and how can research be utilised as a global common good?

Numerous viable funding initiatives have been employed by governments help, finance diagnostics and therapies as well as the production of COVID-19 vaccines. Different nations took different approaches to address COVID-19 issues. These included funding research proposals, directing resources through already-existing funding mechanisms to improve responses, refocusing already-progressing novel production, participating in COVID-19 eradication innovation programmes and supporting current grant holders in their innovation and research endeavours (World Bank 2020). Moreover, research funding organisations delayed application deadlines and took more lenient stances. Research employment in higher education, research institutes and research projects threatened by the pandemic was protected by low-cost grants, while countries including the USA, Germany and the UK implemented grant extension plans for PhD students of up to 6 months interest loans. Funding assistance to entrepreneurs and innovative firms was also initiated (Harris et al. 2020).

■ Scientific publishing models

Scientific publishing is another area that needs to be re-evaluated in post-pandemic period. Scientific publications during the COVID-19 pandemic were published remarkably quickly, and open access started to become more prevalent (Callaway 2020; Palayew et al. 2020). Researchers, journalists, corporate executives and politicians started self-publishing preprint manuscripts to share fresh discoveries. Preprints were published more quickly than standard peer-reviewed research, which requires a lengthy review process before publications are made. But the question of whether speedier publication processes are feasible across all disciplines is part of the new realities linked the issue of speeding up the release of

research results. The calibre of research published under such agreements will determine how far this strategy advances (Paunov & Planes-Satorra 2021).

Additionally, during the pandemic period, numerous publishers and journals, such as Elsevier, Springer, Nature and the *New England Journal of Medicine*, continued to make free-read publications on coronavirus research available. Researchers were also advised to deposit their manuscripts on preprint servers, which were not peer reviewed. COVID-19 publication patterns favoured open access, and large amounts of research data were made publicly available on open access platforms. However, before the global spread of COVID-19, journals and publishers had already started taking steps to make results available online early and to embark on open access publishing (Strydom et al. 2022).

Science is generally characterised by public funding processes, but the outputs are not easily accessed in terms of the publications resulting from the research, and many are denied access altogether. During the COVID-19 pandemic, open access was readily employed, which brought about a united and rapid global scientific response towards all COVID-19 issues (Kupferschmidt & Cohen 2020; WEF 2020). The question now is whether the COVID-19 open access agreements will become a permanent science communication roadmap or whether it was just a temporary pathway to address COVID-19 problems.

There have been studies supporting the stance that open access research communication practices related to COVID-19 need to be nurtured and continue to be utilised in the post-COVID-19 period (Bacheman & Frutos-Bencze 2022; Strydom et al. 2022). In a proposed model highlighting why we should embark upon an open science tradition, the above authors explained the numerous benefits of open science, including promoting efficiency, quality, integrity, innovation, public disclosure and engagement, as well as global and economic benefits. However, looking forward to complete open access systems in science will not be easy for reasons that include the current open access initiatives having led to individual researchers bearing the cost, which is inappropriate and unsustainable. It takes time for new journals, whether traditional or open access, to obtain an impact factor, which is essential to the rating of the scientific standing of researchers in the fields of science, medicine and economics. Open access journals are thus not particularly useful to researchers until they have achieved an impact factor. Sometimes publishing in an open access journal requires extra administration, unlike traditional journals that are easily accessible online. Article processing charges (APCs) are additional expenses that most institutions are ill-prepared to cover, particularly in times of emergency like the COVID-19 epidemic. Examples of APCs for

publishing in specific renowned and established academic journals are available on the Open APC website. Researchers may question if publishing in open access would yield the intended findings because of copyright obstacles that occasionally appear in open access articles (Bhosale 2021). On the other hand, many universities are now receiving funding for open access publications, and many open access journals do not charge for publishing. Over 70% of peer-reviewed open access journals do not charge any fees, according to the Directory of Open Access Journals (DOAJ) (Bhosale 2021).

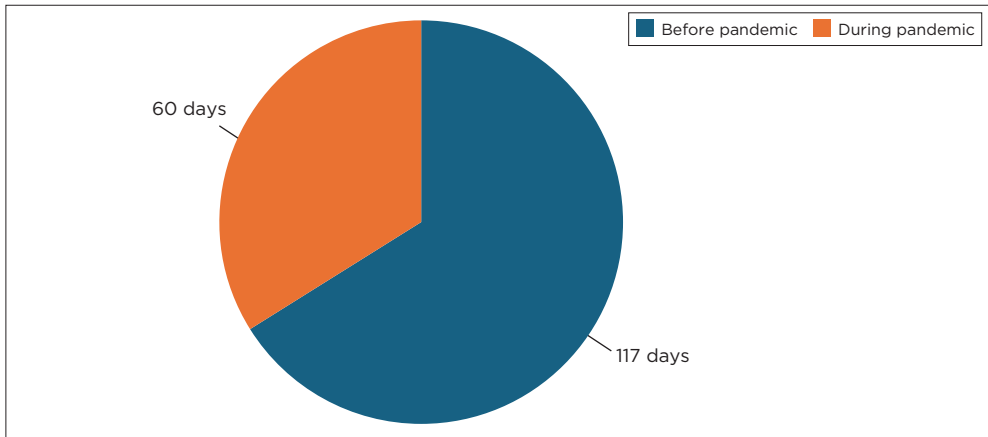
For science to embrace a completely open access system, the systemic national and international redirection of financial movements needs to be reimagined. The system should also ensure that the cost of openness is already integrated into the research support and funding processes; the cost of the system should not be paid piecemeal by the individuals and institutions involved (Kupferschmidt & Cohen 2020).

Publication patterns during the coronavirus pandemic showed the significance of these earlier proposed ideas (Callaway 2020). Many of the characteristics of publishing during the COVID-19 era, such as the short processing and publication time and the volume of preprint publishing, suggest that the pattern might be permanent even in the post-COVID-19 era. However, so many unclear and difficult situations complicate the possibility of expanding open access publication.

■ Short publication time

The exceptionally rapid pace of publication during the pandemic is recognised and well-documented (Callaway 2020; Strydom et al. 2022; WEF 2020). Indeed, publications of studies on coronavirus have been enhanced by peer-reviewed journals. An evaluation of 14 journals (WEF 2020), mainly in virology, indicated that the average publishing time was reduced from the usual 117 to 60 days (Figure 13.1).

Because of the volume of research being published during the 2019 pandemic period (Chen, Allot & Lu 2020), Palayew et al. (2020) evaluated the speed of the publication process. The findings of their study comparing statistics for six groups of journals (Table 13.1) showed that 367 COVID-19 journal articles were being published weekly, with six days as the median time from acceptance to publication. By comparison, four journal articles on Ebola were being published per week, with a median acceptance time of 15 days. In contrast to the 1,250 COVID-19 journal articles (59%) that were accepted after one week of submission, the median acceptance time for publications, for instance, on cardiovascular illness, was 102 days under normal circumstances (Palayew et al. 2020). Only 374 articles (3%) were accepted within that time frame.



Source: WEF (2020), image modified.

FIGURE 13.1: Diminished publication time during COVID-19 pandemic in an evaluation of selected journals.

TABLE 13.1: Comparative descriptive statistics for the six sets of journal articles.

	COVID-19	Ebola	Cardiovascular disease	2019 COVID-19 publishing journals	2020 COVID-19 publishing journals (excluding COVID-19 records)	2020 COVID-19 publishing journals (including all records)
Total records	7,155	333	27,702	99,147	111,331	117,644
Total journal articles	4,403	164	20,080	79,588	94,952	98,858
Total journal articles with dates	2,113	48	13,111	56,465	65,032	66,758
Median days to acceptance [inter quartile range]	6 [12;134]	15 [45;136]	102 [93;1,053]	93 [100;1,074]	84 [103;1,089]	82 [103;1,089]
Accepted within 7 days [n]	59% [1,250]	38% [18]	3% [374]	2% [1,386]	3% [2,113]	5% [3,138]
Accepted within 30 days [n]	93% [1,970]	71% [34]	9% [1,158]	13% [7,324]	18% [11,396]	20% [13,020]
Accepted within 100 days [n]	99% [2,099]	92% [44]	49% [6,465]	54% [30,536]	58% [37,972]	59% [39,698]

Source: Palayew et al. (2020).

Another study observed similar results to Palayew et al. (2020) using analysis at a smaller scale (Horbach 2020). Numerous data thus showed that peer-review procedures were accelerated, especially in relation to the publication of open access COVID-19 articles, perhaps even through temporary schemes to remove paywalls. These changes to shorten the publication time during the COVID-19 era might be temporary, but decisions to act on them or not will be transformative for the future.

Preprint publications were already being used before the pandemic, but they have become more popular during the pandemic era. Preprints have the scope of providing faster results in real time more than traditional peer-review methods, where the results are sometimes already outdated by the time they are published or accepted.

Scientific articles relating to COVID-19 that are available as preprints can be accessed on the websites of important preprint distribution services and open access archives, including arXiv, medRxiv and bioRxiv (Callaway 2020). The number of publications in these preprint servers has grown enormously because of the 2019 pandemic, and thousands many more articles were received each week. These preprint servers could also enhance other areas of medical research. This situation presented a number of questions for the scientific publishing community, such as: Will this influx of articles continue? Is this just an emergency situation that science is dealing with? Can open access be applied in all research works? It is also envisaged that this newfound access to scientific publishing could lead to many challenges in future, with the creation of new audiences requesting open access science (WEF 2020).

In summary, it must be accepted that during the 2019 pandemic, the easy and fast communication of appropriate scientific and academic knowledge is very important. Changes in understanding and policymaking can certainly be enhanced by prompt and adequate information from researchers and academic journals. However, the public have to be warned to be alert to pseudo-science and nonsensical falsities, such as the experienced 'fake-news pandemic' in the absence of established scientific knowledge being disseminated through social media (Khatri et al. 2019; United Nations Educational, Scientific and Cultural Organization [UNESCO] 2020).

■ Science communication

During the pandemic, the discoveries regarding COVID-19 were largely because of the global open science effort (Kupferschmidt & Cohen 2020). In the post-COVID-19 environment, measures to refute misinformation and foster trust will be necessary. This could be accomplished by implementing the regulatory flexibility required to guarantee prompt actions while upholding security. For instance, the Australian Department of Health gave regulatory review of COVID-19-related medicinal products applications first priority (Vincent-Lamarre, Sugimoto & Larivière 2020). Supporting data and knowledge-sharing and promoting research collaboration will also help to promote science communication. Science communication could take the form of visual, verbal, digital or cultural communication.

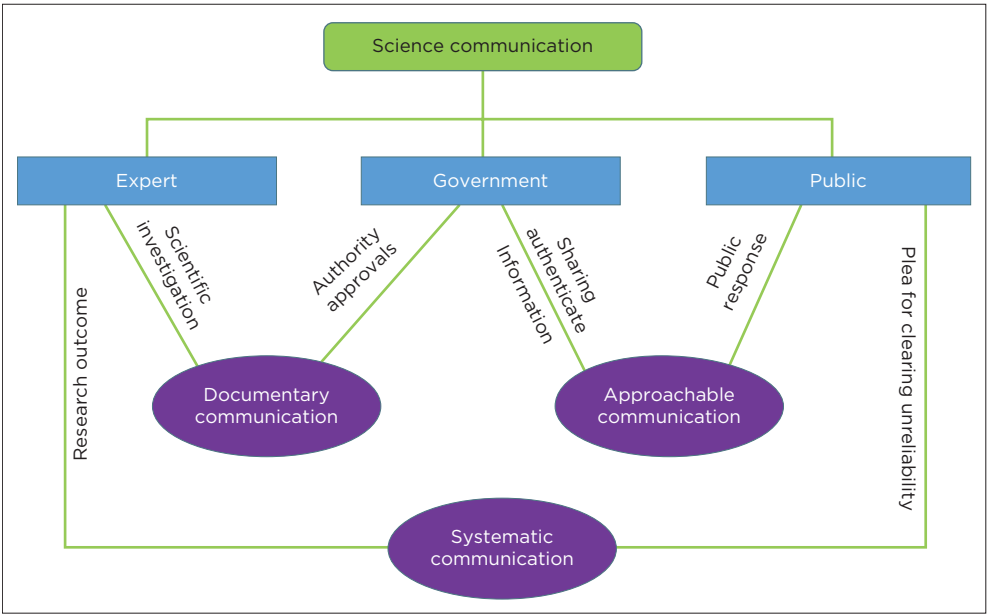
COVID-19 generated panic among people, because of the false information and myths about fictitious health issues in the future, which incited fear among the public (Marwah et al. 2023; Orso et al. 2020). People did not care about the truth of the information they read or see and this did not enhance the expected response to the pandemic and to the science community in general (Ioannidis 2020). To this effect arose a need for a yet undefined platform or platforms that could be used to filter information and evidence for everyone, not only during times of crisis but also during normal times. The big puzzle would be to define the criteria for such a post-COVID-19 platform. While this puzzle lingers, there is no doubt that for evidence-based decision-making to exist in society, there needs to be constant training of researchers to communicate at very high standards the nature of their research work and the contribution they can offer to society (WEF 2020; Wirz et al. 2022).

The extent of public concern could also be reduced through accurate reporting by science communicators. During COVID-19 crisis, researchers resorted to using bulletins or updates on digital platforms and organising live press meetings and webinar discussions. Many other researchers are using scientific short reviews and communication despite the restrictions in laboratories (Matta et al. 2020). It is vital to concentrate on data sources and message-centred strategies both during and after the COVID-19 epidemic in order to comprehend science communication. Zhang, Li and Chen (2020) used a combination model (Figure 13.2) with three components – government-public, government-expert and expert-public communication – positioned such they could produce interactive communications to hypothesise the significance of effective scientific communication. The government is positioned as the primary decision-maker with regard to all other constituents. According to Zhang et al. (2020), the remaining elements consist of scientific answers and societal requirements, including social media platforms.

■ Reimagining technology

Science and technology are known to go hand in hand. From one point of view, new technologies are born out of science. From another perspective, science uses technology to make new discoveries. On the whole, science and technology could be said to have different but converging goals. While science answers question and increases knowledge, technology brings about solutions to practical problems. Hence, technology awareness is very important to the development of scientific ideas and methods.

Since the start of the pandemic, steps have been taken to speed up responses by facilitating data-sharing and granting access to vital



Source: Zhang et al. 2020.

FIGURE 13.2: A model for communicating science to the public, specialists and government.

research infrastructures. New procedures like hackathons have also been implemented to gather feedback and promote efficient teamwork. Information and communication technology (ICT) and innovation are finding serious applications in developed countries while developing countries are wondering how ICT and innovation could be introduced when there is little or no infrastructure to support the new developments. Access to adequate classrooms and educational materials remains a challenge in African countries. Some African countries do not even have access to proper classrooms and textbooks. This calls for the implementation of blended approaches and exploration of hybrid models of education, as it is considered to improve access in children’s education (UNICEF 2020).

With similar advances in other technologies, we are advancing not only the Fourth Industrial Revolution, but also our present civilisation. Developments in medical and genetic equipment for gene identification and manipulation are advancing the medical sciences, especially the field of biotechnology (Simplilearn 2024); for example, we can proudly talk of telemedicine and efficiently adopt this method of treating patients.

An important outcome of COVID-19 is the extent to which the pandemic has exposed us to technology. For instance, the adoption of educational technology for learning could be said to have come relatively late in relation

to the technological capacity achieved decades ago. Educational technology has been adopted after decades of promises to revolutionise education. In order to support educators and promote student learning, the 2019 pandemic has made it imperative to provide technology-based support. The pandemic has changed the field's emphasis from disruption to mitigation and inclusion, which has the potential to lessen injustice (Quota et al. 2022). At this juncture, technology can be employed to make learning more comprehensive, for instance, by translating digital learning materials into local languages and adopting universal design for learning approaches to produce the learning material into different formats that are accessible to disabled children (UNICEF 2020). Other blended approaches to learning, such as scaling up connectivity, reducing costs and capacity building for proper use of the available tools by teachers and students, could also help to improve the quality of education.

Furthermore, in product development, companies are redesigning teams so as to remain agile while working remotely, thereby reversing the multi-year trend towards co-location. Such arrangements could be made permanent in future and could become transformational with good governance, more productive work time and location optimisation.

To summarise, since technologies provide novel grassroots opportunities for platforms such as e-learning and e-discussions that strengthen the capacity of knowledge networks and the exchange of ideas on emerging issues, in the post-COVID-19 era, efforts towards the integration of marginalised populations are imperative (Delivering Results for Africa's Agenda 2063, 2020–2023, p. 72).

Before, during and after emergencies and disasters, science should be able to establish data collection and utilisation systems that will work even in emergencies, such as disaster medicine statistics and numerical data and health data collection (Kubo et al. 2019).

■ Transitioning through and beyond the pandemic – educational sector

Globally, the 2019 pandemic affected all sectors. The education sector witnessed incessant disruptions and closure of educational institutions, with negative impacts for children and youth, parents and carers, educators and indeed society at large. This impact proved to be persistent as the COVID-19 virus continued to spread and affect education at all levels both in the negative and somewhat positive way. Some of these impacts within the educational sector will be around for a long time and in the foreseeable future. Recent reviews of the impacts of lockdowns and closure of schools and institutions of learning during the pandemic as documented by Galea,

Merchant and Lurie (2020) and Panchal et al. (2023), identified a surge in depression, loneliness, domestic violence, child abuse and substance abuse. In the UK, it led to unprecedented fall in the GDP because of the closure of non-essential services and travel restrictions (Mukherjee et al. 2023). Motivation for learning dropped drastically among students who were faced with the loss of face-to-face access to educators and lack of interaction among peers, resulting in further demotivation for learning among students (Neuwirth, Jović & Mukherji 2020).

Apart from the negative impacts, the pandemic also had many positive outcomes in the education sector, necessitating creative ways of teaching and learning, with the potential of becoming a sustained approach that will contribute towards addressing educational inequalities. It has enhanced publishing among academics, taking this to greater heights, with shortened response times from publishers. Remote and hybrid teaching has become the new reality in educational institutions during and after the COVID-19 pandemic, involving reliance on technology for pedagogical skills and delivery. The major challenges of this approach to education include unavailability of resources and equipment for students, lack of enabling environments for learning and lack of digital skills among educators and students alike. Other challenges include psychosocial factors such as loss of employment (among both students and parents), unexpected and additional childcare demands and sharing of family spaces, to mention but a few that have directly impacted upon students studying at home or university staff working remotely from home (Neuwirth et al. 2020). Despite remote teaching and online learning having become so popular, many families in many countries cannot afford the luxury of strong internet bandwidth to power digital platforms and devices. This has meant that education comes at a very high cost to some at a time when ICT is perceived to be ubiquitous. With remote learning becoming the reality of today's education and the future, and with technology becoming more available and embedded in our new culture, both socially and educationally (Nwaozuzu & Mpakati-Gama 2018), the need is becoming more apparent for countries to equip their citizens with the enabling tools for remote teaching and learning, such as high-speed broadband and technological devices, including laptops, iPads and tablets, thus providing for the long-proposed 'anywhere any time' education (Wheeler 2012). A more sustainable approach would be to employ strategies for upskilling the educational workforce through investment in training such as online course development and facilitation, digital resources and enabling environments with high-speed internet.

The transitioning impacts of the pandemic have presented both opportunities and challenges within the higher education institutions (HEIs) (Khawaja, Anjos & Qureshi 2023). The rapid decisions to digitalise all

forms of services and delivery models are accompanied by challenges with respect to the digital skills and general well-being of educators and students, in addition to the financial implications for universities as well as the cultural implications of the new approaches to work for staff and students (Gabriel et al. 2022). Although university staff and students have been creative and adaptive in their responses to the situation, the emerging trend in what has been termed the 'new normal' (Cowan et al. 2022; Emanuel, Osterholm & Gounder 2022; Jandrić et al. 2022) by many suggests the need for re-envisioning and reimagining the curriculum and the approaches to assessment. Some popular destinations for education such as the UK and South Africa have reviewed the effect of the pandemic on their educational sector and economy in a bid to redesign the future educational curriculum.

■ Effect of the pandemic on the UK higher education institutions

The UK is a popular destination for international students, and they contribute significantly to the financial health of the economy (Yordanov 2024; Yu & He 2024). The higher education sector generates about £95bn for the UK economy, provides full-time employment to about 940,000 people and realises annual export earnings of £13.1bn (Ahlburg 2020; Kulkarni & Chima 2021; Carrascal Incera, Kitsos & Posada 2022). The impact of the pandemic in 2019–2020 resulted in a loss of £790 million in revenue and a projected loss of £6.9bn from international student recruitment in 2021 (Ahlburg 2020). Other financial implications for this sector include the loss of research funding, which is subsidised through high international student fees; loss of income from accommodation fees (as the hostels are not fully occupied) and loss of income from catering and conference facilities because of the reduced demand for such facilities and services. As documented by the Institute of Fiscal Studies (06 July 2020), the estimated income loss was between £3bn and £19bn, with a significant proportion of income loss from international student recruitment estimated at between £1.4bn and £4.3bn. Between 2018 and 2019, 350,000 non-EU international students in the UK constituted 14% of the total student numbers of 2.4m students at UK universities, accounting for a financial contribution of £5.8bn (Bhattacharjee & Lisauskaite 2020; Drayton & Waltman 2020; UKRI 2023; Universities UK 2020). Other financial losses incurred from sectors within the university system include income from student accommodation that was lost because of the lockdown. UK universities that are large recruiters of international students, as well as those with high pension obligations, seem to be the most affected by the pandemic impact, and some universities have faced insolvency. There were also reduced numbers

of home students because of significant numbers of deferrals of admission start date. Declining research funding resulted in further loss of income for UK higher education (Bolton & Hubble 2021; Kamssu & Kouam 2021; Sohrabi et al. 2021; Wyatt et al. 2021).

In spite of these grave impacts of the pandemic, the sector responded positively by making the necessary swift adjustment to online teaching and moving most services online. To ensure that the higher education sector does not jeopardise its capacity to contribute to the economy, Universities UK (2020) made some proposals to the government aimed at ensuring stability in the foreseeable future. The proposals include tuition fee reduction for foreign students to encourage them choose UK as a study destination, the introduction of flexibility in study visas, delaying new immigration laws and fees for students from European Union to optimise stability, increasing research funding to 100% for the continued maintenance of research excellence, increasing innovation funding in order to support upskilling and rebuilding of the economy, stabilisation for UK students entering universities from 2021 upwards by sustaining the institutions and universities of their choice and the establishment of a transformational fund to support universities to 'reshape and consolidate through federation and partnerships or potentially merge with other higher education policy' (Universities UK 2020). Universities understand the implications of reducing costs to ensure sustainability and efficiency.

■ Effect of the pandemic on higher education in South Africa

The effect of the pandemic has not been very different in South Africa, although the virus has spread more than in most parts of Europe and other African countries. For a country that is already experiencing high levels of unemployment and poverty, with over 2.5m children experiencing hunger and malnutrition and susceptible to high child mortality rates (Bamford et al. 2018), COVID-19 and its associated impacts in the health and educational sectors have further exacerbated the current problems. For instance, the impact of the lockdown on schools meant that 25%–57% of normal school days were lost by schools at the end of August 2020 (UNICEF 2020), and there was very low uptake of access to technologies for remote learning. A survey carried out by Statistics South Africa (Stats SA) in 2019 on homes with computers reported that only 28% of South African households have access to computers at home. Of these households, only 10% have access to the internet at home (Gustafsson 2020), suggesting a huge challenge in adjusting to remote teaching.

Within the educational sector, the story is not different. Recent studies carried out by universities in South Africa (Dson et al. 2022;

Mhlanga & Moloi 2020; Woldegiorgis 2024; UNICEF 2020) on the readiness of the HEIs to succeed in the post-pandemic era reveal that major challenges for the sector include the lack of appropriate devices, data challenges and poor internet connectivity, yet these elements are integral to present-day education and beyond (Tsiligkiris & Ilieva 2022).

The major income streams of universities are government subsidies, tuition fees and derivations from corporate commercial activities, investments and donations (Gredley & McMillan 2024). With major reliance on tuition fees and donations as income sources, any impact on the sector could be devastating. For instance, over R88bn was realised from tuition fees in 2019, while R42bn came from government grants and R46bn from non-grant funding (Stats SA 2019). A significant drop in income was recorded because of the closure of universities and the associated student tuition fees loss but also from research-related activities (Ngcobo, Marimuthu & Stainbank 2024; Tewe et al. 2024). Therefore, to protect the higher education sector from losing funds and to become more attractive to prospective students in the future, universities would think innovatively and creatively about the future world of work and its associated skills (Kanyane 2023; Opesemowo & Adekomaya 2024; Xulu 2024). One such approach would be to invest in digital platforms that will bridge the digital divide by making digital content highly accessible to students from all backgrounds (Sims 2024). Another corresponding approach would be to invest in digital skills training. This would also ensure regular student enrolment and revenue from tuition fees (Gredley & McMillan 2024; Kruger & Rosslyn-Smith 2024).

With remote teaching, hybrid and online learning has become the acceptable status in global education, South Africa is set to witness a serious digital divide by perpetuating existing inequalities, where students without access to technology will be further excluded in the current realities in digital education. The 2019 pandemic era added another level of historical disadvantage and unrest, exposing the current alienating practices (Cornell, Kessi & Ratele 2022; Czerniewicz et al. 2020). Within South Africa's educational institutions, there seems to be universal recognition of a shift from physical classroom teaching to online and hybrid learning among 26 South Africa's vice-chancellors from public universities, who have called for innovative and creative approaches to the transition (Buccus & Potgieter 2023). However, the existing inequality among universities, which has resulted in the categorisation of some universities as research intensive, historically advantaged institutions (HAIs), universities of technology, historically disadvantaged institutions (HDIs), comprehensive or rural and urban (Czerniewicz et al. 2020; Reddy & Mncwango 2021), needs to be addressed. Existing inequalities within

the higher education sector, such as resource inequality and existential inequality that have become more overt because of the pandemic, need to be curtailed for sustained participation in the new era of digital education (Isaacs 2020; Therborn 2020).

There is a need for assistance from public-private partnerships and the South African government in reviewing the realities of these inequalities and expected curriculum changes are imminent for the HE sectors to be a player in the 'new normal' (Mabasa, Mabasa & Maluka 2024; Rossouw & Goldman 2023).

■ Key differences between the UK and South African models

From the analysis of the UK and South African HEI funding models presented in the preceding sections, the key difference lies in the strategies for funding with the HEI in these two countries. While the UK higher education system relies on diverse sources such as the government, international student tuition, charities and internally generated funds from corporate business (Bone & Sherbon 2024; Jones 2022; Smith & Christopoulos 2024), the South African funding from government is determined by principles such as the percentage of student intake, student output and contributions from research (Mbhalati 2024; Nwosu et al. 2023). Cuts in research funding for both countries were evidenced, although South Africa had been experiencing regular cuts in this regard prior to the pandemic and is expected to undergo further cuts in the foreseeable future (Wills & Van der Berg 2024). It is believed that funding from these cuts will be repurposed to provide a national digital platform for educators and students as part of the preparation for the post-pandemic situation with a renewed workforce (Nording 2021).

■ The 'new normal' in teaching and learning

Remote and hybrid teaching has become popular since the global pandemic that occurred in 2019 and all through 2020, which has affected education and schooling worldwide. Supported by UNESCO, this approach to teaching and learning was initially aimed primarily at reducing the spread of the virus through interaction with people, which often occurs within an educational setting. Despite the benefits of remote learning during the period of health emergencies, the associated challenges are numerous, as most countries were ill equipped and unprepared for the aftermath of the pandemic, which was later termed the 'new normal' by many. Apart from the lack of equipment and connectivity prevalent in most developing countries, there were associated social and mental well-being issues

encountered by socially deprived students, who still find the demands of remote learning more challenging (Eyles, Gibbons & Montebruno 2020). However, these gaps in social, collaborative and cooperative learning associated with deprivation, which have been longstanding challenges in education (Heyes 2012; Jacobs 2015; Lin 2020), can now be addressed more effectively through digital and personalised learning. Educational institutions have resorted to a hybrid model that seems to be an acceptable midpoint for remote learning and physical class-based learning.

Most educational systems responded quickly to the demands of the emergency situation posed by the pandemic by transitioning to virtual teaching and learning in a bid for continuity of learning and also to maintain some financial inflow (Khawaja 2023; Rossouw & Goldman 2023; Sims 2024; Wyatt et al. 2021). However, most institutions failed to consider the skills requirements for both educators and students to meet the demands of the educational environment after the pandemic. There seemed to be an assumption that students, as 'digital natives' (Prensky 2001), are homogeneous and well equipped with the right technologies and would naturally adapt to the high usage of technologies and the demands of online learning, but this is not the case (Reid, Button & Brommeyer 2023). The first consideration for this paradigm shift would be to assess the skills gap and requirements of remote teaching and online learning. Next would be to get government support for the provision of the required resources and an enabling environment for both students and their educators. With these preparations in place, the take-off and adaptation to the 'new normal' and beyond would be sustained.

International students, as part of the diverse population of universities, were also adversely affected by being stuck in the city or country of domiciliation for their learning or forced to return home during the 2019–2020 pandemic (Onyeaka et al. 2021; Raghuram & Sondhi 2022; Schartner 2023). Students that were still in university hostels experienced heightened anxiety and loneliness, with significant impacts on engagement. For students abroad, with intermittent internet connectivity, the frustrations and disconnection from their learning environments were intense, as most universities had not yet determined the type of support that would be most effective in their situation. Current support mechanism ranges from approved deferral of assignment submission to delayed enrolment, yet none of these constitute a lasting approach, hence the introduction of the hybrid model, which can also offer continuity of learning regardless of the location.

There is shared concern about the digital skills of university staff and demands for upskilling, but less consideration for student training in technologies in preparation for remote learning (Hämmerle et al. 2022;

Neuwirth et al. 2020). Furthermore, there is a lack of consideration for students with specific learning needs in addition to the lack of mental preparation for the altered teaching delivery style. These impacts have been challenging and affected students' mental health.

Prior to the pandemic, there were emphasis on 21st-century skills as key skills sought by employers (Van Laar et al. 2020). These skills that include communication, creative thinking, problem solving, team skills and collaboration were embedded as part of the learning outcomes in most higher education curricula. However, with the lessons learned during the pandemic, new skills sets including graduate attributes are in high demand by employers in line with the expected post-pandemic workplace and to complement the existing 21st-century skills, including resilience, technical skills, commercial awareness, onboarding, coaching and mentoring, leadership and management (McKinsey Global Institute 2021).

Moving forward, and using the lessons learned during the pandemic as a guide for reviewing and redesigning curriculum content and delivery, the technical skills requirements for educators to be able to design engaging digital learning content as well as develop the confidence to do so have become mandatory. Similarly, the production of short bite size digital courses as a form of interventions, designed to address specific training needs of students in preparation for the new learning style and meeting the demands of the new workplace post-pandemic.

■ Designing effective digital learning content

The shared experience of the 2019 pandemic suggests that the future of educational content will largely be dependent on technology, with educational content aligned to the skills demands of our environment. The resultant limitations for teaching and learning have both short- and long-term consequences (Talib, Bettayeb & Omer 2021). For instance, the transition from physical classroom to virtual classroom is perceived both as convenient and challenging (Di Pietro et al. 2020). Discussions on the associated issues of sustainability, security and authenticity are crucial.

The need to rethink learning content, teaching delivery and accessibility tools becomes necessary (Rajaram 2023; Kanyane 2023; Woldegiorgis 2024; Xulu 2024). Digital learning content has been an attribute of distance learning and has become effective through the engagement of digital authoring tools (Gabriel et al. 2023). Digital pedagogy, as the underlying factor in digital learning, emphasises the effective use of digital tools in promoting effective learning (Xulu 2024). Digital tools and platforms such as Big Blue Button, Microsoft Teams, Zoom, Moodle, Blackboard, Skype,

Google Classroom and Top Hats, to mention but a few, are in high demand as platforms for delivering teaching.

Central to these tools is the learning management system (LMS) platform for creating engaging content as well as managing learning communities. The LMS is a software-based application that can be used for the creation and delivery of courses and also for providing training programmes and needs for an institution's workforce (Bradley 2021). There are varieties of LMS to choose from depending on the particular needs and activities of the institution, ranging from a free open-based LMS to a fee-paying commercial LMS. There is also the cloud-based LMS, which offers more freedom and easy integration, supports all file formats, is mobile and tablet friendly and above all, can be accessed from anywhere through a user-client browser using log-in details. This type of LMS can also be packaged as a SaaS (software as a service) licensing model, which is universally more useful (Bouchrika 2024; Kasim & Khalid 2016; Veluvali & Suriseti 2022). This is different from an LMS that is installed on a hardware device.

As Bouchrika (2024) documents, a major benefit of using an LMS for remote staff training (both internally and externally) is that it reduces the cost of face-to-face training and saves travelling time in the long run. As this approach is electronically hosted, it offers the capacity to reuse and repurpose training materials and onboarding. Some examples include Blackboard, MoodleCloud, Canvas, Edmodo and LearnUpon.

The engagement of digital tools in the design of learning content does not automatically suggest that the learning content is effective or innovative (Rajaram 2023). What matters is the ability of the technology and digital tools to create an effective learning experience during the delivery of teaching and research. This means that incorporating technology into teaching and learning must be purposeful. opined that in practising effective digital pedagogy, educators should make a conscious effort to recognise students' preferred ways of studying and then adapt the teaching (both content and delivery) to those preferences (Sankey & Marshall 2023; Sims 2024). Varying learning disabilities exist among student and staff populations in institutions of learning, ranging from dyslexia to dyspraxia and even neurodiversity (Fletcher & Miciak 2024; Spaan, Van Trigt & Schippers 2024). What works for one student might not work for another. Including media and interactivity elements in an online module might be a powerful visual tool for engagement for some students, whereas for others it might be a source of distraction, hence the need for reasonable adjustment to visual and interactivity elements of online resources. This means that even with the right technologies, some students may still find digital content and online education very challenging.

It is imperative that a positive student experience is enhanced with the use of digital tools that engages with online learning post-pandemic. To achieve effective pedagogy during design, interactive activities need to be embedded in the content. Three suggested ways of incorporating digital pedagogy that have proved to be effective include focusing on collaboration, design for inclusion and engaging tools that work towards class participation (Hodges et al. 2020). Laurillard's (2013) conversational model, for example, incorporates design tools and activities such as seminars, polls, quizzes and discussion steps to enthuse students towards thinking critically while participating in online class activities. This model incorporates the four major factors of flexibility, collaboration, accessibility and interactivity that are fundamental to successful learning design. The model also addresses the expected graduate outcomes skills of the 21st century, which includes critical thinking, creativity and presentation skills.

■ Laurillard's conversational design model

In all aspects of education, we need to apply the lessons from the pandemic, in which there was an emergency move from rote to online teaching in response to the issues experienced within the educational system. This means revisiting the curriculum in terms of content, teaching delivery and assessment and rethinking the processes of professional accreditation, placement and competencies.

The 2019 pandemic brought a paradigm shift within the education sector and influenced the delivery of teaching and learning to be either wholly online or as a hybrid of physical and virtual classrooms (Spaan et al. 2024; Wyatt 2021). As a result, there was a need to review the various teaching philosophies and adapt to the new realities in learning. It is important to ensure that the new learning approaches enhance the student experience and engagement, aligned with each institution's educational strategy. In facilitating the review process, educators are faced with the challenges of what should constitute the content of learning, the approaches to student learning and what preparations needs to be done by learners (Cowan et al. 2022; Emanuel et al. 2022). Laurillard's (2013) conversational framework, which aims to enhance learning through technology, proposes six learning types for consideration when designing effective online content, namely acquisition, investigation, discussion, practice, collaboration and production (Laurillard 2024). It mirrors physical classroom activities involving a combination of strategies such as teaching practice, an appropriate instructional model and an enabling environment that is supportive (UNESCO 2020). It is hoped that these learning types will provide guidance in developing digital alternatives to conventional teaching and learning.

■ Learning through acquisition

Online learning involves active learning design, incorporating real-time access to academic materials as well as asynchronous access. When learners acquire new knowledge, whether through lectures, reading or attending classes, they reflect on the new knowledge and align it to their existing knowledge. The same can be achieved through online learning. Making resources available and accessible in a variety of formats would enhance student interaction and engagement. An active learning content design would build in, teacher-to-student interaction, as well as among students (Richey, McEldoon & Belenky 2023). This could be encouraged by introducing personal response systems, discussion forums, presentation of clearer information and learning resources in a variety of formats such as blogs, social bookmarking and open educational resources to encourage student interaction. Alternative learning technologies would enhance student engagement too.

■ Learning through investigation

This is an inquiry-based exploratory design that encourages students to actively find information or carry out research using digital resources as well as other academic repositories that are part of the embedded content. This process enables students to test their own ideas while contributing to learning and is dependent on students' access to suitable resources and an enabling environment (Mao 2023). Examples of this approach include guided analysis and individual and group tasks. This inquiry-based approach to teaching and learning offers students the benefits of participation and contributing towards learning.

■ Learning through discussion

Technology can enhance learning by incorporating discussion as pedagogy within the learning design, either as a regular activity or as an outcome assessment for learning content. Discussion offers students the opportunity to experience social learning through participation in discussions. There are many options to consider when embedding a discussion step in a learning design; examples include seminars, tutorials, small groups, buzz groups and activity sets. Information from these options could form part of a discussion board, set up as pre-class input similar to just-in-time teaching (Winet et al. 2023) or as an asynchronous activity. Discussions could be either synchronous providing real-time interaction or asynchronous. Most online delivery platforms have features to enable a discussion, which could be embedded as part of the learning design. Platforms such as Microsoft

Teams, Big Blue Button and Zoom have breakout rooms that can be used for synchronous group discussions.

■ Learning through practice

Improvements to learning content are encouraged through reflection and feedback. Learning through practice requires a clear picture of the specific task that is to be carried out and the targeted outcome. When students are given an activity as part of the learning design, such as analysis, application or simulation, the goal is to provide feedback that would be used for revision (Laurillard 2013). This is equivalent to learning by doing. Some examples that can enhance student engagement in online learning include embedding images, videos, data sets and case studies and providing questions aligned with the learning outcomes.

■ Learning through collaboration

Studies have shown that peer-to-peer collaboration is an effective instructional learning approach (Antciferova, Kolosova & Shchukina 2023; Carr 2023; Kasturi, Agrawal & Hota 2023). The requirement for students to work in groups towards a common goal has been an integral component in educational design in both conventional and online settings. Known generic or transferable skills can be developed with group work or collaborative activities. For instance, communication, teamwork and problem-solving skills are enhanced through collaborative work. These skills relevant to the collaborative activities are also considered life skills in the knowledge economy and can be further enhanced through online learning design by embedding activities that will encourage students to explore and identify resources for learning.

■ Learning through production

Most learning designs include embedded forms of assessment, whether formative or summative, that encourage the learner to produce something such as an essay, report, article or model. Designing for online learning is no different but would take a slightly different format. Some of the considered formats for online design include digital representation such as e-portfolios, presentations and videos (Mei 2022).

■ Moving assessment online

As online learning aims to be sustained for a long period, one of the challenges facing its future revolves around the validity of online assessment.

At present, asynchronous assessment seems to be the sustained response to the 'new normal' within educational institutions, as it accommodates issues associated with student access and time zones. This does not in any way dismiss the option of synchronous assessment using proctoring software. Either of these options demands clarity with respect to its feasibility, validity and costing. In fact, three determining factors with respect to the choice of an online proctoring system include cost, security and ease of use by both instructors and students (Serutla, Mwanza & Celik 2024).

Proctoring software has been developed to address the rising challenges of academic dishonesty associated with online assessment (Sevnanarayan & Maphoto 2024). Studies (Mitra 2023; Mutalip et al. 2023; Serutla, Mwanza & Celik 2024) highlight a growing number of companies that profit from academically dishonest services to students such as providing answer keys, writing papers and contract writing. Proctoring offers educational institutions the opportunity for either partial or complete monitoring during online examination in order to maintain assessment integrity using a record of students' visual activities or cues, including their computer, smart phone and facial movements (Mukhtar et al. 2020; Hussein et al. 2020). Studies reveal unproctored students score to be higher in online examinations than proctored students (Брескіна 2023; Gribbins & Bonk 2023) because of using more time to complete the assessment, which was attributed to cheating. Recent studies investigating online assessment found proctoring to be useful for remotely monitoring the activities of online students within an examination environment in order to avoid cheating (Dendir & Maxwell 2020; Han, Nikou & Ayele 2023; Howard 2020; Reisenwitz 2020). However, this monitoring comes at a cost depending on the functionality and features of the software. For instance, live proctoring software involving off-site human monitoring would be more expensive than reviewed proctoring software, which would use artificial intelligence or delayed video review (Gribbins & Bonk 2023). Sophisticated proctoring features such as facial capture and eye movement will also be more expensive.

The design and administration of proctoring software have remained a cause for concern, particularly as it is facilitated through an LMS or through online examinations managed by individuals, thereby challenging the issue of sustained integrity (Alguacil et al. 2023; Nugroho et al. 2023; Oeding, Gunn & Seitz 2024). Another challenge is how to cover the costs, which could either be absorbed by the institution as part of its assessment integrity strategy or be incorporated into students' tuition fees. A considered advantage of online proctoring software is that it has both human and technological elements that can provide guidance when deciding to invest in the software. Features such as lockdown (to prevent using other computer applications or computing processes), authentication

(for accuracy and ease of compliance) and webcam use (for video recording) are used to deter cheating (Nugroho et al. 2023). The high cost at which these features are delivered is an obvious disadvantage, particularly for institutions with poor funding, irregular power supply or internet facilities that are not technically robust.

In most developed countries, the quest for the most effective software and strategies for improved academic integrity for online assessment continues to feature in national debates as a source of concern (Mahon, Gay & Garner-O'Neale 2023). Several options are currently being explored and tested. DigitalEd's Möbius e-learning platform is used in some higher education settings around the globe. Möbius allows for randomisation of questions to ensure that students answer different questions for the same module (Subasic 2023). This seems to be one of the early attempts on e-assessment platforms, with more developmental work ongoing in this regard. CrowdMark is another platform that is used for online grading of handwritten assessments, but this is likely to be short-lived as institutions redesign curricula and transition to online submission as well as grading (Kurni, Mohammed & Srinivasa 2023).

It is a shared idea among academics in developed countries for students to be co-creators of assessment. Their contributions in designing the assessment are aimed at identifying unique difficulties that their peers face, including preferred technologies that work effectively off campus and ultimately result to a positive student experience (Maher & Bedwei-Majdoub 2024). A platform of interest with demonstrable learning experience for students, particularly for group work, collaborative learning and assessment, is the Aula platform and its use of Handin as an assessment tool. A pilot study carried out by Coventry University in the UK in 2019 revealed improvements with student engagement, contributing to building a learning community, with students learning in a style similar to social learning (Metreveli 2019).

There are other forms of assessment that can be incorporated as part of a pragmatic approach to e-assessment portfolios for online learning, such as critical reflective journals, which can be easily assessed using the created rubrics on Turnitin. Similarly, professionalism competence as an element of assessment of a module can be executed through structured feedback with the aim of enhancing students' development plans (Mooney et al. 2020). Course work alternatives that can be incorporated include portfolios, patchwork assessment, individual peer assessment, video documentary assignment, creative artefacts and interviews. Strategies to optimise the learning environment and ensure that these platforms deliver the expected outcome to both educators and students include video orientation, team huddles and consistent communication with students. All these approaches

and strategies suggest a hybrid of online and physical classroom activities as a sustainable approach to learning within the educational sector moving forward.

■ Bridging the gap through flexible and personalised learning

The new realities in education post the pandemic have focused on improving the quality and diversity of educational opportunities (Killen O'Toole 2023) aimed at bridging the digital divide and inequality in the dissemination of knowledge. Online learning and remote teaching should be reviewed to ensure that inequalities are addressed through flexible and personalised learning.

Flexible and personalised learning offers students choices with respect to module content, delivery and administration through alignment to individual needs, involving inclusive curricula in which students act as co-creators of the curriculum as well as the assessment. Accommodating students' preferences on how they want to study, their preferred pace, the medium for the study and their mental health is crucial. The experience of the pandemic has suggested health and well-being as the priority for most universities, followed by student learning preferences. It is therefore imperative that students participate in the co-creation of the curriculum. Co-creating assessment with students offers students the opportunity to be part of the design of their assessment and should be flexible enough to meet their different needs and preferred ways of learning (Habib & Pius 2023).

The UK Higher Education Academy (HEA) defines 'flexible learning' as the empowerment of students through choices on style of learning, content to be learned, when to learn and a preferred location for the learning. It also includes the mode of delivery and the pace at which the delivery occurs (Andrade & Alden-Rivers 2019). As a strategic approach for improved access to higher education, it accommodates online learning to address the diverse needs of learners, some of whom are affected by the pandemic, and provides accessible opportunity to all. For this approach to be effective, the learners' voices need to be captured in the learning design by determining what will work and at what pace, as included in the definition above. By comparison, personalised learning refers to a range of learning experience, put together to meet the needs of an individual using differentiated instructions. These needs can be met by varying teaching strategies and learning experiences to address the diverse needs of different learners (Fariani, Junus & Santoso 2023). This means that personalised learning is part of flexible learning, where learners with the

same purpose choose different pathways through the curriculum to achieve the same learning outcome. From a learning design perspective, personalised learning focuses on the pedagogy that is employed in developing the learning experience.

■ Learning and work skills post-COVID-19

The upheavals created by the pandemic forced organisations and institutions to realise the opportunities created, despite its devastating impacts on lives, health, education and the economy (Khawaja et al. 2023). A fully embraced digital education and digital delivery service, which was a direct response for survival during the COVID-19 lockdown, seems to be an approach for the future (Emanuel et al. 2022). We have realised that the assumption that most activities could only be physically executed can no longer be sustained as the norm. For instance, team meetings carried out virtually on Microsoft Teams or Google Meet have improved participant numbers, and individuals have become more supportive of one another. Virtual lectures are an acceptable alternative to physical classroom activities, and organisations have been run from the confines of employees' homes. Furthermore, banking, shopping and recreational activities have mostly been carried out remotely. These activities have challenged institutions and organisations to review their organisational needs, strategies and employee skill sets and to address any skills gaps and embrace the new ways of doing things (Cowan et al. 2022; Jandrić et al. 2022).

A survey carried out by Accenture in collaboration with the Chartered Institute of Personnel Development (CIPD) on learning skills acquisition at work revealed that only 18% of organisations believed that their learning strategy, investment and resources would remain unchanged after the pandemic, whereas the majority of the organisations surveyed believed otherwise (CIPD n.d.). Similarly, the 2021 McKinsey survey on the future of work that was conducted after the pandemic revealed the increased pace in remote work, automation and e-commerce, which has over 25% of workers displaced because of lack of digital skills (McKinsey Global Institute 2021). This suggests that increasing numbers of institutions have embraced new ways of doing things and are willing to reskill to address the new approaches presented by the pandemic. However, we are also mindful of some aspects of workplace activities that may be inappropriate for remote working or learning, such as sensitive feedback, brainstorming sessions, onboarding new employees and negotiations.

From the lessons learned during the pandemic, it is recommended that embracing digital innovation will be useful in rebuilding institutions and

preparing them for the new world of work. It will also ensure a choice of approaches to learning and working, both physical and remote, being able to make informed decisions on when to activate either of these approaches or a hybrid of both. Curricula need to be redesigned to be more inclusive and embed personal, technical and essential skills, including soft skills, which will be in high demand in future (McManus & Rook 2021). Business skill sets such as leadership, critical thinking, resilience, decision-making and conflict resolution need to be emphasised in the work-ready economy, as part of the wider employability skills embedded in university curricula (Consearo 2021). Roles such as online facilitators, digital asset creators, learning technologists and instructional designers will be especially relevant in the months ahead, and training programmes for these skills should therefore be considered as an inclusive package to university staff either as continuous professional development or external training solutions. The benefits of hybrid approaches are that they are more inclusive and perhaps more sustainable if the government deems it a priority to improve financial support to academic institutions.

■ Conclusion

The 2019 pandemic reshaped the affairs of various institutions around the world by challenging the usual ways of doing things. It also exposed the inadequacies and shortcomings of various systems, organisations and academic institutions and forced academics to reflect, re-learn and think deeply about innovative approaches to daily operations. Issues such as the challenge of accessing reliable research evidence, weak collaboration among relevant stakeholders and time constraints were some of the experiences of academic in HEI. The pandemic exposed the extent to which higher education is reliant on the conventional teaching model, but it has also offered an opportunity to review and adopt a flexible and personalised approach to curriculum design as it enhances access and participation by students, business resilience and financial sustainability. A hybrid of these approaches might be considered as a sustainable approach.

As we consider the investments needed for now or in future, the best approach might be to strengthen institutions in providing timely support in public health crises, guided by a well-informed data and research evidence. During the pandemic situation, there was no pre-existing formula to serve as a guide; instead, it presented opportunities to reflect, re-learn, think deeply and engage all stakeholders in education in designing a more sustainable new world in education, including how to read, teach and disseminate knowledge. It is certain that in the years ahead, digital, cognitive, social and emotional skills sets will be required, and skills

including adaptability and resilience will be needed to meet the challenges of the new digital workplace. This means that employees will need to either re-skill or upskill as a strategic approach for continuous employment in their current positions or move into other parts of the workforce.

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None.

Ecology in the wake of a zoonotic pandemic

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■ Abstract

Background: Coronavirus disease caused by SARS-CoV-2 virus (COVID-19) was a disease predicted by scientists, a consequence of humankind's ever-increasing pressure on the natural world. When the pandemic hit us, however, we were unprepared. The global response from the medical community, many governments and economic institutions was rapid, and it seems likely that those working on the 'human' end of this zoonotic disease will continue to explore every possible avenue to prevent a similar catastrophe from recurring soon. Ecologists need to mount an equally strong response to SARS-CoV-2. As scientists preoccupied with the functioning of the natural world, ecologists should broaden their applied research to have more direct bearing on the emergence of zoonotic pathogens in wildlife hosts.

Aim: To make suggestions on how ecologists' workflow, research focus and collaborations can be adapted to improve our preparedness for future zoonotic pandemics, which are expected to increase because of global change.

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Methods: I build on my own experience as an ecologist and research manager, as well as providing a brief review of the relevant literature. This chapter is primarily in the form of an extended commentary and required no ethical clearance.

Findings: Describing animals' behavioural ecology and responses to global change can be done at a far more detailed level, particularly in the Global South, where land-use change and human development are continuing apace in the midst of relatively intact ecosystems. Tissue samples need to be collected with metagenomic analyses in mind, and ecological data shared on platforms where modellers and epidemiological experts can examine patterns that may allow us to identify spillover hotspots or high-risk zones. Ecologists need to proactively involve experts from other knowledge fields in the design of research projects and go beyond academic consortia to include policymakers and economists. It is also essential that ecologists speak up. With 'fake news', apathy and scientific illiteracy challenging effective responses to global change and the current pandemic, it should be a fundamental part of ecologists' job description to actively counter false narratives in the media and to help create an evidence-based dialogue about global change and preparedness for the next zoonotic disease outbreak. Coronavirus disease caused by SARS-CoV-2 virus is a crisis that might finally bring home the message that global change is an imminent threat to ourselves.

Conclusion: In this chapter, I argue that we can – and must – use this pandemic as a catalyst for engaging in more collaborative 'Open' Science to safeguard our own species in a natural environment that is pushing back against our relentless disruptions. Ecologists, who have a profound understanding of the connection between the ecosystem and humans, must be at the forefront of this change.

■ Introduction

In 2020 and 2021, many countries 'locked down' their citizens, and economies went into shock because of an unprecedented – but not unexpected – viral pandemic. In peer-reviewed academic journals, many authors had predicted that the next epidemic would soon be upon us, more than likely from ribonucleic acid (RNA) viruses originating in wildlife (Carrasco-Hernandez et al. 2017; Fan et al. 2019; Jones et al. 2008). These same authors suggested that the origin of this emerging infectious disease would be in either Africa or East Asia, where growing population sizes and increased human contact with wildlife would provide fertile grounds for pathogens to jump the species barrier and quickly spread among the human population. The only shortcoming of these studies was in their under-estimation of the speed and reach of SARS-CoV-2. Since the previous

pandemic in 1918, the outbreak of zoonotic epidemics has been increasing in frequency (Halabowski & Rzymiski 2020; Jones et al. 2008; Weiss & McMichael 2004), and we have developed the ability to characterise viral genomes in real time (Bahrami & Ferns 2020; Khailany & Safdar 2020). Nevertheless, we are not close to pinpointing and preventing the next spillover of a novel infectious agent from non-human animals to humans. Ecologists, as scientists with their ear to the ground (sometimes literally), tend to leave epidemiological research to their colleagues in the lab. Here, I suggest a more purposeful role for ecologists and wildlife biologists in our efforts to be prepared for the next zoonotic outbreak.

■ Improving our pandemic foresight

Zoonotic diseases are caused by pathogens that originate in animal hosts and spill over the species barrier to infect human beings. This is neither a simple nor inevitable progression for any infectious agent, and the obstacles to successful spillover have been eloquently described by Plowright et al. (2017) in a useful ‘pathway to spillover’ conceptual template. To prepare for the next zoonotic disease outbreak, ecologists need to focus more research on Step 1 along this pathway, where there is currently an acute lack of data (Halabowski & Rzymiski 2020; Holmes, Rambaut & Andersen 2018). I suggest changes to ecologists’ research focus and approach on the right (Figure 4.1). Much of the existing research focus of ecologists could remain unchanged, but data should be shared through Open Science processes (Hampton et al. 2015) to improve monitoring and predictive capabilities, and better links need to be forged with specialists that can extract additional valuable data from tissue samples routinely collected by many field biologists. More proactive public communication about research will go a long way towards mitigating future zoonotic disasters.

Distinct barriers to interspecies spillover exist at three points: a pathogen has to circulate effectively enough in the animal reservoir or environment to (1) exert significant pathogen pressure; after which (2) human exposure to the pathogen needs to occur, for example, through slaughtering infected meat or vectors biting human hosts and finally (3) infection and transmission must be effective, considering both human and pathogen traits. Life scientists, social scientists and medical researchers are conducting some excellent research on the factors that facilitate or prevent pathogen transmission at Steps 2 and 3, but the monitoring of pathogen pressure (Step 1) – or, disease surveillance – is rarely on the agenda of ecologists. Indeed, Salkeld Hopkins and Hayman (2023) call systematic wildlife disease monitoring ‘a thing of the future’.

Hence, the biggest blind spot we have in combatting emerging infectious disease is the lack of adequate surveillance in wildlife – review after review

has highlighted this basic data deficiency (Halabowski & Rzymiski 2020; Holmes et al. 2018; Jones et al. 2008). Precious little coordinated monitoring of wildlife populations and domestic animal welfare occurs in the Global South, where human population density is often highest in areas with a greater diversity of wildlife (Balmford et al. 2001) and developmental needs feed ever-more intensive conflict between humans, domestic species and wildlife (Nyhus 2016). A recent expert analysis indicated that anthropogenic landscapes in Africa will not extirpate populations of smaller-bodied species, except perhaps in dense urban zones (Clements et al. 2024). By contrast, human populations in the Global North encounter far more limited wildlife, and coordinated vaccination programmes on target species can work to control specific zoonoses, such as rabies (Müller & Freuling 2018). Surveillance strategies that work in Westernised countries cannot, therefore, simply be extrapolated to other regions. Ecologists have, of course, been studying wildlife for many decades, describing everything from mating habits and responses to novelty, to travel paths as vertebrates circumnavigate the globe. Although disease prevention has not been the primary goal of most ecologists, much of the existing research can be used to better understand sylvatic disease cycles, and small tweaks to our research agendas (Figure 4.1) could significantly change our global understanding of how zoonotic pathogens emerge.

Ecologists, for example, routinely collect physiological and behavioural data to describe wild species' interactions with conspecifics and the environment, their stress responses and fitness. These data have a direct bearing on the circulation of pathogens in wild hosts. The nature, location and frequency of social interactions affect how pathogens transmit within a population, and therefore, such real-world data could calibrate models of disease transmission and help identify conditions that exacerbate the risk of infections spreading among wildlife hosts (Craft 2015; Silk et al. 2017). Behavioural ecologists also frequently collect tissue samples and faecal samples from their study animals. If these samples are stored properly, laboratory scientists could subsequently extract information on gut microbiota (Wasimuddin et al. 2017) and describe entire viromes, the community of viruses living inside an animal host (Duarte et al. 2019). Parasitologists could identify blood parasites and parasitic life cycles from the ectoparasites we comb off wild rodents' hair (Kamani et al. 2018). This information on pathogens present in various study species could not only be used to protect humans against potential zoonoses but could proactively identify wildlife populations that are at risk of diseases originating in humans (Rwego et al. 2008).

Similarly, movement data could help disease ecologists understand which individuals are at higher risk of encountering novel pathogens and becoming 'super spreaders' or which individuals may be dead-end hosts

for potentially infectious pathogens (Keesing et al. 2010; Martin et al. 2019). In response to climate change, animal movement patterns are expected to change, bringing migratory species in contact with novel environments and pathogens (Altizer, Bartel & Han 2011; Medina 2018). Some animal movement data, based on wildlife radio telemetry, are already stored in various open-access databases (e.g. <http://animove.org> and www.movebank.org), where modellers can access datasets that may be key to disease transmission in wild populations. Camera-trap networks are becoming almost commonplace (Pardo et al. 2021), and the collective data on species distribution and interactions can be invaluable in monitoring wildlife that may host zoonotic pathogens. Indeed, during the various national lockdowns, many camera-trap networks remained active and could continue documenting wildlife behaviour at a time when human behaviour changed dramatically (Blount et al. 2021). We have to note, however, that most of these networks are managed by scientists from the Global North (Blount et al. 2021), which therefore reduces our ability to monitor the most vulnerable areas where we anticipate future pathogen spillovers.

In South Africa and elsewhere, scientists are cataloguing basic biodiversity with renewed vigour, thanks to targeted funding programmes (e.g. the Foundational Biodiversity Information Programme of South Africa's Department of Science and Innovation) and the global recognition that we are losing species at a catastrophic rate (IPBES 2019). Although intact ecosystems and functional ecological communities are necessary for basic ecosystem services such as the provisioning of fresh water and air, the collapse of biodiversity is also altering the risk posed by potentially zoonotic pathogens. A pattern has revealed that reduction in biodiversity amplifies the transmission of infectious pathogens (Civitello et al. 2015; Keesing et al. 2010), but the picture is highly complex. It is unclear whether biodiversity – and equally diverse host immune systems – is the buffer against infection in and of itself or if there are keystone species whose absence allows a pathogen to run rampant. For example, Randolph and Dobson (2012) emphasise that it is the specific wildlife community's composition that can dilute or amplify disease risk, and a model by Faust et al. (2017) suggests that larger wildlife habitats could increase risk from density-dependent pathogens while reducing risk from frequency-dependent species. Olival et al. (2017) urge researchers to focus on more field programmes that specifically aim to describe the natural host range of potentially zoonotic pathogens, which would help identify the crucial species or functional groups to protect if we wish to reduce the likelihood of pathogen spillover to human populations. Again, ecologists could contribute to these goals by collecting and sharing samples of animal tissue, faecal matter and ectoparasites, particularly in populations that

do not appear diseased, but could be asymptomatic carriers of potentially zoonotic pathogens. This kind of data collection could be readily incorporated in expert 'bioblitzes' (Parker et al. 2018; Rogers, Yong & Holden 2024) or regular field sampling for specific project purposes.

Finally, land-use change and rapid urbanisation have been implicated as primary catalysts for zoonotic disease emergence, more so in regions where the expanding human population encroaches on wilderness or relatively intact ecosystems. Research in the Global North has described the characteristics of wildlife that coexist successfully with humans in urban areas – typically, long-lived generalist species with cognitive abilities that enable the exploitation of the resources offered by anthropogenic environments (Fehlmann et al. 2020). The flexibility of these species is often key to their survival among human infrastructures. However, flexibility can also open a species up to new threats if, for example, altered foraging behaviour draws more individuals to high-risk locations, as in the case of the banded mongoose (*Mungos mungo*) feeding on rubbish (Alexander & Nichols 2020). Ironically, the 'social distancing' response of human populations to the coronavirus disease caused by SARS-CoV-2 virus (COVID-19) pandemic appears to have altered the normal avoidance behaviour of urban rat populations and may inadvertently expose humans to more rodent-borne pathogens (Parsons et al. 2020). A review of urban bat behaviour in Brazil suggests that zoonoses are more common in the insectivorous species that favour roosts near human infrastructure (Nunes, Rocha & Cordeiro-Estrela 2017), but the study of urban wildlife lags behind in the Global South (Le Roux 2018; Shackleton et al. 2021), and the factors that increase or limit infectious disease risk from urban wildlife remain poorly understood. Some 'urban' research should attract the attention of ecologists who might typically be drawn to 'exotic' locales away from human habitats. For example, unusually high population densities of serval were discovered at industrialised sites in South Africa (Loock et al. 2018), and the evolving relationship between domestic species and wildlife creates opportunities for both experimental (Radford et al. 2020) and observational (Krauze-Gryz, Żmihorski & Gryz 2017) field research. Multi-national collaborations between scientific experts can also lead to detailed and spatially explicit predictions on faunal responses to anthropogenic change on a continental scale (Clements et al. 2024), enabling us to identify spillover hotspots and therefore research focus-areas.

■ A more connected and open world post-COVID-19

Ecologists often admit among themselves that they are studying a vanishing world, rushing to note 'natural' behaviours or describing wild communities

before being changed by humans in the Anthropocene era. The time has come, however, to admit that no location – not even the deep sea (Ramirez-Llodra et al. 2011) – remains unaffected by *Homo sapiens*. Now, while we are recovering from the catastrophic impact of the COVID-19 pandemic, we must remind ourselves that the emergence of new zoonoses, viral evolution and spillover potential are all exacerbated by anthropogenic global change (Brown & Rohani 2012; Gorji & Gorji 2021). In our increasingly connected world, we continue to exploit wildlife and remove the essential natural buffers between humans and wild animals that may protect us from zoonotic pathogens (Córdoba-Aguilar et al. 2021; Keesing et al. 2010). As ecologists, we cannot afford to ignore this fact. We should collect evidence, not incidentally but purposefully, of the impacts of humans on other organisms and the potentially harmful organisms that could affect us. I do not suggest that we all become disease ecologists, but we can contribute meaningfully to monitoring the presence of pathogens in wild, domestic and urban animals. We can do this by sharing the analytical burden with other experts and not waiting passively for someone to reach out to us. As an example, such a group of diverse researchers and local communities themselves have developed working solutions to the challenges of zoonotic disease monitoring in an African city (Taylor et al. 2008), demonstrating how these transdisciplinary teams can work.

Do ecologists have the luxury of ignoring human behaviour, which represents Steps 2 and 3 in the pathway to zoonotic spillover? I argue that we cannot step back from the fray; we need to acknowledge that our work and words have social relevance. It matters that we know how rabies hosts such as the yellow mongoose (*Cynictis penicillata*) interact with urban environments (Cronk & Pillay 2019), and that we understand patterns of behaviour in ‘nuisance’ animals (Barrett, Stanton & Benson-Amram 2019). It also matters to be proactive. Research has shown that people often cling to the initial information they received – a tendency referred to as the ‘anchoring bias’ (Furnham Boo 2011) – rather than the most logical or correct information. These psychological predispositions have led to a rather dangerous ‘infodemic’ during the COVID-19 crisis, with disinformation leading to medically risky behaviour in many human populations. The good news is that false information can be ‘pre-bunked’. If people have the correct facts first, they are less likely to cling to the subsequent fake news (Jolley & Douglas 2017). There are also indications that public trust in scientists is high, post-COVID-19 (Cologna et al. 2024). It is, then, up to scientists to present relevant facts and anticipate where misconceptions or even rampant conspiracies can emerge. Ecologists have to step up to the task, as much as other life scientists.

Along with others (Boele-Woelki et al. 2018), I urge scientists to share knowledge and ideas with more than just their immediate collaborators,

turning an Open Science mindset into practice. ‘Open Science’ is a concept that has been defined and re-defined in many ways (Hampton et al. 2015; Vicente-Saez & Martinez-Fuentes 2018), but at heart it describes a scientific process that is transparent and shared among the experts as well as with the lay public. Open Science, including shared datasets, freely accessible publications and high visibility of scientists on social media platforms, has undoubtedly contributed to the successful responses of the global scientific community to the novel coronavirus (Besançon et al. 2021; Homolak, Kodvanj & Virag 2020). There are admittedly inherent challenges to Open Science practices, including the misinterpretation of results by the lay public, but that is again where the researchers themselves need to publicly counteract false narratives and work on boosting scientific literacy in the communities we serve. This is particularly important for ecologists and other life scientists at a time when zoonotic diseases are on the rise. Transparent science, translated for the popular press, can be effective. For example, one of the reasons that climate change is on the lips of most government officials is that the facts have been reported and discussed in mass media for years (Swain 2012). Knowledge affects behaviour: some consumers altered their meat consumption patterns when they became aware of the environmental impact of intensive meat production (Sanchez-Sabate & Sabaté 2019), while Shreedhar and Mourato (2020) linked participants’ support for conservation to the knowledge that COVID-19 was caused by humankind’s over-exploitation of the natural environment. We need to use these Open Science tools to help restore public trust in science and mitigate our impact on the biosphere.

However, ecologists are humans too, and the selfless sharing of resources or collecting of ‘extra’ data will not be sustainable unless there are incentives to change. Some benefits to the changes I have suggested are purely selfish. In my own experience, writing for mass media has earned me much more recognition than publishing in peer-reviewed outlets: the 50-odd articles I have written since 2001 have barely garnered 1,200 citations, while the four articles I wrote for *The Conversation* have been read nearly 30,000 times since 2015! There is growing recognition that, for ecologists, an active social media presence and Open Science approaches can lead to better research opportunities, citations and career progress (Hampton et al. 2015; Lamb, Gilbert & Ford 2018). Online visibility of researchers from marginalised groups (Maas et al. 2021) can certainly help with the decolonising of ecological science to lead to a more representative and ethical way of conducting ecological research.

However, the challenges to Open Science in the Global South are significant. Open access publishing is often prohibitively expensive; preparing data for shared databases takes a significant time investment;

and many researchers fall prey to ‘predatory’ publishers while chasing publication targets (Nwagwu 2015). Therefore, employers and funding bodies also need to buy into the importance of Open Science and the ecological side of disease surveillance. Technical training and conversations about Open Science are vital for development in the Global South (Atiso, Kammer & Bossaller 2019; Nwagwu 2015). Funders and research institutions can effectively boost disease surveillance by creating open access databases (e.g. <https://www.gbif.org/> and <https://www.boldsystems.org/>), incentivising researchers to publish their data on these platforms, adding financial support for disease surveillance to all funding applications and prioritising transdisciplinary research.

■ Conclusion

Many funding applications already require evidence of societal impact or ‘outreach’ efforts linked to funding; this impact could more explicitly include a public health component. Further, at governmental level, it is vital to coordinate efforts to monitor pathogens in animal hosts, using a One Health approach that integrates social and natural science with public health, veterinary medicine and policymaking. This is a major challenge, but initiatives such as South Africa’s National One Health Forum (Weyer & Mulumba 2017) can bring together all the vital stakeholders that could design solutions to the complex challenge of pandemic preparedness. Of course, these initiatives should not forget to draw a few ecologists into the conversation. The pandemic is a vivid reminder that anthropogenic change is not merely an environmental concern, but a potentially catastrophic disruption of our own welfare.

An analysis of risk communication strategy during COVID-19: A case of Twitter in South Africa

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■ Abstract

Background: Since March 2019, coronavirus disease caused by SARS-CoV-2 virus (COVID-19) has spread rapidly across South Africa. The conversation about COVID-19 has also increased on social media networks, including Twitter, which provides real-time information to a large audience. The South African national government has incorporated Twitter into its official communication policy to disseminate information about the COVID-19 virus and efforts to contain it. The volume of data about COVID-19 available on social media networks could be overwhelming for the public and make it more difficult to discern which information is reliable and trustworthy. This phenomenon during a pandemic is known as an ‘infodemic’ and has been recognised by several international organisations, including

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the World Health Organization (WHO) and the United Nations (UN), as a problem that could have harmful consequences for citizens.

Aim: This research investigates how the South African national government has used Twitter in its risk communication strategy to respond to the COVID-19 pandemic.

Method: Tweets on the official government Twitter account, COVID_19_ZA, were harvested for six months and analysed using content analysis.

Findings: The findings showed that the government consistently used Twitter to communicate with the public about COVID-19, making use of unique content and retweets from various sources, the most prevalent being the minister of health, Dr Mkhize. Most tweets sent via the COVID_19_ZA account fell into the category of information sharing, followed by government response, which included linkages with international partners such as the WHO and the Cuban government. Other categories identified included personal protection measures, morale boosting and technology interventions. The ubiquitous nature of Twitter was found to be beneficial, as tweets could be sent at all hours of the day. The government was also concerned about fake news and sent several tweets to dispel rumours and fake information about COVID-19.

Implications: The contribution of this study is to analyse how the government used Twitter as a risk communication tool during an epidemic, the first of its kind in South Africa.

Conclusion: The study found that in the rapidly changing situation of an epidemic, Twitter was an excellent solution for fast communication and risk management.

■ Introduction

The novel coronavirus disease caused by SARS-CoV-2 virus (COVID-19) was first identified in Wuhan, China in December 2019. Three months later, on 11 March 2020, the World Health Organization (WHO) declared COVID-19 a pandemic (Google 2021; WHO 2020). The global health emergency has impacted the global economy and thus mandated an extraordinary political and social response from the government (Singh et al. 2020). Information that needs to be disseminated to citizens worldwide includes what measures to take to prevent the spread of COVID-19, as well as the government's response to the pandemic (Seddighi & Salmani 2020). Government typically uses traditional media, such as television, radio and newspapers, to disseminate information, with social media becoming a more critical part of the information highway during the recent past (Rufai & Bunce 2020; Singh et al. 2020). Seddighi and Salmani (2020) reported

that by March 2020, many state leaders worldwide were using Twitter as a platform to inform citizens about COVID-19.

Social media have become a part of our daily routine, with the most critical applications being Facebook, Twitter, Instagram and WhatsApp (Amani et al. 2020; Dastani et al. 2015). Ortiz-Ospina (2020) estimates that one in three people worldwide uses social media in some form or another. Social media provide the opportunity to keep the public informed in real time during a crisis and reach a wider audience than would be possible with traditional media channels (Seddighi & Salmani 2020).

Twitter has reported a 45% increase in the usage of curated event pages and a 30% increase in direct messaging usage since 06 March 2020 (Jolly et al. 2020). Four million South Africans make use of Twitter, with 73% using social media as a source of news. However, only 28% of these South Africans say they trust social media as a source of information (Fourie 2020).

Health misinformation is a big problem on social media. Health misinformation is defined as 'information that counters the best available evidence from medical experts at the time' (Singh et al. 2020, p. 1). This phenomenon can be found across many social media platforms and is not limited only to information related to COVID-19. The literature has reported misinformation about a number of issues, including vaccinations, Ebola, SARS and Zika outbreaks (Akin et al. 2020; Manene, Hove & Cilliers 2023; Şenol & Avcı 2020; Singh et al. 2020).

Health misinformation has become such a serious matter that the UN and WHO acknowledged that the infodemic of misinformation could create a secondary crisis brought about by the pandemic (Pastor-Escuredo & Tarazona 2020; Roitero et al. 2020). The word 'infodemic' is derived from the root words 'information' and 'epidemic'. Infodemic refers to 'an excessive amount of data that is made publicly available, consisting of both accurate and less accurate information, which makes it harder to find reliable, trustworthy and accurate guidance when needed' (Manene et al. 2023, p. 1). Infodemics can influence a community at a social and economic level with either negative or positive consequences. If Twitter is used to inflame or divide racial groups, it could lead to violence, while some have used it more positively to bring together communities in a time of need (Pastor-Escuredo & Tarazona 2020).

During the pandemic, governments worldwide had to respond and disseminate information about the virus and their efforts to contain the pandemic in an unprecedented manner (WHO 2022). A study by Rufai and Bunce (2020) found that only one of the Group of Seven (G7) leaders, Chancellor Angela Merkel (chancellor of Germany until 2021), did not use

Twitter to communicate during the COVID-19 pandemic. Similarly, Twitter has become a valuable tool in the South African government's arsenal, with President Cyril Ramaphosa and the minister of health, Dr Zweli Mkhize, choosing to use their personal Twitter accounts to send tweets to 4m South Africans. A separate Twitter account, @COVID_19_ZA, was introduced by the Department of Health as a dedicated portal for COVID-19 information.

This research investigates how the South African national government has used Twitter in its risk communication strategy to respond to the COVID-19 pandemic. To answer this question, content analysis was done on all the tweets on the official COVID-19 Twitter account, @COVID_19_ZA, posted during the first six months of the pandemic. The rest of the chapter will first introduce the empirical and theoretical literature on the subject, followed by the methodology used in the study. A discussion of the analysis and results follows, with a discussion of the insights and recommendations arising from the study, after which the chapter concludes.

■ Literature review

During natural and human-made disasters, communication is critical to all phases of disaster management (Mukkamala & Beck 2016). In the past, traditional media such as television, radio and newspapers were used to share information with the public. Smartphones provide people with access to real-time and interactive information, while social media platforms such as Facebook and Twitter encourage users to produce and consume information in real time (Pastor-Escuredo & Tarazona 2020).

During pandemics, social media is often used as channel to convey information to the public as it is easily accessible and able to reach a wide audience (Jolly et al. 2020; Manene et al. 2023). Social media allows government to monitor emergency situations in real time through location-based services such as time-stamped and geo-located data and can respond effectively to the need on the ground (Diaz et al. 2020; Purohit & Mehta 2020). Social media networks also offer a virtual space separate from the user's real world, where sensitive or taboo topics such as domestic violence and HIV stigmas can be discussed. The popularity of these networks has brought about a sharp increase in their usage during the COVID-19 pandemic, as seen by the reported 45% increase of Twitter during the first three months of 2020 (Jolly et al. 2020).

The government must understand what communication channels and sources of information it can use on social media to make its risk communication strategy more effective. Human behaviour during public health crises has changed because of the way people collect and search

for information. The virus itself also presents a unique challenge: it prevents face-to-face interactions, leaving people to rely on remote platforms such as social media (Hove & Cilliers 2023). Therefore, the discipline of health communication has to change with the times to inform the public about health-related issues and create individual and social awareness about health-related risks (Akin et al. 2020; Vraga et al. 2023). Porat et al. (2020) posit that these health communication guidelines and strategies must be accessible, reliable, helpful, actionable, acceptable, inclusive, consistent, understandable and promote sustainable behaviour change in individuals.

Twitter was created in 2006 as a social media site that offered microblogging in the form of real-time tweets comprising a maximum of 280 characters. Hashtags (#) within posts can be used to collect tweets into specific topics (Twitter 2023). While users can put direct messages on the site, they can also provide updates to previous messages, comment or reply to other messages, re-post a particular message to their page (retweet) or like messages. No permission is needed to follow a specific user's profile (Rufai & Bunce 2020).

During COVID-19, Twitter has emerged as one of the most frequently used platforms to publish and obtain information (Seddighi & Salmani 2020). Many health care professionals use Twitter to convey health information and warnings to a broad global audience (Kullar et al. 2020). Because of these information-sharing capabilities, Twitter is one of the preferred social media tools during crises or disasters (Porat et al. 2020). Before the event occurs, social media can issue disaster warnings and set up crisis communication. During disasters, it is helpful to send and receive requests for help. After the disaster, the communication can be analysed and used for disaster documenting and lessons learned in relation to delivering news, response information, raising awareness, mental health support and sharing stories (Houston et al. 2015). During infectious disease outbreaks, Twitter has effectively engaged, educated and supported people to change their behaviour, resulting in an overabundance of information (Porat et al. 2020).

The infodemic phenomenon is amplified through social media, as information is produced and spread faster than the scientific evidence, which tends to be more rigorous (Manene et al. 2023). This mismatch leads to an information overload on social media platforms, much of which is neither accurate nor true (Porat et al. 2020). During the COVID-19 pandemic, there was often a lack of transparent, actionable, credible and inclusive information from trustworthy sources, leading to misinformation about COVID-19, unproven preventive measures and the anti-vaccination movement (Park et al. 2020).

There is also a more personal impact, as individuals may find that infodemics increase their distress and risk for common mental health disorders (Shultz, Baingana & Neria 2015). Early studies during the COVID-19 pandemic suggested that mental health problems such as anxiety and depression were positively associated with frequent social media exposure (Gao et al. 2020).

Research has been done to investigate the extent and effect of infodemics on social media. Extensive collections of tweets have been collected for different countries, which can be analysed for content, source, propagators and reach of information (Leng et al. 2020; Medford et al. 2020; Miller 2020). While previous literature has focused on the factuality of the information in the dataset by investigating fake news, rumours and conspiracy theories, the COVID-19 infodemic has also introduced the potential to harm through the spread of fake cures, panic, racism and mistrust in the authorities, among others (Alam et al. 2020). The global nature of COVID-19 has also introduced a geographical problem, as locally produced misinformation can be spread globally. This means that misinformation from an apparently credible source, such as a news agency in one country, has the potential to undermine the health authorities in another country (Huang & Carley 2020). Vosoughi, Roy and Aral (2018) postulate that the spread of false news is faster, deeper and broader than accurate news.

In some cases, the volume of misinformation can lead to the denial of scientific evidence, with dire consequences for public health (Vraga et al. 2023). One of the reasons for this problem is the delayed response by the authorities to false news. Alsudias and Rayson (2020) reported a two-month difference between when false information about hot weather killing the COVID-19 virus was published and when authorities officially responded and corrected the information.

The WHO has likened an infodemic to 'a disease that spreads and circulates in the form of misleading information' (Elhadad, Li & Gebali 2020, p. 165202). To increase the validity, credibility and correctness of shared information on social media, the WHO asked popular search engines and social media platforms to display the official WHO reports and statements as the first hit on any search related to COVID-19 (Shu & Shieber 2020). Seddighi and Salmani (2020) also found that because of the interactive nature of Twitter, rumours and misrepresentation can be questioned by users immediately and counteracted by re-publishing the correct or formal content. Online fact-checking sites also publish information daily about disinformation stories. The most prevalent categories of fake news in relation to COVID-19 include false preventions and cures, false claims about the nature of the disease, false diagnostic procedures, false origin stories and false emergency measures (Huang & Carley 2020).

■ Risk communication

Risk communication ensures that:

[A]ll related risk messages can be presented and shared to participants in a risk communication process openly and timely, aiming to rectify the knowledge gap between the originators of information and those receiving the information and adjust the public's behaviour to cope with the risk proactively. (Árvai & Rivers 2014, p. 3)

If there is a lack of transparency, whether real or perceived, the effectiveness and impact of the risk communication will be decreased. Similarly, disclosing information and delayed decision-making can contribute to ineffective risk communication, as in the case of Wuhan during the COVID-19 outbreak (Kavanagh 2020). Seddighi and Salmani (2020) conducted a literature review to investigate the various purposes of risk communication. They identified several categories: early warnings, disseminating information and misinformation, advocacy, personal gains, assessment of the situation, organisations' role, public mood, geographical analysis, charity, trust and using influencers.

Risk communication relies on internal and external communication to be effective. Internal communication occurs among risk assessors and managers, the government and the academic community, while external communication shares information between the government and the public. To explain risk communication, Zhang, Li and Chen (2020) developed a government-expert-public risk communication model.

The model postulates that there are three components or communication interactions in effective risk communication. The first is government-public, where the government is responsible for an effective risk governance process and external communication with the public to provide adequate and accurate information regarding COVID-19. Information disclosure should be accessible and open, as well as socially responsible. Complete transparency may cause unjustified fear among the public. During the COVID-19 outbreak in Wuhan, for example, the government initially concealed information regarding the virus in order to maintain social stability (Zhang et al. 2020). Information disclosure is often an exercise in balancing public risk tolerance and the subsequent desirable outcomes. However, an effective government-public relationship should be interactive. The public needs to provide feedback in response to the government's initial information so that the information can be adjusted to what the public wants to know. If communication is not interactive, the government could become frustrated, as public perceptions of risk reduction measures could appear to be inaccurate and unrealistic (Covello, McCallum & Pavlova 1987).

The second component of the model relates to government-expert internal communication, which incorporates risk assessment and decision-making. A range of expert judgements about the risk is used to establish the probability of each possible outcome, plan a response and weigh each potential benefit and risk (Zhang et al. 2020). This process needs to take place in an environment that does not restrict expert voices. In contrast, the academic community needs to investigate and share the results and findings of their studies rigorously and scientifically. The government must use these evidence-based results to make the most effective decisions regarding handling the risk (Tucker & Ferson 2008).

The last component of the model entails expert-public communication and aims to bridge the gap between expert and public views on public health issues. This is a type of external communication. Experts must take responsibility for translating and conveying professional knowledge simply and explicitly for the public to understand and use to make decisions about their health and care (Gesser-Edelsburg et al. 2015).

Risk communication must prepare the public to adapt to changing circumstances or uncertainty during COVID-19 (WHO 2023). The first step in this journey is developing and delivering appropriate structured emergency messages, as accurate and timely information is needed to minimise unforeseen social disruption and economic activity. These messages should instruct, inform and encourage appropriate self-protective behaviour by building trust and dispelling rumours (Traberg et al. 2023). This could include information about assessing one's risk of infection and the risk of becoming seriously ill or dying, the availability of vaccines and what drugs to use if one is sick (Zhang et al. 2020).

■ Methodology

The study used a qualitative review of tweets downloaded from the official @COVID_19_ZA Twitter account that the Department of Health introduced as a dedicated portal for COVID-19 information. The period under investigation was 15 March 2020 to 15 September 2020. The start of the study corresponds with the date when President Ramaphosa declared the COVID-19 pandemic a national disaster, while the end date was five days before the country moved down to alert Level 1 of the national lockdowns. Using the Twitter Streaming API, all tweets were collected on the COVID_19_ZA Twitter account. A total of 1,452 tweets were collected from the account, 351 of which were retweets from 58 unique sources. The tweets were analysed using content analysis and thematic analysis and presented using descriptive statistics such as graphs and tables. Ethical clearance was obtained through the University Research Ethics Committee. These results are presented in the next section.

■ Discussion of results

Time plays a vital role in controlling outbreaks. Getting good information and acting on it rapidly can halt outbreaks before they require emergency measures. (Zhang et al. 2020, p. 64)

Information about COVID-19 published on Twitter has increased at an unprecedented rate because of the global impact of the disease. This increase has led to an infodemic in which users are exposed to so much information that they cannot discern what is fake news and what is real. Banda et al. (2020) found that their dataset of COVID-19-related tweets increased from 6,737,875 in January 2020 to 110,220,360 in March 2020, representing a 16-fold increase within 90 days.

This section discusses the analysis of the tweets collected from Twitter for the period from 15 March 2020 to 15 September 2020. A total of 1,452 tweets were collected from the COVID_19_ZA account. Of the total number of tweets, 351 were retweets from 58 unique sources. Figure 15.1 indicates the volume of tweets per week on the COVID_19_ZA account. The orange lines provide a timeline of the most important events during the COVID-19 pandemic. On 06 March 2020, South Africa registered the first COVID-19 case in the country, while the first orange line on the diagram indicates 15 March when President Ramaphosa declared the COVID-19 pandemic a national disaster in South Africa. While there was some activity in the next few days, the volume increased considerably the following week, leading up to 27 March when the country went into lockdown Level 5.

The activity again spiked about a week into lockdown as the 'new normal' was discussed by South African citizens. After 09 April, there was some activity when the president announced that the country's national lockdown would be extended by two weeks beyond the initial 21 days. The least amount of activity is recorded for the period between lockdown Level 4 (01 May 2020) and Level 3 (01 June 2020). The reduced activity was most likely because of what is known as 'lockdown fatigue' when citizens become weary of lockdown restrictions and do not apply preventative measures as stringently as before since they perceive the initial crisis to be over. As South Africans became used to the lockdown regulations and the overload of information on COVID-19 on traditional and social media, the infodemic started to numb citizens to these messages. As a result, less information was provided by the government. The next period until 15 August when South Africa moved to lockdown Level 2 shows a steady rhythm of tweets, with more tweets being sent early in the week. This trend continued until 15 September, five days before South Africa went down to lockdown Level 1. According to the diagram, there were only two days on which no tweets were recorded. This record shows the

commitment of the Department of Health to make Twitter part of its risk communication strategy during the pandemic. Refer to Figure 15.1.

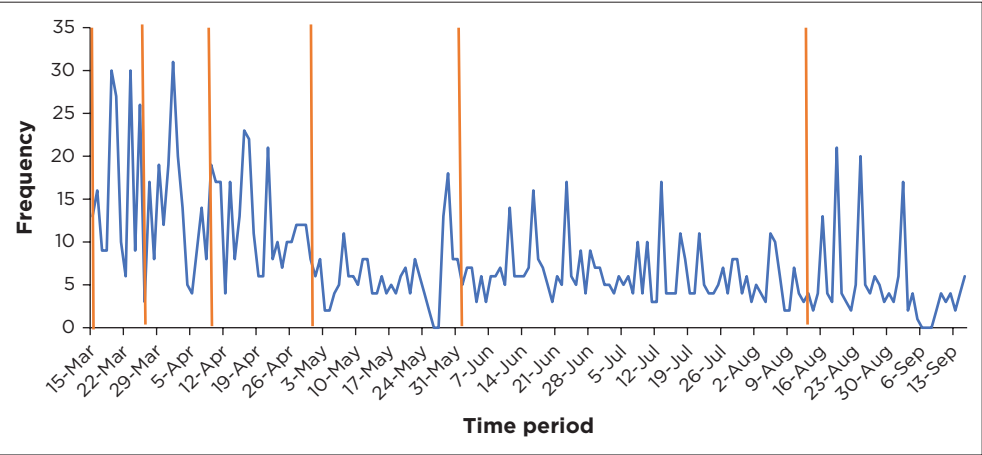
There were 351 retweets from 58 unique sources during the period when tweets were collected. Table 15.1 shows the categorisation of these sources. The most retweeted source was the minister of health, Dr Zweli Mkhize, with 278 tweets. The majority of these were the daily statistics that the minister released via his Twitter account. This is in line with the findings of Singh et al. (2020) and Rufai and Bunce (2020), who found that the statistics could be made available in real time when available, reaching a large audience almost instantaneously and supporting the government’s multipronged risk communication strategy, which made use of the national government website, social media and traditional media to relay the same information across various platforms to reach a wide audience. These tweets would typically start with:

‘RT @DrZweliMkhize: As of today, a cumulative total of 628,259 confirmed COVID-19 cases in South Africa had been recorded, with 1,218 new cases identified.’

‘RT @DrZweliMkhize: Podcast: We speak to Professor Barry Schoub, who explains what may lie ahead in South Africa’s #COVID19 fight.’

‘RT @DrZweliMkhize: #ListenToTheExpertsnProtect the elderly & the vulnerable against #Covid19’, says Prof. Lucille Blumberg, deputy director, NCID [National Institute for Communicable Diseases].’

The platform was used to pass on information from international organisations and demonstrate the involvement of these organisations in South Africa during the COVID-19 pandemic. It is crucial to provide such



Source: Author’s own work from the data collected on Twitter.
FIGURE 15.1: Volume of tweets per week in South Africa on @COVID_19_ZA account (15 March 2020-15 September 2020).

TABLE 15.1: Sources of retweets.

International organisations	No. of retweets	News organisations	No. of retweets
@MoetiShidi (WHO Regional Director for Africa)	1	@eNCA	3
@whoafro	1	@newsroom	4
@EmbassyCubaZA	1	@GCISMedia	10
@gretathunburg	1	@SAfmnews	2
@WHOint	2	@News24	1
		@KhayaJames	1
		@ewnreporter	2
Government sources		@kailenepillay	1
@gautenghealth	1		
@bhekisisa	1	Commercial	
@governmentza	13	@samsungmobile	1
@NorthWestDOH	1	Private individuals	
@mynsfas	1	5 individuals with 1 Tweet each	5
@CyrilRamaphosa	1		
@DrZweliMkhize	278		
@PresidencyZA	16		

Source: Author's own work from the data collected on Twitter.

information to the public to assure them that the national government is communicating with international partners and that decisions are based on international guidelines and best practices. The WHO played a pivotal role in the fight against COVID-19, with WHO retweets from three individual sources when WHO representatives arrived in the country.

'RT @MoetiShidi: Thank you, Minister @DrZweliMkhize, for welcoming the @WHO surge team of experts supporting South Africa[']s #COVID19 response.'

'RT @whoafro: Wearing a mask is only effective to stop the spread of #COVID19 if it is worn properly.'

'RT @WHO Surge Team deployed to South Africa has submitted a detailed report of the epidemiological trajectory of the virus in the country.'

The environmental activist teen Greta Thunberg also made it on to the retweet list with an announcement about the benefit concert, One World: Together at Home. The concert was intended to promote the practice of social distancing while staying together during the COVID-19 pandemic.

Government sources focused on the official page within the national government's TweetDeck, including the health pages of some

provincial departments. The variety of Twitter pages, including the president's official Twitter page, shows the extent to which the national government was making use of Twitter as a communication tool, similar to other governments worldwide that adopted Twitter as part of their risk communication strategy.

Several news organisations were retweeted during the six-month data collection period. These tweets are from a range of independent and state news outlets, showing that the government does not have a preferred media outlet. The tweets typically announced an upcoming presidential address, or when the minister of health, Dr Mkhize, would make important announcements or visits to health sites.

'RT @eNCA: At 7 pm, we expect an address from our health minister for the latest on our country[']s efforts to push back coronavirus. Tune in on eNCA at 13:00'

'RT @kailenepillay: Minister Zweli Mkhize with KZN health MEC Nomagugu Simelane-Zulu and Premier Sihle Zikalala at the Durban Port to welcome the Queen Mary 2 @TheMercurySA.'

The news organisations also used the opportunity to market discussions with experts on their news platforms, as seen from this tweet from News24.

'RT @News24: Do you have a question for Professor Salim Abdool Karim? Submit it herenhttps://t.co/GxpgHWfiVI https://t.co/LQG8jkTBCs'

One of the retweets was from a commercial company, Samsung, which provided a donation of cellular phones to the Department of Health. Twitter can be used to provide brand exposure to commercial companies efficiently and effectively. This is one way to encourage donations during a crisis such as the COVID-19 pandemic when innovative solutions are needed.

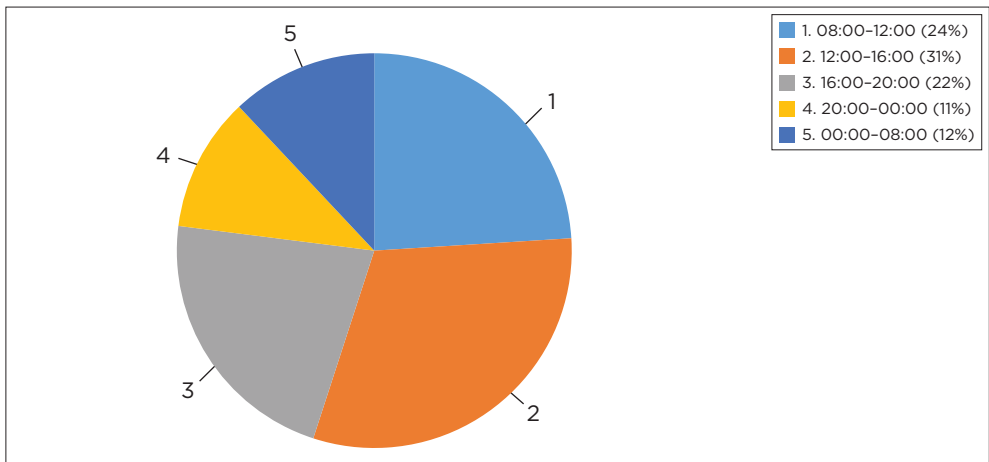
'RT @samsungmobilesa: To further strengthen our call to support those on the front lines of the fight against COVID-19, we have donated 1500 handsets to be distributed in the provinces hardest hit by the spread of the virus.'

Five individuals were retweeted during the data collection period. Although these individuals were expressing their personal opinions, such tweets could serve to bring government agendas to the forefront, for example, by raising issues such as national health insurance. This could be a very efficient way of swaying public opinion as the tweet is seen to come from peers, not from the government. Some of the other individual retweets supported local initiatives to fight COVID-19 and boost the country's morale. Such individuals are used as champions for initiatives to encourage participation by the public.

One of the advantages of Twitter is the ubiquitous nature of the social network. Tweets can be sent out at any hour, and from there, the spread of the information is virtually limitless. Figure 15.2 illustrates that 55% of tweets were sent out during working hours. Almost a quarter of the tweets

(22%) were sent from 16:00 to 20:00, while a similar percentage (23%) were sent between 20:00 and 08:00. The benefit of tweeting after 16:00 means that the person assigned to tweet or retweet is not confined to office space or time. Tweets can be sent out when needed, such as during an emergency or down time for the individual involving travel or leisure activities (Seddighi & Salmani 2020).

Figure 15.3 categorises the 1,452 tweets according to five categories. The category with the most tweets (58%) was information sharing, which was to be expected as Twitter is primarily a tool to share information.



Source: Author's own work from the data collected on Twitter.

FIGURE 15.2: Tweets sent out per hour from the @COVID_19_ZA account.



Source: Author's own work from the data collected on Twitter.

FIGURE 15.3: Categories of tweets on the @COVID_19_ZA account.

An analysis in the USA found that the most popular searches related to COVID-19 included seeking information about government interventions, the number of infections worldwide and prevention and treatment measures against the virus (Panuganti et al. 2020; Yum 2020). Because of the limit on the number of characters used, there is often a web link to the actual infographic or to a site where the reader can access more information.

Typical examples of these tweets were the daily statistics that the Department of Health released:

'As of today, a cumulative total of 568,919 confirmed COVID-19 cases in South Africa had been recorded, with 2879 new cases identified.'

Another theme in this category included sharing information on protecting oneself from COVID-19 and what to expect if one tested positive for the virus. Three hashtags were created for this theme: #ListenToTheExperts, #ListenToTheDoctor and #HealthHighlights.

'#ListenToTheExperts So your #Covid19 isolation or quarantine period is over. Should you test? We asked Professor Francois Venter, Director of Ezintsha (Wits University).' <https://t.co/rZXyv1rzmZ>

'#ListenToTheDoctor Your most important mask questions answered by doctors from the Gauteng General Practitioners Collaboration.' <https://t.co/3VrSTST6mb>

'<https://t.co/1FtYohleFdnn>#HealthHighlights Inside the Nasrec field hospital, the quarantine facility set up in record time.' <https://t.co/MUs5amQAd4>

The national government also identified fake news as a problem early on during the pandemic. This was similar to the experience of other governments that had to prioritise the fight against fake news and infodemics in their response to the virus.

'#ListenToTheExperts 'Fake news slows down our progress in testing for Covid-19.' Dr Florette Treurnicht Head of Dept: Medical Virology, NHLS & Wits University.' <https://t.co/rLmkOQWXbG>

'DrZweliMkhize says there is no link between anti-inflammatory agents with the spread of the #Covid19SA infection.'

'There's a lot of misinformation about #Covid_19SA. Let's work together to share the truth about the virus so we can [...].' <https://t.co/ivXhwV2xAM>

The second category was the government response (17%) to COVID-19. In this category, tweets provided information about what the national government was doing during the initial months of the lockdown to make sure South African citizens remained safe.

The COVID-19 conference that was held virtually is one of the sub-themes in the category. The conference was held on 31 July 2020 and provided a platform for various stakeholders to pool resources through

joint investments, data sharing and reciprocal access to research infrastructure.

'RT @DrZweliMkhize: #Covid19ConferencenOur 64% recovery rate is encouraging, says Health Minister Dr Zweli Mkhize.' <https://t.co/PSvYmgycAy>

The second theme in this category is the discussion around the National Health Insurance (NHI) plan and roll out. A discussion with Dr Crisp, the NHI Fund developer, was tweeted during a press conference:

Dr Crisp: People will contribute to the NHI according to their earnings.

Dr Crisp: The NHI process is a statutory process. Community consultations and parliamentary debates need to take place.

The third theme was the arrival of Cuban doctors in South Africa to assist the health care system. Dr Mkhize first announced the doctors' arrival and cautioned against prejudice or fear that these doctors would take South Africans' jobs.

'217 health specialists arrived from Cuba to aid South Africa in its fight against #COVID19 #CubainSA.' <https://t.co/eBv3XXi0QD>

'RT @DrZweliMkhize: In the Eastern Cape today, Minister Dr Zweli Mkhize cautioned against negativity towards Cuban doctors who are here to help with the fight against #COVID19.'

The fourth theme was the WHO team that arrived in South Africa. The arrival and subsequent work of the team were made available for citizens to follow on Twitter via the hashtag #WHO.

The third category, personal prevent measures (16%), provided citizens with education about protecting themselves and their families against the virus. Two hashtags were used frequently in this category: #NewNormal and #Fightcovid. These tweets often used everyday activities to show the behavioural changes necessary to protect against the virus. Users on social media informed, exchanged, sent and searched for information, but they also warned their friends and followers about COVID-19, which might be more acceptable as peer support than government intervention (Abd-Alrazaq et al. 2020; Aguilar-Gallegos et al. 2020).

'If you are eating out, remember to maintain strict hand hygiene. #COVID19 #2ndWave #AvoidResurgence #NewNormal.' <https://t.co/L3eSsuUJ6p>

'RT @DrZweliMkhize: #NewNormal Staying at an accommodation establishment like a hotel or lodge? You should follow these FIVE basic precautions/'

'#FightCOVID19 This is hard combat time...It's up to each one of us to make sure we reduce the fatalities, @DrZweliMkhize says.'

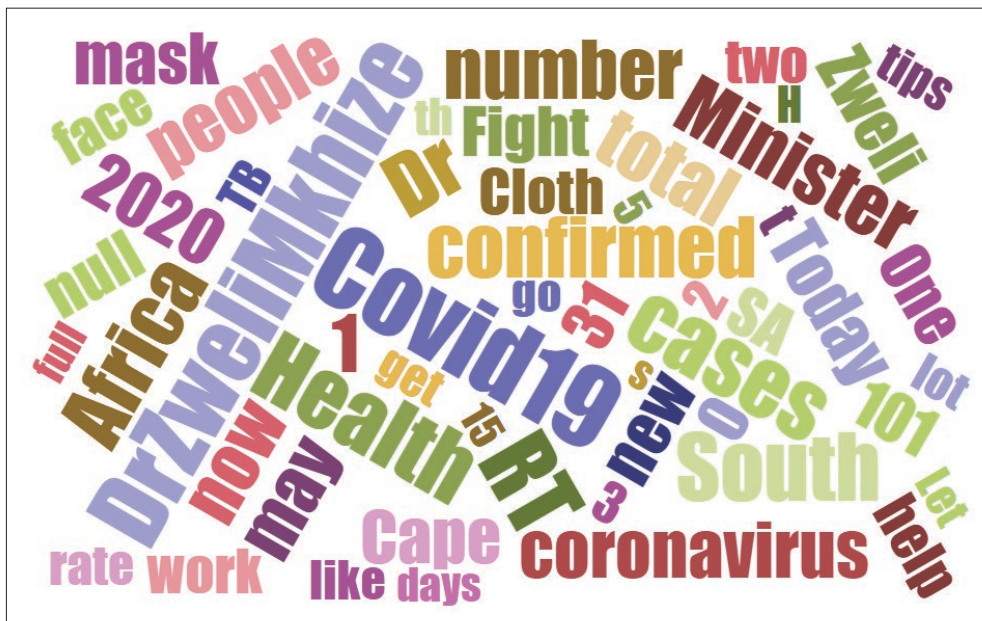
The fourth category, morale boosting (7%), focused on boosting the morale of South Africans, with three main focus points. The #Jerusalema challenge took South Africa by storm, and many health care facilities and

entire towns came together to show camaraderie and their dance moves to the country.

'Staff at Africa[']s largest hospital, Chris Hani Baragwanath Hospital, join the #jerusalemchallenge.' <https://t.co/9iQ1wNGkOz>

The hashtags #thecoviddiaries and #healthcareheroes focused on stories from COVID-19 survivors and health care staff in the trenches during the epidemic to encourage one another to believe that survival was possible. These two hashtags were well received, and readers retweeted them many times.

The last category, technology solutions (2%) was concerned with the national government's technology solutions to improve the efficiency of the health care system. A COVID-19 alert application was developed to notify users if they were exposed to another application user with COVID-19. Digital contact tracing was made more efficient by this system. An official COVID-19 service portal, COVIDConnect, was also launched to enable citizens to access services on their mobile phones. With mobile penetration in the country being very high, it made sense to use mobile technology to increase access to health services. Figure 15.4 presents a word cloud from the 1,452 tweets collected during the six-month data collection period.



Source: Author's own work from the data collected on Twitter.

FIGURE 15.4: Twitter word cloud from the @COVID_19_ZA account.

A word cloud is a text-mining technique that aids in the construction of a storyline. The most commonly cited words in all the tweets are shown visually, quickly identifying the keywords. As expected, the most frequent words used included 'COVID-19', 'coronavirus' and 'Dr Zweli Mkhize', the minister of health. The words associated with the statistics released, such as 'confirmed', 'cases' and 'number', are also prominently displayed in the word cloud. The primary protective measure, a cloth mask, is also featured, although the words are separated. This seems in line with the categories presented in Figure 15.4, where information sharing accounted for the most tweets, followed by government response and personal prevention measures.

■ Recommendations

The following recommendations were derived from the results discussed in the previous section and framed within the risk communication strategy of the WHO (2019):

- Risk communication is grounded in the perception of risk by citizens rather than the technical assessment of the actual risk. Citizens often display 'herd behaviour' in crises and follow the leader in their community or country. Government must responsibly fill this role; otherwise, the void will be taken up by those that spread false information. Twitter provides an easy-to-access communication channel that can disseminate information in real time to citizens.
- During the COVID-19 pandemic, it was essential to change citizens' behaviour to mitigate the effects of the virus. Actions such as handwashing, sanitising and social distancing had to be communicated to citizens to keep them safe. Behaviour change is a process and must be communicated and repeated multiple times from various sources. Twitter provides this type of communication, as the same information from different sources can be tweeted, retweeted or shared without producing new content on the same topic.
- The perceived risk is what motivates citizens, although local and cultural factors can also influence their actions. During the first weeks of the pandemic, the volume of tweets was much higher than in subsequent months when lockdown fatigue had set in. However, Twitter is available 24/7; thus, content can be distributed to citizens at any time, and the permanency and reach of such information are far greater than with traditional media channels.
- The WHO (2019) found that trust and transparency are the foundation of risk communication in emergencies. Citizens will trust those whom they feel are credible. The national government used @DrZweliMkhize extensively on the COVID_19 hashtag to build this trust, as Dr Mkhize

was the ‘face’ of the response to COVID-19 in the country. There were also many tweets from experts in the medical field to establish the transparency of the national government’s response by basing it on evidence from these experts.

■ Conclusion

This study investigated how the South African national government used Twitter as part of its risk communication strategy to respond to the COVID-19 pandemic. To answer this research question, 1,452 tweets on the official COVID_19_ZA account over a six-month period were analysed. Twitter was chosen as the social media platform because previous studies had shown that the use of Twitter increased significantly during periods of crisis.

In this study, Twitter was consistently used by the national government in its risk communication strategy to inform South African citizens about the COVID-19 crisis and subsequent responses. The government used various sources, both local and international, to provide messages that catered to various levels of sophistication and literacy levels. International links with the WHO and Cuba were announced to show that South Africa was not battling COVID-19 alone but could access the best medical opinions to make decisions in the citizens’ best interests. The ubiquity of Twitter was illustrated, as tweets were sent at all times of the day, even after working hours.

Twitter was used to convey information to citizens about COVID-19, the ways in which the government was responding to the pandemic including technological advancements, and how one could protect oneself from the virus. The social media platform was also used to boost the morale of citizens and health care workers through various initiatives. It is noteworthy that the government identified fake news as a possible issue in the fight against COVID-19 and used Twitter as a tool to dispel such information. Given the rapidly changing situation during the pandemic, this tool was an excellent solution for fast communication and risk management in a pandemic.

The study had some limitations. Only one Twitter account was analysed, which probably underestimated the true reach of the platform and of government communication. However, the account used in the analysis was created to provide information about COVID-19 to the public, which is the most likely place where information from the government was published. A six-month period was chosen for the study, as it encompassed the initial lockdown levels. However, a longitudinal study of the Twitter account could

produce more themes as the government response changed from level to level and between the first and second phases of the pandemic. Future research could include other official Twitter accounts from the president, the minister of health and other government sources over an extended period and involve more quantitative analysis of the tweets.

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Social media and misinformation during the COVID-19 pandemic in Africa

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■ Abstract

Background: As the coronavirus disease caused by SARS-CoV-2 virus (COVID-19) emerged in China in 2019 and rapidly spread to countries around the world, misinformation about the illness spread even faster on social media. While social media offered a crucial communication tool and access to information vital for combating this novel virus, it also became a platform for fake news.

Aim: This chapter examines how governments, international institutions, health practitioners, citizens and leaders relied on social media to share ideas, knowledge and information needed to overcome COVID-19. It also assesses how social media promotes misinformation.

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Methods: This chapter reviews the literature based largely on qualitative analysis techniques to explore how African governments and citizens communicated about COVID-19 on social media.

Findings: It was established that social media became an epicentre of misinformation and rumour mongering. The challenge of combating COVID-19 was compounded by misinformation that spread more rapidly than the virus.

Conclusion: Governments, social media companies and the World Health Organization devoted their attention to fighting misinformation and the coronavirus disease 2019. In this chapter, the authors suggest that governments should consider social media as a platform for public participation by taking the comments seriously to improve their policies.

■ Introduction

Since December 2019, social media platforms have been overwhelmed by messages about the coronavirus disease 2019 or coronavirus disease caused by SARS-CoV-2 virus (COVID-19). Individuals worldwide were talking about the coronavirus disease 2019 on Facebook, Twitter, YouTube, Snapchat, Instagram and WhatsApp. In addition, the World Health Organization (WHO), the Centers for Disease Control and Prevention and ministries of health posted statistics, guidelines, regulations and developments about the coronavirus disease 2019 on various social media platforms (Barua et al. 2020). Health practitioners also used social media on a large scale to search for and share information about the coronavirus disease 2019. Since the emergence of the pandemic, #Coronavirus has become a popular hashtag; this implies a high quest and appetite to get and share information about the coronavirus disease 2019 (Josephson & Lambe 2020).

As many institutions took the initiative to disseminate information about the coronavirus disease 2019 on social media, it became a conduit for misinformation and rumour-mongering. Some people deliberately spread misleading information about the virus on social media and shared unfounded suspicions (Barua et al. 2020). In addition, many social media users did not verify the source of information before sharing messages. Organisations such as the WHO (through Director-General Tedros Adhanom Ghebreyesus) and the United Nations (through Secretary-General Antonio Guterres) were concerned that this rumour-mongering behaviour would lead to a massive 'infodemic' with detrimental outcomes (Barua et al. 2020; Emecheta 2020; Merchant 2020).

The spread of unverified information on social media is not without repercussions. It is difficult to censor everyone posting on Twitter or

Facebook because social media companies cannot easily or instantly pull down messages posted on their platforms before they reach viewers. Whatever the content is posted, responsible social media companies often react after the damage has been done. For instance, the actions by Twitter and Facebook over an article by President-elect Joe Biden sparked disputes as they tried to limit its spread because it was allegedly associated with misinformation (Fox 2020). By the time social media companies pull down a post, many people have already seen it or shared it on other platforms (Wu et al. 2019). To curb this, some companies classify the content as false if a post is found to contain misleading information (Fox 2020). Still, not everyone is going to check whether the information is classified as fact or otherwise.

It is difficult for social media companies to control the content posted on their platforms about coronavirus disease 2019 because of the different patterns of misinformation (Meserole 2018). Misinformation is defined as incorrect information disseminated either by accident or intentionally (Scheufele & Krause 2019). Misinformation or misleading information can come as fake news, unverified information, rumours, spam, trolling, hate speech or an urban legend, among others. According to Wu et al. (2020), fake news refers to intentionally disseminated misinformation in a news format. Such content can become viral through social media. Unlike fake news, unverified information may be either accurate or false, but it remains unclassified as either false or real.

Similarly, rumours are shared along with unverified information that has yet to be categorised as false or true. Likewise, spam refers to unsolicited information that unfairly floods the recipient's inbox. It is typical of email and Facebook. Trolling is the information intended to cause disruption or instil hatred and occurs when a particular group of people tries to instil hatred towards certain other people. This could be similar to hate speech, which is content shared on social media targeted at particular people, expressing hatred or prejudice and threatening the targeted victims' lives. Finally, when misleading information related to fictional stories about local events is intentionally spread for entertainment purposes, it is known as urban legend (Wu et al. 2020). In all these misinformation types, the content may be manipulated intentionally or unintentionally or based on unfounded claims. Whatever shape misinformation takes, there are repercussions, especially when it is widely spread through social media (Meserole 2018). This study explores how Africa communicated about the coronavirus disease 2019 and monitored misinformation. The chapter begins with an introduction, followed by a literature review, a presentation of the analytical approach, a discussion and the conclusion and recommendations sections.

■ Literature review

■ The role of social media in Africa during the COVID-19 pandemic

Social media connotes internet-based applications with consumer-generated content to create and disseminate information and join the online community (Hudson 2020). It refers to the behaviour, practices and activities of a networking community of online application users participating in sharing information, opinions and knowledge using conversational media (Stellefson et al. 2020). Social media are a digital tool that gives users options to create and share content with other users. It comprises various applications that allow users to create online communities and chat privately and in groups to share ideas, content and personal messages. Examples of social media include Twitter, Instagram, Pinterest, YouTube, WhatsApp and Facebook. All these platforms permit users to share information with a large population in a few seconds (Hudson 2020). These social media applications have proved to be very instrumental in communicating information on COVID-19 since its outbreak.

The WHO (2020) defined SARS-CoV-2 (COVID-19) as a severe acute respiratory syndrome. It is a novel coronavirus that was first diagnosed in Wuhan City, China in December 2019 (Kali 2021a; Sahni & Sharma 2020). The virus seems exceptionally severe because it spread from China to all the continents and countries of the world in less than six months. Furthermore, COVID-19 appears deadly because, over the year from December 2019 to November 2020, the virus accounted for 64,897,870 cases and 1,500,271 deaths worldwide (Worldometer 2020). By 24 January 2024, there were 9,575,050 cases in Africa and 175,494 deaths (WHO 2024).

Social media and internet users quickly captured the coronavirus disease 2019 outbreak and subsequent virus developments across the world. This was made possible by the increased level of internet penetration in the world. The number of people who now use the internet has grown to over 5.35 billion (66.2% of the world population), and more than 5.04bn people (62.4% of the world population) use social media (DataReportal 2024). This is an increase from 2020 levels, where at least 58% of the world population used the internet, and 49% used social media, as the world population was estimated at 7.8bn (Kaneda, Greenbaum & Kline 2020). In 2021, globally, Facebook penetration was estimated at 62%, YouTube, WhatsApp at 52%, Facebook Messenger at 36%, Twitter at 22%, Instagram at 39% and Snapchat at 13% (Dixon 2022).

Based on the global index, internet penetration in Africa differs significantly by region, with 3.5% users in West Africa, 3.4% in North Africa,

2.5% in Southern Africa and 2.7% in Central Africa (Petrosyan 2024). These statistics do not necessarily imply that internet penetration in one region is better than in others since each region's population is unique. However, more people are using the internet in some regions than in others.

Social media offer a key platform for disseminating misinformation. Among the critical topics spread through social media are those dealing with illnesses, diseases, treatment, prevention methods, guidelines on preventing pandemics and ways of transmitting infectious diseases (Sahni & Sharma 2020). In a study in Brazil, Carey (2020) found that when the Zika epidemic started spreading in 2015 and 2016 and yellow fever began to threaten lives in 2018, people shared unscientific and misleading information about how the viruses spread. Misconceptions about how the viruses are transferred from one person to another thus soared, and people misunderstood the side effects of the diseases (Carey 2020). The efforts of governments to correct misinformation seemed futile.

Misinformation can be as dangerous as a pandemic in some instances. One study showed that 'infodemic' or misinformation spread through social media in the form of rumours, hate speech and other means led to suffering among people (Barua et al. 2020). According to Silk (2020), some conspiracy theories about the treatment of coronavirus disease 2019 raised false notions that practices such as eating cow dung, drinking bleach or ingesting camel urine were effective against the viruses. The study established that misinformation in its various forms has caused many deaths (Silk 2020).

Evidence of misinformation was also encountered in Africa. There were cases of misinformation about COVID-19 linked to the 5G network. Rumours on social media claimed that the virus is spread through the 5G network (Kennedy 2020). Facebook showed a video of 5G towers being burned down in the United Kingdom and the Netherlands, and people celebrated these incidents online (Bruns, Harrington & Hurcombe 2020). According to Kennedy (2020), people argued that the coronavirus disease 2019 was merely a cover-up of the threat posed by 5G.

Some Facebook users were convinced that the 5G network was killing people, and some claimed that 5G electromagnetic waves emit electromagnetic radiation that causes cancer (Kennedy 2020). Others argue that the 5G network exposes people to dangers such as weakening people's immune systems (Bruns et al. 2020; Kennedy 2020). Even role models posted messages on social media claiming a link between COVID-19 and wireless mobile network connectivity. For instance, a video by Pastor Chris Oyakhilome circulated on YouTube, Twitter and Facebook showing him explaining the relationship between COVID-19 and the pandemic (Kali 2021b). He argued that the coronavirus disease 2019 was just a sham used to compel

nations to consent to adopt the insertion of a digital identity into human bodies, which would be monitored via the 5G network (Banjo 2020). Pastor Chris's video attracted more than 104,200 views on Twitter alone (Banjo 2020). Other cases of misinformation contended that the 5G network is hazardous to human cells and that, in some instances, it has killed plants close to where the towers have been installed (Banjo 2020). Other comments on social media claimed that in Nigeria, the restriction of movement, known as lockdown, was meant to give technicians the chance to install 5G cables (Banjo 2020).

Other people use social media to promote misinformation. Messages were shared on Facebook and Twitter claiming that one could conduct a COVID-19 self-test by holding one's breath for about 10 s (Conroy-Krutz 2020). Some argued that drinking alcohol could eradicate the virus, while others believed that African blood or black skin makes people immune to the coronavirus disease 2019. Rumours claimed that inhaling steam from a mixture of garlic, onion, ginger and lemon could kill the coronavirus and that drinking the same concoction would heal an infected person (Conroy-Krutz 2020).

Some studies found that disseminating unfounded and misleading information about diseases has severe effects. When misgivings about public health are disseminated through social media, they lead unnecessarily to undesirable and regrettable outcomes. For instance, Li et al. (2019) found that the effects of such misinformation include misunderstanding of the illness, anxiety, fear, adoption of wrong treatment methods and even death. This means that it is crucial to manage the information shared on social media to prevent unnecessary and undesirable outcomes. As important as access to information may be, it is necessary to consider the content of the information being shared on social media to avoid uncalled-for outcomes and loss of life.

■ Tackling misinformation about the COVID-19 spread via social media

The world is now taking initiatives to tackle misinformation and its undesirable outcomes. Social media platforms such as Twitter employ tactics that redirect individuals who misspell 'Coronavirus' to related content and reliable sources (Josephson & Lembe 2020). Twitter and Facebook have introduced a fact-checking programme to filter information shared online and classify it as false or true. The companies have made it possible to detect messages spread in languages other than English, including French, Portuguese, Hindi, Arabic, Spanish and Italian, as well as many African languages, including Sotho, Zulu, Southern Ndebele,

Setswana, Afrikaans, Wolof, Swahili, Igbo and Yoruba (Kazeem 2019). The WHO also uses Facebook and WhatsApp messaging services to warn people about COVID-19 misinformation and disseminate prevention guidelines. These are user-friendly applications that allow the WHO to disseminate information to nearly 2bn people connected to its page or group who wish to access information from it (Lacina 2020).

The frequent lack of reliability and accuracy are critical hitches related to health information disseminated via social media and other online sources. A complicating factor in identifying reliable information is that much of the information shared on social media platforms is anonymous. Where health-related information or a video is posted and shared on social media, it may be incomplete, or essential details might be missing because such content is editable and its length is reducible when sharing it via applications such as WhatsApp and Twitter. Furthermore, some social media users may reduce a health-related message or video to share it, not with the intention of spreading the intended message but to attract attention and get more viewers or followers. Hence, social media companies and health institutions have the responsibility of warning and encouraging patients and people in general to seek information from reliable sources (Voorveld et al. 2018).

For health guidelines, the WHO collaborated with search engine companies to prioritise information from reputable health institutions. The search engines from selected companies, such as Google, prioritised health information about COVID-19 from institutions, including the WHO and government ministries of health. The search engines made it easy to access validated information on health by placing it at the top of all the information unearthed by a search engine. It became challenging to dig up information from non-reputable institutions because of this management strategy employed to curb the spread of misinformation. When one searches for information regarding COVID-19, the search engine makes it possible to get the information provided by reliable sources more easily than to get information from unknown sources that might not be truthful (Makhortykh, Urman & Ulloa 2020).

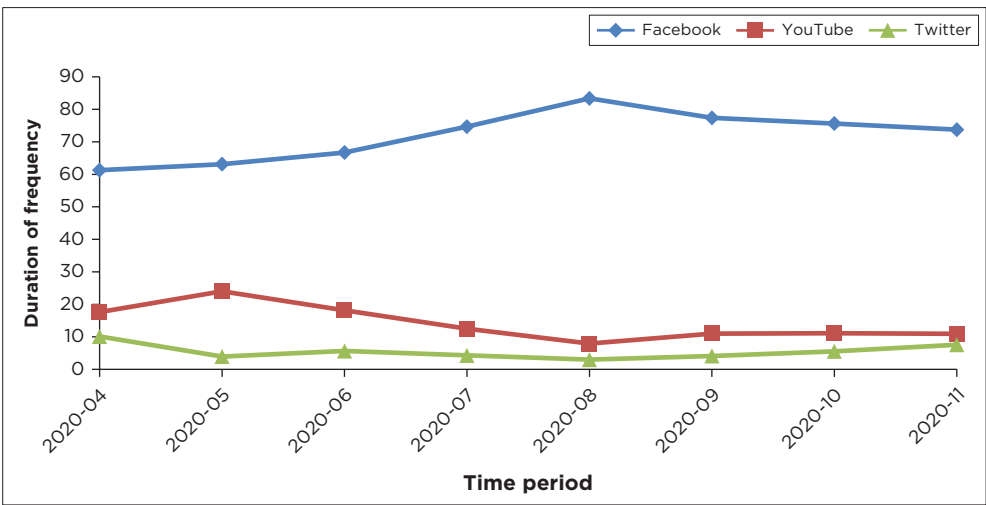
Social media companies employ a number of approaches to curb misinformation and assess the credibility of information. Most of the methods use database models, such as automatic techniques that identify rumours and false information. Different applications are used to detect information that is spreading as spam or fake news so as to increase the credibility of health information shared on social media. The technique used applies both algorithms and human intervention to verify the veracity of information shared on social media platforms (Pulido et al. 2020).

■ Analytical approach

This study aimed to assess how misinformation about the coronavirus disease 2019 pandemic in Africa spiked and how it was managed. To this end, the authors reviewed literature based mainly on qualitative analysis techniques to understand how rumours, fake news and misleading information about the coronavirus disease 2019 were spread on social media and monitored by governments. To this end, we searched for answers to the following research questions: How did Africans use social media to disseminate COVID-19 information? How did social media contribute to misinformation, and how was it tackled? The study focused mainly on information shared via Facebook, Twitter and YouTube, the platforms most commonly used in Africa to disseminate information on COVID-19, as indicated in Figure 16.1.

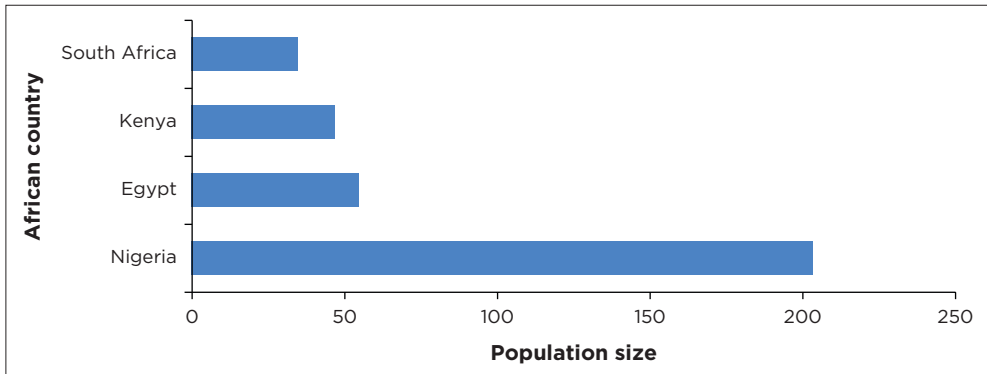
This study drew its cases from the top four African countries with the highest number of internet users. Studies demonstrate that the African countries with the highest numbers of internet users are Nigeria, Egypt, Kenya and South Africa, in descending order (Johnson 2020). Figure 16.2 illustrates the number of people who use the internet in these countries.

Data for this study were drawn from journals, internet sources, books and social media. In addition, the authors assessed the tweets of government institutions and role models to examine their messages about the



Source: Adapted from Statcounter (2020).

FIGURE 16.1: Most frequently used social media in Africa.



Source: Adapted from Johnson (2020).

FIGURE 16.2: Number of people using the internet in Nigeria, Egypt, Kenya and South Africa.

coronavirus disease 2019. The data reviewed were purposively collected based on thematic relevance to the issue under review. This study is thus based mainly on secondary data sources, and its analysis primarily uses qualitative methods.

■ Use of social media during the COVID-19 pandemic in Africa to curb misinformation

In Africa, social media users communicating about the coronavirus disease 2019 were like a double-edged sword. Ministries of government used social media to spread public health information needed to overcome the pandemic. For instance, the South African government used Twitter to post guidelines on COVID-19 (South African Government 2020). President Cyril Ramaphosa's speeches addressing the nation about developments in COVID-19 were uploaded on Twitter and broadcast live on Facebook. The government used these platforms to issue COVID-19 information on statistics, prevention measures, vaccine developments and lockdown regulations or levels. It also warned citizens to be aware of misinformation and fake news spread on social media (South African Government 2020).

The social media platforms helped governments to reach large numbers of people efficiently and swiftly. In addition, the messages disseminated by governments became easily transferable to other people via social media through sharing, forwarding, copy and paste and many other options that different social media applications allow (South African Government 2020). Thus, social media helped keep governments and their citizens in touch to share information on staying healthy and limiting the rate at which the virus spread.

Apart from the government, the private sector also relied on social media to keep in touch with clients and staff during the lockdown. In addition, non-governmental organisations and companies used social media technology to facilitate the spread of coronavirus regulations and their activities (Conroy-Krutz 2020). When the lockdown was imposed and free movement was restricted, some organisations ordered their staff to work from home and use social media to continue their activities and share information (Theunissen 2020).

South Africans relied on social media to air their worries and seek government intervention (Bird & Smith 2020). When COVID-19 reached South Africa, it radically changed many lives. It severely affected low-income households and communities, particularly the unemployed. The lockdown and strict regulations imposed by the government compounded the problems of people who were already hard hit by poverty and unequal income distribution. Many who had unstable incomes lost the little they had, which exacerbated food insecurity and complicated strategies to control infection rates. The absence of resources such as running water, needed to prevent infections, compounded the problems that people experiencing poverty were already facing (Govender 2020a). When the government posted coronavirus disease 2019 regulations on Facebook and Twitter, citizens responded with comments to raise the challenges and difficulties facing their communities.

Many South Africans used social media to help the government reshape its policies. As the country gradually opened up, economic activities resumed (eNCA 2020). The government wanted children to continue with classes (Govender 2020a). Meanwhile, the situation remained dire among disadvantaged and vulnerable communities and townships. Since many were affected by several months of lost income, they found it difficult to send their children back to school (Govender 2020b). People turned to social media to urge the government to reconsider its decision and evaluate children's need to return to school.

Facebook gave a boost to small businesses to help curb the detrimental effects of the coronavirus disease 2019. Through Facebook, South African companies were allowed to apply for a COVID-19 grant worth R24,482 in cash and R14,689 in coupons for advertisements on Facebook (Business Insider SA 2020). The grant came with conditions stipulating that it should not be used to advertise tobacco or bolster political lobbying or gambling. The opportunity was available to companies with at least two but not more than 50 employees (*Business Insider SA* 2020).

In Nigeria, social media were similarly used as an instrumental communication tool during the coronavirus disease 2019 pandemic.

To begin with, the announcement of the first recorded case of coronavirus disease 2019 in the country was made on various social media platforms such as Facebook and Twitter (China Global TV Network [CGTN] 2020). Since large numbers of Nigerians have access to the internet and social media, as in many other African countries, it was not difficult to disseminate information on COVID-19. In addition, health care agencies such as the Nigeria Centre for Disease Control (NCDC), Nigeria's national public health institute, used social media to communicate and keep people informed about developments with the pandemic. The NCDC updated citizens about the number of positive cases recorded, deaths and recoveries (NCDC 2020a, 2020b).

The information from the NCDC helped to prevent infections. When the pandemic invades a nation, the consequences may be dreadful if people are unprepared to deal with it. General information disseminated through social media limits the spread of a virus since people are already informed about how to take care of themselves. For instance, the NCDC disseminated WHO regulations related to washing hands frequently for 20 s, using sanitisers, wearing a mask and respecting social distancing to keep citizens informed about preventive measures against COVID-19 (NCDC 2020a, 2020b).

The government of Nigeria used the NCDC to communicate with its citizens by means of social media as a means of accountability. The NCDC used Facebook and Twitter to keep citizens updated about the challenges facing the government in relation to coronavirus disease 2019 deaths and new infections. The institution updated the statistics from time to time to ensure that the nation was aware of new developments, successes and government failures in handling the pandemic. The platforms allowed citizens to raise their concerns and judge their government's preparedness to curb the coronavirus disease 2019 pandemic (NCDC 2020a, 2020b).

Although social media allows citizens to give feedback and comment on the government's posts, the Nigerian government was not responsive to its citizens' concerns. According to Obi-Ani, Anikwenze and Isiani (2020), the Nigerian government paid little attention to comments in response to its messages or citizens' interactions concerning the COVID-19 regulations. If a government wants to make a significant impact and develop inclusive policies that citizens can accept, it must listen to the views of citizens raised through social media. Most citizens do not have formal platforms to communicate with policymakers, and social media creates such a platform. Hence, social media communication needs to be taken seriously, not only

in terms of regulations but also for disseminating positive advice and suggesting corrections for policymakers.

In Egypt, misinformation about COVID-19 was commonplace. For example, a study conducted by Shea (2020) analysed 69 pieces of misinformation observed on Egyptian social media between January and April 2020. The misinformation was classified into four broad categories: (1) false claims about the coronavirus disease 2019, including information on transmission, treatments and vaccines; (2) content that was falsely or inaccurately contextualised; (3) conspiracy theories and (4) false claims about the Egyptian government's response to the virus.

False claims about the coronavirus disease 2019 constituted 39% of misinformation and exceeded other categories of misinformation. Most of the misinformation in this category included false claims about treatments, such as drinking a lot of water and salt or gargling with vinegar to eliminate the virus. Moreover, it was falsely claimed that the virus could die a natural death in summer because it could not withstand the heat. Another type of misinformation was where videos and photos were juxtaposed against irrelevant information to distort the information and make it inaccurate. The third category of misinformation involved conspiracy theories that claimed different origins of COVID-19. The fourth category was false information about the government's responses to the pandemic, such as closing schools (Shea 2020).

The Egyptian cabinet's media centre took a proactive response to curbing prevalent misinformation about the government's policies launched in response to the virus. It corrected false information about the coronavirus disease 2019, such as claims about various remedies and how the virus is transmitted. Furthermore, the Ministry of Health introduced an automated response service on WhatsApp to provide fast and accurate information about the coronavirus disease 2019. In addition, the WhatsApp service provided statistics on virus infections and deaths, as well as preventive guidelines (Shea 2020).

The Egyptian Public Prosecution Office promulgated a regulation on 28 March 2020 stipulating that people who were found disseminating false information about COVID-19 would be imprisoned or fined. After the outbreak of the coronavirus disease 2019, several social media accounts were blocked by the authorities without any justification. Many people were arrested for making social media posts about the coronavirus disease 2019, one of whom was a lawyer named Mohsen Bahnasi, whose post called for the release of Egyptian prisoners during the COVID-19 outbreak (MENA 2020).

Similarly, a popular Kenyan blogger known as Robert Alai was arrested on 20 March 2020 for his claims about COVID-19. He alleged that the government of Kenya was concealing information about patients who tested positive for COVID-19. The government charged him with contravening section 22 of the *Computer Misuse Cybercrimes Act 5 of 2018* (Kimari 2020). At least six citizens were killed by the police while imposing lockdown regulations in Kenya (Kali 2021c).

In Kenya, some social media users deliberately shared information that they knew was misleading, biased or factually manipulated. At least 86.2% of Kenyans acknowledged that they had encountered fake news, misinformation or misleading information on social media. In comparison, only 13.8% indicated that they had not noticed any false information shared on social media (Wamuyu 2020). Moreover, about 83.5% of Kenyans were likely to have come across fake news about COVID-19 and shared it (Wamuyu 2020).

A study revealed that the citizens of Kenya and South Africa are not prone to believing false information and rumours because they have confidence in scientists. However, a significant number of them showed interest in sharing rumours about COVID-19 on social media even when they did not necessarily believe them. For instance, 29% of South Africans and 40% of Kenyans were prone to believe fake news. Individuals had different motivations for sharing rumours about COVID-19. Some believed that they had to warn others; others wanted to generate discussions, while others wanted to make a statement and so on (Wasserman & Madrid-Morales 2020).

■ Discussion

■ Implications of social media usage during the COVID-19 pandemic

From the start of the coronavirus disease 2019 outbreak, social media became an essential instrument for information dissemination. International institutions such as the WHO, ministries of health, centres for disease control and health authorities used social media to spread news related to the coronavirus disease 2019. In addition, the institutions used social media, particularly Facebook and Twitter, to disseminate COVID-19 regulations, preventive measures, infection rates, death rates and recovery rates. These measures kept citizens aware of the severity of the virus, its spread rate and ways of curbing it. Social media thus helped citizens to prepare themselves to handle the virus.

In some cases, social media created panic and fear of COVID-19. While information from the WHO and government ministries was considered genuine, other information from unknown sources was spread through the same social media that were disseminating coronavirus disease 2019-related information. The messages from unverified sources created confusion and fear, usually with detrimental effects, since they seemed to spread faster than the virus itself (Rivera 2020). Institutions such as the NCDC tried to warn people to refrain from spreading misinformation about the coronavirus disease 2019 on social media (NCDC 2020c). Nevertheless, fake news related to the COVID-19 and 5G network, as well as conspiracy theories about the vaccine, continued unabated (Mutanga & Abayomi 2020).

Although misinformation and claims about the coronavirus disease 2019 may often seem far-fetched, governments have to pay attention to them. If misinformation is ignored, it will tend to sabotage the implementation of regulations and policies to combat the spread of the pandemic. However, the government of Nigeria decided to pay little heed to the concerns of its people raised on social media. A responsive government should react to the citizens' circumstances, correct misinformation where necessary and listen to policy advice when required. Information spread through social media can foil government policies by creating mistrust unless the government counters claims made by unverified sources (Mutanga & Abayomi 2020).

Some African countries, including Kenya and Egypt, tightened their legislation to monitor misinformation spread through social media. This endeavour led to the imprisonment of some citizens and attracted criticism (Kimari 2020). However, where countries collaborated with social media companies to use fact-checking programmes, the need to use coercive power was reduced. It is better to fight social media misinformation through technology rather than rely on the state's coercive apparatus. When lockdowns are imposed, governments need to consider the welfare of poor communities and curb their inclination to use social media to spread unfounded claims about policies.

Since public participation is limited in most African countries, it can be extended by considering social media as another avenue of policy input. One of the limitations of this study was that it did not evaluate the extent to which governments regarded social media as an avenue for informing public policy. Future researchers should examine how social media platforms can be utilised to inform public policies in Africa. Notwithstanding, this study adds to our knowledge about how social media spreads misinformation and how fake news can be addressed during a pandemic. In this regard, it can inform policymakers who wish to understand how they can tackle the misuse of social media and misinformation.

■ Conclusion

A substantial amount of lethal misinformation has been spawned about the COVID-19 pandemic since its outbreak in December 2019, much of it spread via Facebook, YouTube and Twitter. The misinformation was related to the various facets of the pandemic. Some claims were concerned with the origins of the virus, while others were about the treatment of COVID-19. All these claims seriously threatened public safety and complicated efforts to control the pandemic. African governments had to focus on fighting both the coronavirus disease 2019 and misinformation. What is worrisome is the fact that misinformation is capable of spreading faster than the coronavirus virus itself.

The world has been fighting two threats since the outbreak of the pandemic, waging war against both COVID-19 and misinformation. The WHO and social media networks have assumed the obligation and responsibility of ensuring that they filter information disseminated on social media to identify false content. Instead of focusing all their efforts on preventing and treating the coronavirus disease 2019 infection, health institutions and social media companies have had to spend time correcting misinformation and misconceptions and righting wrongs spread through social media, but this problem is not insurmountable.

Instead of just reacting by correcting misconceptions already in circulation, it is crucial to communicate the facts before the rumours begin. Hence, Nigeria and South Africa used Twitter and Facebook to keep citizens updated about the coronavirus disease 2019. Experts, international institutions and social media companies should feed people with reliable information promptly before the rumours commence. Experts have to provide timely advice and information to raise public health awareness and draw the attention of social media users to possible misinformation when false content is identified. The lessons drawn from the experience of COVID-19 should be sufficient for think tanks, experts and international institutions to develop approaches to control future misinformation.

African governments should consider social media as an extension of the public participation space. To do so, they need to take the comments of social media users seriously to improve public policies. Catering for information targeting the government from social media sources could widen civic spaces and create platforms, especially for the youth, to contribute to policymaking. The interaction that takes place on social media is often informal, although rich with information necessary to inform policies. Future studies need to explore how social media can be formalised to allow citizens to challenge policies and contribute to policymaking.

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Chapter 1

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Chapter 4

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Chapter 5

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Chapter 10

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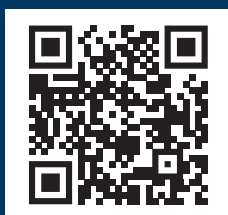
This scholarly book magnifies reflections from young scientists in South Africa, Africa and beyond around the COVID-19 pandemic. With contributions by upcoming scientists, this scholarly book provides a synopsis of socio-ecological-economic views on the impact of COVID-19. Through its chapters, the book takes a multi-disciplinary approach to reflecting on what it was like to be a scientist during the COVID-19 pandemic. By doing so, each chapter re-imagines science from the viewpoint of its discipline, offering insights from the perspective of young scientists that could benefit other scholars, academics and policymakers.

Socio-ecological-economic reflections on the impacts of COVID-19 in Africa addresses a very current issue – the post-COVID-19 era and takes the reader through various fields and how challenges brought about by the pandemic can be addressed. Each chapter explores post-pandemic issues unique to the discipline. The chapters provide a forum for dialogue between different circles of scholars and provide avenues for future research into the issues raised in the chapter.

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Socio-ecological-economic reflections on the impacts of COVID-19 in Africa provides scholars with a multidisciplinary approach to the challenges and opportunities emanating from COVID-19. The authors provide reflections on COVID-19 in the African context from various fields of study. Considering issues such as remote learning and working emanating from restricted-activity lockdowns, access to information during and after the pandemic, knowledge production, communication, and dissemination, the book provides diverse solutions to survive during the pandemic. The book demonstrates how different fields of study can contribute solutions to grand societal challenges, especially those concerning COVID-19. This scholarly book makes an important contribution to the effort to find solutions to grand societal challenges in Africa, providing essential reading for scholars, academia, and policymakers in various fields of study such as information science, indigenous studies, African studies, health studies, development studies, economics, communication science, and others.

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