

Multimorbidity in South Africa: Is the health system ready?

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Abstract

Background: Multimorbidity is likely to be a significant contributor to ill health and inequality in South Africa and yet has been largely overlooked.

Purpose: This paper focuses on the findings of a recent large study that highlighted emerging issues - namely (i) the high levels of multimorbidity among three key groups - older adults, women, and the wealthy; (ii) discordant and concordant disease clusters among the multimorbid.

Research Design: Narrative.

Study Sample and Data Collection: Not applicable.

Results: We discuss the implications of each emerging issue for health systems policy and practice.

Conclusion: Although key policies are identified, many of these policies are not implemented and are therefore not part of routine practice, leaving much space for improvement.

Keywords

Multimorbidity, ageing, integrated care, South Africa

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Introduction

Multimorbidity, in its simplest form, can be described as the coexistence of multiple health conditions in an individual.¹ Living with multimorbidity negatively impacts on the individual's ability to work,² increases their healthcare costs^{3,4} reduces their quality of life^{5–8} and intensifies the need for regular contact with healthcare services.⁹ Multimorbidity cuts across different spheres and introduces many negative consequences for the healthcare system, which is traditionally, orientated around single disease conditions¹⁰ (i.e., non-communicable diseases (NCDs), chronic infectious diseases and mental health conditions). It could also alter the resources required for staffing, financing¹¹ and technological development.¹² The vertical nature of health service delivery, along with a lack of training by healthcare workers could further hinder patient-centred care and delivery.¹¹

Levels of multimorbidity are expected to increase globally as populations age, people adopt unhealthy lifestyles, and the incidence of chronic diseases increases.¹³ Low- and middle-income countries (LMICs) face additional challenges when dealing with multimorbidity, including

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Data Availability Statement included at the end of the article.



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fragmented healthcare systems with limited capacity, inequities in healthcare utilisation and a lack of data on the subject.¹⁴ In South Africa, an upper middle-income country,¹⁵ despite limitations, a growing body of literature has sought to characterise the epidemiology and consequences of multimorbidity in the country.^{16–20} Our project consisted of a systematic review of prevalence studies on multimorbidity,²¹ which informed, and was followed up by the systematic analyses of the three most recent national health surveys.^{22–24} The systematic review found a paucity of local studies and a lack of standardization of studies reporting multimorbidity estimates.²¹ It was argued that the lack of funding and reporting mechanisms are impeding research on multimorbidity.²⁵ The systematic analyses²⁶ of multimorbidity in three nationally representative surveys in South Africa,^{22–24} highlight the high levels of multimorbidity among three key groups, namely, older adults, women, and the wealthy.²⁶ Our results indicate eleven common disease clusters affecting the multimorbid population.²⁶ This article aims to synthesize the main findings from a project that described the epidemiology of multimorbidity in South Africa²⁷ and highlight the importance of implementing multimorbidity focused health policies and service delivery in the country.

Discussion

Multimorbidity among older adults

The systematic review of multimorbidity prevalence studies in South Africa showed that multimorbidity increased with age. This was evident in the analysis of three South African national surveys which showed that multimorbidity increased with older age and peaked in the 60 years and older (60+ years) age group (Table 1).^{22–24} These findings are also confirmed in recently published studies that looked at the prevalence of multimorbidity in South African national surveys.^{17,18,20}

The increased odds of multimorbidity in older age are consistent with what has been observed internationally.^{31–33}

The prevalence of multimorbidity among older individuals is concerning, because the proportion of older people are increasing dramatically in LMICs.³⁴ Population ageing is being driven by falling fertility rates, improved survival at younger ages, fewer adults dying of infectious diseases, and socioeconomic development in the past 50 years.^{34,35}

Statistics South Africa estimated that the proportion of older persons (60+ years) increased from 3.5 million people in 2002 to 5.4 million people in 2020 (i.e., from 7.6% to 9.1%).³⁶ It is further predicted that the population over 60 years will double between 2012 and 2050.³⁷ A 2020 report on ageing in Africa highlighted that older adults experience a disproportionate burden of disease - NCDs dominate the disease burden, but infectious (e.g. HIV, Tuberculosis, lower respiratory infections) and nutrition-related disease still account for a sizeable proportion of the disease burden, compared to other regions.³⁸ Older people also struggle to access healthcare due to financial constraints, as shown by a study in Cape Town, which found income-related disparities in accessing quality care.³⁹ Mobility issues, the physical effort of spending hours waiting in lines, and dealing with rude and ageist healthcare staff were noted challenges faced by participants.³⁹ Poor and dismissive communication contributed to confusion in participants trying to navigate the health system.³⁹

The rights of older people have been recognised internationally by several legal and policy frameworks. Since 2002, two major international policy instruments have guided action on ageing – the *Political declaration and Madrid international plan of action on ageing*⁴⁰ and the World Health Organization's *Active ageing: a policy framework*.^{34,41} Both documents detail the importance of health in older age but there has been a lack of prioritisation of the issue and a consequent lack of progress in implementing these instruments in South Africa.³⁴ The South African government has endorsed these policies on ageing, and subsequently developed the *South African Policy for Older Persons*⁴² in 2005.⁴³ The policy promotes a life-course approach, focused on the prevention of disease, and integrated treatment and management of disease in older

Table 1. Prevalence of multimorbidity by survey and age group (weighted).

Age group (years)	SADHS 2016 ^a % (95%CI)	SABSSM 2017 ^b % (95%CI)	NIDS 2017 ^c % (95%CI)
15–19 ^d	4.4 (3.0–6.5)	0.5 (0.2–1.3)	0.1 (0.0–0.4)
20–29	14.9 (12.3–17.8)	1.6 (1.0–2.4)	0.2 (0.1–0.5)
30–39	24.6 (21.5–28.0)	4.0 (3.0–5.4)	0.7 (0.4–1.2)
40–49	30.2 (26.7–34.0)	9.9 (8.0–12.1)	2.7 (1.9–3.6)
50–59	38.6 (34.7–42.8)	16.6 (14.3–19.2)	9.0 (7.4–10.9)
60–69	47.2 (42.3–52.1)	21.7 (18.1–25.9)	14.4 (11.6–17.7)
70+	44.3 (38.3–50.4)	23.7 (19.6–28.4)	14.2 (11.5–17.4)

^aSouth African Demographic and Health Survey 2016.^{22,28}

^bSouth African National HIV Prevalence, Incidence, Behaviour and Communication Survey 2017.^{24,29}

^cNational Income Dynamics Study 2017.^{23,30}

^dPeople aged 15 years and older are commonly included in national health surveys.

persons.⁴³ However, the policy has not been followed up with implementation guidelines, regulations or evaluation plans. Of further significance is *The Protocol to the African Union Charter on Human and Peoples Rights on the Rights of Older Persons in Africa* which was adopted by the African Union in 2016.⁴⁴ Article 15 of this charter guarantees the rights of older people to access health services that meet their needs, facilitate reasonable access to health services and medical insurance, and ensure the inclusion of geriatrics and gerontology in the training of healthcare workers.⁴⁴ To ensure appropriate services are available to older people, multimorbidity needs to be considered a vital aspect of these services, given the high prevalence among older adults.

Ensuring a healthy life for all remains a key commitment of the South African government. In 2010, the government adopted the Negotiated Service Delivery Agreement 2010-2014 and among the key outputs were: increasing life expectancy; combatting HIV and AIDS and Tuberculosis; and, strengthening the effectiveness of the health system.⁴⁵ More recently, in the National Development Plan (NDP) 2030, the South African government stated that they aim to increase the average life expectancy at birth for men and women to 70 years.⁴⁶ The NDP noted that a change in the demographic profile will affect government spending in terms of healthcare and pension provisions, and that high levels of unemployment in the working-age population may make it difficult to absorb these costs.⁴⁶ However, no clear strategies exist on how to meet these needs.⁴³ A notable omission (or oversight) is the lack of acknowledgement of the implications of rising multimorbidity.

In the authors' view, multimorbidity could be indirectly managed through the implementation of Goal 4 (reduce the prevalence of NCDs) and Goal 6 (complete health-system reform) of the NDP 2030.⁴⁶ Another plan that could also indirectly impact multimorbidity is 'The Strategic Plan for the Prevention and Control of Non-Communicable Diseases 2013 – 17' which was a result of the South African Summit on the Prevention and Control of Non-communicable Diseases held in September 2011.⁴⁷ It set ten clear targets to be reached by 2020 - the first, to reduce premature mortality in people under 60 years of age due to NCDs by 25%,⁴⁸ which effectively excludes older people. There was no focus on population ageing, although achieving these targets would yield healthier older people⁴³ and reduce multimorbidity. More recently, the 'National Strategic Plan for the Prevention and Control of Non-Communicable Diseases 2022 – 2027' was launched.⁴⁹ This document explicitly mentions multimorbidity in Goal 3 (people living with NCDs must receive people-centred health services to prevent and control NCDs).⁴⁹ As part of Goal 3, the document states the need to 'promote and strengthen care within a context of managing co- and multimorbidities'.⁴⁹ However, the plan does not mention targeting at-risk groups of people with multimorbidity.

Some provincial health authorities such as the Western Cape Department of Health recognize co-morbidity as an issue. As part of their 2013 plan, *Healthcare 2030: A Future Health Service for the Western Cape*⁵⁰ they set out a strategic framework and focus on four pillars to address the burden of disease in the province.⁵¹ The pillars include having a person-centred approach, integrated provision of care, continued support for the patient and a life-course approach to treating patients.⁵¹ They acknowledge the increased risk of co-morbidities in adulthood, hence the strong focus on mental health integration into primary healthcare services, HIV and chronic disease health services.⁵⁰ However, older adults and their needs are not specifically mentioned.

While nationally the policy environment is supportive of the needs of older people, few documents mention co-morbidity or multimorbidity in older people. In South Africa, much attention has been given to increasing life expectancy. However, no clear strategies have been suggested to enable South Africa to meet these challenge and many of the policies appear not to be implemented or evaluated.⁴³ It may be essential to further prioritise the needs of older people – in the same way the needs of under 5s have been prioritised.⁴³

Multimorbidity in women

In the three analysed South African national surveys,^{22–24} it was noted that women had a higher prevalence of multimorbidity compared to men, and this was true across most age groups (Figure 1).

The gender differential has been found in other local^{17,18,52,53} and international studies.^{54,55} While fairly well established, it is unclear why these differences exist. There are various possible explanations. First, there is a gender gap in self-reported health status.⁵⁶ Second, women are more likely to know their health status as they tend to have higher healthcare utilisation compared to men.⁵⁷ Third, the gender differential reflects disease burdens that are more prevalent in women, such as HIV⁵⁸ and obesity.⁵⁹ This high prevalence of HIV among women has been attributed to multiple related factors, including biological, behavioural, socioeconomic, cultural and structural risks.⁶⁰ Similarly, women have high and increasing rates of obesity,^{61–63} which is associated with increased odds of multimorbidity.⁶⁴ In addition, gender norms may exacerbate the consequences of multimorbidity. For example, multimorbidity can impact women's lives by affecting their ability to earn an income due to women having less secure forms of income with little to no social protection.

Since women live longer than men, and have higher levels of multimorbidity than men,^{54,55} the compounded effects of age and gender could result in older women being the group worst affected by multimorbidity. However, no

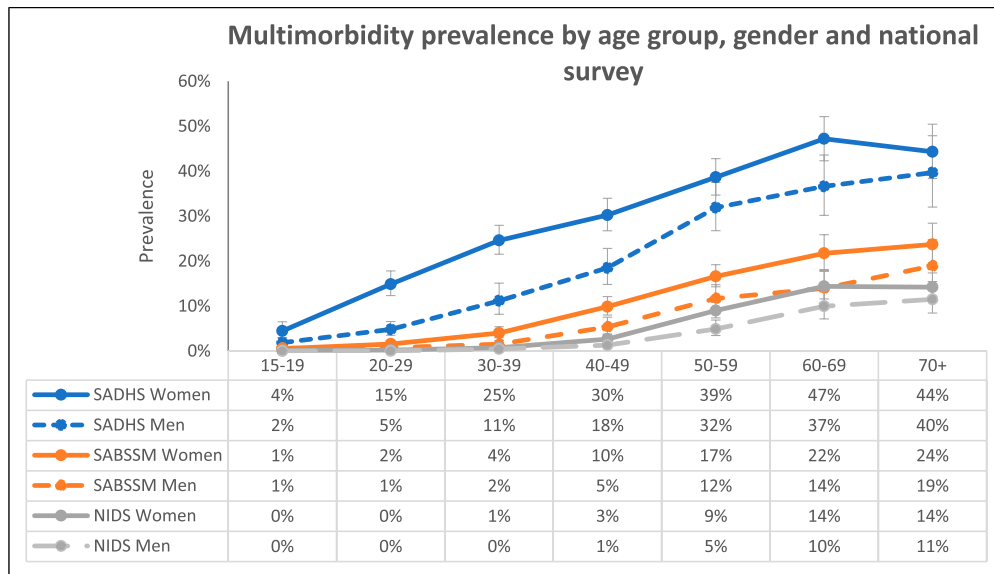


Figure 1. Multimorbidity prevalence by survey, age group and gender(weighted).

policy documents speak directly to multimorbidity in women. Although the Negotiated Service Delivery Agreement 2010-2014 mentions reducing the adult mortality rate, decreasing maternal mortality and reducing mother-to-child HIV transmission,⁴⁵ multimorbidity is not mentioned. The NDP 2030 notes that diet-related NCDs may rise, especially among ‘poor African women’ but does not mention multimorbidity, nor does it target specific groups for NCD interventions.⁴⁶ The National Strategic Plan for the Prevention and Control of Non-Communicable Diseases 2022 – 2027 mentions the need to strengthen care in the context of multimorbidity⁴⁹ but does not focus on high-risk groups. In comparison, other national strategic plans (the plan for HIV, TB and Sexually Transmitted Infections) explicitly mentions reaching vulnerable populations (such as young women), addressing social and structural drivers of HIV⁶⁵ and have incorporated gender inequality, gender norms and gender-related vulnerability into their agenda.⁶⁶ Gender mainstreaming should be adopted into policies related to multimorbidity.

Multimorbidity and inequality

In high-income countries, multimorbidity is associated with poverty.⁶⁷ However, our analysis of the National Income Dynamics (NIDS) 2017 survey revealed higher odds of multimorbidity among wealthier people in South Africa.²³ Other studies on the African continent (Burkina Faso⁶⁸ and Ghana⁶⁹) have confirmed this pattern. This could be linked to lifestyle risk factors among the wealthy, where disposable income could facilitate access to fast foods⁷⁰ and increase the odds of being obese.⁷¹ Obesity has also been linked to

being wealthy (prosperous) in South Africa^{72,73} a factor also associated with multimorbidity. Obesity risk in African population groups may also be influenced by cultural norms that associate fatness with beauty.⁷⁴

The association between wealth and multimorbidity may also point to a different disparity altogether – which is access to healthcare. South Africa has a two-tiered health system comprising private and public health sectors.⁷⁵ Wealthier people may be more aware of their disease conditions as they tend to have better access to healthcare due to being able to afford the cost of private health insurance or medical aid.⁷⁶ Many private medical aid schemes in the country offer - or require - annual health screening (blood pressure, body mass index (BMI), glucose and cholesterol),⁷⁷ which could possibly increase awareness of health conditions among employed people. They may also have access to work programmes that do health and wellness screenings.⁷⁷⁻⁷⁹ If the cause for higher observed levels of multimorbidity among wealthy people is greater access to healthcare, it points to a gross level of unmet need among average South Africans. One local study found disparities in healthcare utilisation by socioeconomic level – with the disadvantaged far more likely to postpone care seeking due to monetary reasons.⁷⁶

The movement toward universal health coverage (UHC) has gained momentum globally.⁸⁰ UHC recognises that all people should have the access they need to health services without incurring financial hardship.⁸⁰ Achieving UHC is a target of the SDGs explicitly stated in SDG 3.8.⁸⁰ In 2019, a United Nations High-Level Meeting on UHC was held and a political declaration affirming high-level political commitment to UHC was adopted by member states.⁸⁰ South Africa has taken up the cause of UHC, in

the form of a National Health Insurance (NHI) scheme.⁸¹ NHI is a health-financing system designed to pool funds to provide quality, affordable healthcare services to South Africans, based on need, regardless of socioeconomic status.⁸² The implementation of the NHI is being done using a phased approach.⁸² In 2019, President Ramaphosa launched the 'Presidential Health Summit Compact' which lays out a five-year roadmap for accelerating UHC in South Africa.⁸¹ Although the transition to the NHI was meant to be functioning by 2026, public health experts agree it will take much longer.⁸³

The implementation of the NHI and achievement of UHC will undoubtedly benefit South Africans in general, and those with multimorbidity. Assessments of progress toward UHC in South Africa found that there has been some progress in terms of service coverage.⁸⁴ However, there has been a lack of support from the public for the NHI.⁸⁵ These concerns are echoed by civil society groups which believe that the current health system is not ready for the NHI, and first needs to be improved.⁸⁵ These concerns are not unfounded and transparency and clarity have not been well managed.⁸⁵ If the NHI is successfully implemented, hopefully more screening will take place. This will allow people, regardless of socioeconomic status, to be aware of the diseases they have and enable access to quality treatment that does not negatively impact them financially.

Disease clusters

In examining the different disease clusters (classes) in the multimorbid population, hypertension was prominent in the majority of clusters.²⁶ The combination of diabetes and hypertension was common across three surveys,^{22–24} while heart disease and hypertension were common in two surveys.^{23,24} Hypertension co-occurred with other NCDs and with an infectious disease such as HIV – thus a mix of concordant and discordant multimorbidity classes exist in the population. Concordant multimorbidity tends to be similar in its origin or aetiology, whereas discordant multimorbidity is when the co-existing disease conditions tend to be unrelated.¹⁰ An important caveat when interpreting this data is that the surveys analysed^{22–24} only collected information about selected disease conditions, hence these may not be the only prevalent disease clusters present in the population. For example, few national surveys collect information on mental health conditions and there are indications that the mental health burden is large in South Africa.⁸⁶

The disease clusters highlight the need for integrated care and a 'one-stop-shop approach' where treatment is available, no matter the underlying cause. The need for integrated care has been acknowledged by the Department of Health i.e. integrating HIV, TB and NCD services with maternal and child health services for efficient service

delivery.⁸⁷ This was exemplified in the release of the 2016 South African National Department of Health Adherence Guidelines for HIV, TB and NCDs.⁸⁸ This policy and the service-delivery guidelines seek to address issues in non-adherence to long-term therapies amidst the expansion of ART programmes and the rising burden of NCDs.⁸⁸ Certain aspects of the programme implementation related to this policy have been positively evaluated.^{89,90} Another part of the strategy focused on linkage to care and implementing screening activities to identify diseases early for intervention. While the Adherence Guidelines do not cover every disease combination possible, these are steps in the right direction.

The Adherence Guidelines complement other South African guidelines and strategies that have been put in place to reduce disease burdens, such as the Strategic Plan for the Prevention and Control of Non-Communicable Diseases 2013–2017,⁴⁸ the Strategy for the Prevention and Control of Obesity in South Africa 2015–2020⁹¹ and, legislation to decrease sodium levels in the food industry.⁹² Although South Africa has policies for the major NCD risk factors (tobacco smoking, unhealthy diets, harmful use of alcohol and physical inactivity), the implementation of these policies is stuttering.⁹³ Much more work is still needed to tackle the drivers of multimorbidity such as hypertension. The number of people with hypertension continues to increase, yet treatment rates remain extremely low (control rates are below 13% in sub-Saharan Africa).⁹⁴

A robust health information system in South Africa is needed to monitor changes in multimorbidity and disease patterns over time. With plans to implement the NHI scheme, an electronic health record (EHR) system would be essential for registering and tracking patients.⁹⁵ However, current sources of patient-level data are fragmented and poorly coordinated.^{96,97} Problems with the routine health-information system should be addressed to enhance the monitoring of the disease burden in South Africa.

Conclusion

Multimorbidity has been largely overlooked in South Africa due to limitations related to routine health information systems as well as the current focus on single diseases. Based on what we know currently as well as trends identified in other countries, multimorbidity is likely to be a significant contributor to ill health in South Africa. Comprehensive information on multimorbidity is needed for health-service delivery planning. While there is increasing focus on epidemiology,^{20,21} and the experience of multimorbidity in South Africa^{98,99} a better understanding of the epidemiology and patient experience of multimorbidity could also allow for interventions to be developed which allow for more effective and efficient treatment of patients.^{10,100}

Multimorbidity is a growing concern in South Africa and therefore requires action. In this paper, we highlight pertinent issues that drive multimorbidity such as ageing, gender and access to healthcare. Multimorbidity poses a threat to the ailing health system in South Africa. Activists, researchers, and the public need to pressure decision-makers in government to act and provide responsive healthcare to the population.

Author contributions

All authors contributed to the article.

Declaration of conflicting interests

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Ethical approval

This analysis was approved as part of the lead author's doctoral studies and received additional ethics clearance by the Biomedical Research Ethics Committee of the University of the Western Cape (BM20/5/8).

Consent to participate

Participants gave informed written consent to take part in all three surveys.

Data availability statement

The data provided in this article were from three sources, including the anonymised 2016 SADHS dataset obtained from the DHS programme¹⁰¹ https://dhsprogram.com/data/dataset/South-Africa_Standard-DHS_2016.cfm?flag=0 anonymised NIDS Wave 5 data (available for public distribution) from the research data service, DataFirst¹⁰² <https://doi.org/10.25828/fw3h-v708> <https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/712> and anonymized SABSSM 2017 data from the Data Curation Services at the Human Sciences Research Council¹⁰³ <http://dx.doi.org/doi:10.14749/1585345902> <https://repository.hsrc.ac.za/handle/20.500.11910/15468>.

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References

1. Johnston MC, Crilly M, Black C, et al. Defining and measuring multimorbidity: a systematic review of systematic reviews. *Eur J Public Health* 2018; 29: 182–189. DOI: [10.1093/eurpub/cky098](https://doi.org/10.1093/eurpub/cky098).
2. Cabral GG, Dantas de Souza AC, Barbosa IR, et al. Multimorbidity and Its Impact on Workers: A Review of Longitudinal Studies. *Safety and Health at Work* 2019; 10: 393–399. DOI: [10.1016/j.shaw.2019.08.004](https://doi.org/10.1016/j.shaw.2019.08.004).
3. Tran PB, Kazibwe J, Nikolaidis GF, et al. Costs of multimorbidity: a systematic review and meta-analyses. *BMC Med* 2022; 20: 234. DOI: [10.1186/s12916-022-02427-9](https://doi.org/10.1186/s12916-022-02427-9).
4. Sum G, Hone T, Atun R, et al. Multimorbidity and out-of-pocket expenditure on medicines: a systematic review. *BMJ Glob Health* 2018; 3: e000505. DOI: [10.1136/bmjgh-2017-000505](https://doi.org/10.1136/bmjgh-2017-000505).
5. Fortin M, Lapointe L, Hudon C, et al. Multimorbidity and quality of life in primary care: a systematic review. *Health and Quality of Life Outcomes* 2004; 2: 1–12. DOI: [10.1186/1477-7525-2-51](https://doi.org/10.1186/1477-7525-2-51).
6. Hodek JM, Ruhe AK and Greiner W. [Relationship between health-related quality of life and multimorbidity]. *Gesundheitswesen* 2010; 72: 455–465. 2009/10/01. DOI: [10.1055/s-0029-1234121](https://doi.org/10.1055/s-0029-1234121).
7. Kanesarajah J, Waller M, Whitty JA, et al. Multimorbidity and quality of life at mid-life: A systematic review of general population studies. *Maturitas* 2018; 109: 53–62. DOI: [10.1016/j.maturitas.2017.12.004](https://doi.org/10.1016/j.maturitas.2017.12.004).
8. Makovski TT, Schmitz S, Zeegers MP, et al. Multimorbidity and quality of life: Systematic literature review and meta-analysis. *Ageing Res Rev* 2019; 53: 100903. DOI: [10.1016/j.arr.2019.04.005](https://doi.org/10.1016/j.arr.2019.04.005).
9. Soley-Bori M, Ashworth M, Bisquera A, et al. Impact of multimorbidity on healthcare costs and utilisation: a systematic review of the UK literature. *Br J Gen Pract* 2021; 71: e39–e46. DOI: [10.3399/bjgp20x713897](https://doi.org/10.3399/bjgp20x713897).
10. The Academy of Medical Sciences. *Multimorbidity: a priority for global health research* <https://acmedsci.ac.uk/file-download/82222577> (2018, accessed 24 May 2022).
11. Whitty CJM, MacEwen C, Goddard A, et al. Rising to the challenge of multimorbidity. *BMJ* 2020; 368: l6964. DOI: [10.1136/bmj.l6964](https://doi.org/10.1136/bmj.l6964).
12. Melchiorre MG, Papa R, Rijken M, et al. eHealth in integrated care programs for people with multimorbidity in Europe: Insights from the ICARE4EU project. *Health Policy* 2018; 122: 53–63. DOI: [10.1016/j.healthpol.2017.08.006](https://doi.org/10.1016/j.healthpol.2017.08.006).
13. World Health Organization. *Multimorbidity: Technical Series on Safer Primary Care*, <http://apps.who.int/iris/bitstream/10665/252275/1/9789241511650-eng.pdf> (2016).

14. Basto-Abreu A, Barrientos-Gutierrez T, Wade AN, et al. Multimorbidity matters in low and middle-income countries. *Journal of multimorbidity and comorbidity* 2022; 12: 26335565221106074. 2022/06/24. DOI: [10.1177/26335565221106074](https://doi.org/10.1177/26335565221106074).
15. The World Bank. *Data: South Africa*, <http://data.worldbank.org/country/south-africa> (2020).
16. Micklesfield LK, Munthali R, Agongo G, et al. Identifying the prevalence and correlates of multimorbidity in middle-aged men and women: a cross-sectional population-based study in four African countries. *BMJ Open* 2023; 13: e067788. 2023/03/15. DOI: [10.1136/bmjopen-2022-067788](https://doi.org/10.1136/bmjopen-2022-067788).
17. Akindele MO and Useh U. Multimorbidity of chronic diseases of lifestyle among South African adults. *Pan Afr Med J* 2021; 38: 332. 2021/07/22. DOI: [10.11604/pamj.2021.38.332.15109](https://doi.org/10.11604/pamj.2021.38.332.15109).
18. Brady E, Castelli M, Walker R, et al. The prevalence and social determinants of multimorbidity in South Africa. *World Medical & Health Policy* 2022. DOI: [10.1002/wmh3.557](https://doi.org/10.1002/wmh3.557).
19. Wong EB, Olivier S, Gunda R, et al. Convergence of infectious and non-communicable disease epidemics in rural South Africa: a cross-sectional, population-based multimorbidity study. *Lancet Glob Health* 2021; 9: e967. 2021/06/19. DOI: [10.1016/s2214-109x\(21\)00176-5](https://doi.org/10.1016/s2214-109x(21)00176-5).
20. Otieno P, Asiki G, Aheto JMK, et al. Cardiometabolic Multimorbidity Associated with Moderate and Severe Disabilities: Results from the Study on Global AGEing and Adult Health (SAGE) Wave 2 in Ghana and South Africa. *Global heart* 2023; 18: 9. 2023/03/07. DOI: [10.5334/gh.1188](https://doi.org/10.5334/gh.1188).
21. Roomaney RA, van Wyk B, Turawa EB, et al. Multimorbidity in South Africa: a systematic review of prevalence studies. *BMJ Open* 2021; 11: e048676. 2021/10/08. DOI: [10.1136/bmjopen-2021-048676](https://doi.org/10.1136/bmjopen-2021-048676).
22. Roomaney RA, van Wyk B, Cois A, et al. One in five South Africans are multimorbid: An analysis of the 2016 Demographic and Health Survey *PLoS One* 2022; 17: e0269081. DOI: [10.1371/journal.pone.0269081](https://doi.org/10.1371/journal.pone.0269081).
23. Roomaney RA, van Wyk B, Cois A, et al. Inequity in the Distribution of Non-Communicable Disease Multimorbidity in Adults in South Africa: An Analysis of Prevalence and Patterns. *International journal of public health* 2022; 67: 1605072. 2022/09/03. DOI: [10.3389/ijph.2022.1605072](https://doi.org/10.3389/ijph.2022.1605072).
24. Roomaney RA, van Wyk B, Cois A, et al. Multimorbidity Patterns in a National HIV Survey of South African Youth and Adults. *Frontiers in public health* 2022; 10: 862993. 2022/04/22. DOI: [10.3389/fpubh.2022.862993](https://doi.org/10.3389/fpubh.2022.862993).
25. Roomaney RA, Wyk BV and Wyk VP. Decolonising multimorbidity? research gaps in low and middle-income countries. *Pan Afr Med J* 2022; 41: 140. 2022/05/07. DOI: [10.11604/pamj.2022.41.140.32104](https://doi.org/10.11604/pamj.2022.41.140.32104).
26. Roomaney RA, van Wyk B, Cois A, et al. A systematic method for comparing multimorbidity in national surveys. *BMC Res Notes* 2022. DOI: Forthcoming.
27. Roomaney RA. *Burden of multimorbidity in South Africa: Implications for health policy and service delivery*. University of the Western Cape, 2022.
28. National Department of Health, Statistics South Africa, South African Medical Research Council, et al. *South Africa Demographic and Health Survey 2016*. 2019. Pretoria, South Africa, and Rockville, Maryland, USA: NDoH, Stats SA, SAMRC, and ICF.
29. Simbayi L, Zuma K, Moyo S, et al. South African National HIV Prevalence, Incidence, Behaviour and Communication Survey, 2017, <https://www.hsrbpress.ac.za/books/south-african-national-hiv-prevalence-incidence-behaviour-and-communication-survey-2017> (2019).
30. N.i.D.S. *National Income Dynamics Study Wave 5 Overview 2008-2019*. 2019.
31. Garin N, Koyanagi A, Chatterji S, et al. Global Multimorbidity Patterns: A Cross-Sectional, Population-Based, Multi-Country Study. *J Gerontol A Biol Sci Med Sci* 2016; 71: 205–214. 2019/07/20. DOI: [10.1016/j.seizure.2019.06.018](https://doi.org/10.1016/j.seizure.2019.06.018).
32. Afshar S, Roderick PJ, Kowal P, et al. Multimorbidity and the inequalities of global ageing: a cross-sectional study of 28 countries using the World Health Surveys. *BMC Public Health* 2015; 15: 776. DOI: [10.1186/s12889-015-2008-7](https://doi.org/10.1186/s12889-015-2008-7).
33. Asogwa OA, Boateng D, Marzà-Florensa A, et al. Multimorbidity of non-communicable diseases in low-income and middle-income countries: a systematic review and meta-analysis. *BMJ Open* 2022; 12: e049133. DOI: [10.1136/bmjopen-2021-049133](https://doi.org/10.1136/bmjopen-2021-049133).
34. World Health Organization. *World report on ageing and health*, <https://www.who.int/ageing/events/world-report-2015-launch/en/> (2015).
35. Independent Evaluation Group. *World Bank Support to Aging Countries : An Independent Evaluation.*, <https://openknowledge.worldbank.org/handle/10986/36007> (2021).
36. Stats SA. *Protecting South Africa's elderly*, <https://www.statssa.gov.za/?p=13445> (2020).
37. UNFPA, HelpAge International. *Ageing in the Twenty-First Century: A Celebration and A Challenge*, <https://www.unfpa.org/publications/ageing-twenty-first-century> (2012).
38. He W, Aboderin I and Adjaye-Gbewonyo D. *Africa aging: 2020*. International Population Reports, https://www.census.gov/content/dam/Census/library/publications/2020/demo/p95_20-1.pdf (2020).
39. Kelly G, Mrengqwa L and Geffen L. “They don’t care about us”: older people’s experiences of primary healthcare in Cape Town, South Africa. *BMC Geriatr* 2019; 19: 1–14.
40. United Nations. *Political declaration and Madrid international plan of action on ageing*. <https://www.un.org/esa/socdev/documents/ageing/MIPAA/political-declaration-en.pdf> (2002).

41. World Health Organization. Innovative care for chronic conditions: building blocks for actions: global report. 2002.
42. Department of Social Development. South African policy for older persons, https://www.westerncape.gov.za/assets/departments/social-development/south_african_policy_for_older_persons_2005.pdf (2005).
43. Solanki G, Kelly G, Cornell J, et al. Population ageing in South Africa: trends, impact, and challenges for the health sector. *South African health review* 2019; 2019: 175–182. DOI: NA.
44. African Union. Protocol to the African Charter on Human and Peoples' Rights on the Rights of Older Persons, <https://au.int/en/treaties/protocol-african-charter-human-and-peoples-rights-rights-older-persons> (2016).
45. South African Government. Progress towards the negotiated service delivery agreement of the health sector, <https://www.gov.za/progress-towards-negotiated-service-delivery-agreement-health-sector> (2011).
46. National Planning Commission. National Development Plan 2030: Our future—make it work, https://www.gov.za/sites/default/files/gcis_document/201409/ndp-2030-our-future-make-it-workr.pdf (2012).
47. National Department of Health. Strategic plan for the prevention and control of non-communicable diseases 2013–17. National Department of Health Pretoria, 2012.
48. National Department of Health. Strategic plan for the prevention and control of non-communicable diseases 2013–17, https://extranet.who.int/ncdccs/Data/ZAF_B3_NCDs_STRAT_PLAN_1_29_1_3%5B2%5D.pdf (2012).
49. National Department of Health. The National Strategic Plan for the Prevention and Control of Non-Communicable Diseases, 2022–2027. Pretoria: National Department of Health, 2022.
50. Western Cape Government Health. Healthcare 2030: The Road to Wellness, <https://www.westerncape.gov.za/assets/departments/health/healthcare2030.pdf> (2014).
51. Western Cape Government. Healthcare 2030: A Future Health Service for the Western Cape, <https://www.westerncape.gov.za/news/healthcare-2030-future-health-service-western-cape> (2013).
52. Garin N, Koyanagi A, Chatterji S, et al. Global multimorbidity patterns: a cross-sectional, population-based, multi-country study. *J Gerontol A Biol Sci Med Sci* 2015; 71: 205–214.
53. Weimann A, Dai D and Oni T. A cross-sectional and spatial analysis of the prevalence of multimorbidity and its association with socioeconomic disadvantage in South Africa: A comparison between 2008 and 2012. *Soc Sci Med* 2016; 163: 144–156. DOI: 10.1016/j.socscimed.2016.06.055.
54. Nguyen H, Manolova G, Daskalopoulou C, et al. Prevalence of multimorbidity in community settings: A systematic review and meta-analysis of observational studies. *Journal of comorbidity* 2019; 9: 1–15. DOI: 10.1177/2235042X19870934.
55. Agur K, McLean G, Hunt K, et al. How does sex influence multimorbidity? Secondary analysis of a large nationally representative dataset. *Int J Environ Res Public Health* 2016; 13: 391. DOI: 10.3390/ijerph13040391.
56. Boerma T, Hosseinpoor AR, Verdes E, et al. A global assessment of the gender gap in self-reported health with survey data from 59 countries. *BMC Public Health* 2016; 16: 1–9. DOI: 10.1186/s12889-016-3352-y.
57. Bertakis KD, Azari R, Helms LJ, et al. Gender differences in the utilization of health care services. *J Fam Pract* 2000; 49: 147. DOI: NA.
58. UN Women. Addressing the economic fallout of COVID-19: Pathways and policy options for a gender-responsive recovery, <https://www.unwomen.org/-/media/headquarters/attachments/sections/library/publications/2020/policy-brief-addressing-the-economic-fallout-of-covid-19-en.pdf?la=en&vs=406> (2021).
59. Cooper AJ, Gupta SR, Moustafa AF, et al. Sex/Gender Differences in Obesity Prevalence, Comorbidities, and Treatment. *Current Obesity Reports* 2021; 10: 458–466. 2021/10/03. DOI: 10.1007/s13679-021-00453-x.
60. Ramjee G and Daniels B. Women and HIV in sub-Saharan Africa. *AIDS Res Ther* 2013; 10: 1–9. DOI: 10.1186/1742-6405-10-30.
61. Smith MH, Myrick JW, Oyageshio O, et al. Epidemiological correlates of overweight and obesity in the Northern Cape Province, South Africa. *PeerJ* 2023; 11: e14723. 2023/02/16. DOI: 10.7717/peerj.14723.
62. Nglazi MD and Ataguba JE-O. Overweight and obesity in non-pregnant women of childbearing age in South Africa: subgroup regression analyses of survey data from 1998 to 2017. *BMC Public Health* 2022; 22: 395. DOI: 10.1186/s12889-022-12601-6.
63. National Department of Health, Statistics South Africa, South African Medical Research Council, et al. South Africa Demographic and Health Survey 2016, <https://dhsprogram.com/pubs/pdf/FR337/FR337.pdf> (2019).
64. Kivimäki M, Strandberg T, Pentti J, et al. Body-mass index and risk of obesity-related complex multimorbidity: an observational multicohort study. *The Lancet Diabetes & Endocrinology* 2022; 10: 253–263. 2022/03/07. DOI: 10.1016/s2213-8587(22)00033-x.
65. SANAC. South Africa's National Strategic Plan for HIV, TB and STIs 2017–2022. In: National AIDS Council, (ed.). Pretoria; 2017.
66. SANAC. South Africa's National Human Rights Plan: A comprehensive response to human right-related barriers to HIV & TB services & gender inequality in South Africa, <https://sanac.org.za/wp-content/uploads/2020/03/HR-STRATEGY-FULL-electronic.pdf> (2020).
67. Pathirana TI and Jackson CA. Socioeconomic status and multimorbidity: a systematic review and meta-analysis. *Aust N Z J Public Health* 2018; 42: 186–194. DOI: 10.1111/1753-6405.12762.

68. Odland ML, Payne C, Witham MD, et al. Epidemiology of multimorbidity in conditions of extreme poverty: a population-based study of older adults in rural Burkina Faso. *BMJ Glob Health* 2020; 5: e002096. DOI: [10.1136/bmjgh-2019-002096](https://doi.org/10.1136/bmjgh-2019-002096).
69. Kunna R, San Sebastian M and Stewart Williams J. Measurement and decomposition of socioeconomic inequality in single and multimorbidity in older adults in China and Ghana: results from the WHO study on global AGEing and adult health (SAGE). *Int J Equity Health* 2017; 16: 1–17. DOI: [10.1186/s12939-017-0578-y](https://doi.org/10.1186/s12939-017-0578-y).
70. Steyn NP, Labadarios D and Nel JH. Factors which influence the consumption of street foods and fast foods in South Africa--a national survey. *Nutr J* 2011; 10: 104. 2011/10/05. DOI: [10.1186/1475-2891-10-104](https://doi.org/10.1186/1475-2891-10-104).
71. Otang-Mbeng W, Otunola GA and Afolayan AJ. Lifestyle factors and co-morbidities associated with obesity and overweight in Nkonkobe Municipality of the Eastern Cape, South Africa. *J Health Popul Nutr* 2017; 36: 22. 2017/05/27. DOI: [10.1186/s41043-017-0098-9](https://doi.org/10.1186/s41043-017-0098-9).
72. Goetjes E, Pavlova M, Hongoro C, et al. Socioeconomic Inequalities and Obesity in South Africa-A Decomposition Analysis. *Int J Environ Res Public Health* 2021; 18. 2021/09/11. DOI: [10.3390/ijerph18179181](https://doi.org/10.3390/ijerph18179181).
73. Alaba O and Chola L. Socioeconomic inequalities in adult obesity prevalence in South Africa: a decomposition analysis. *Int J Environ Res Public Health* 2014; 11: 3387–3406. 2014/03/26. DOI: [10.3390/ijerph110303387](https://doi.org/10.3390/ijerph110303387).
74. Adeboye B, Bermano G and Rolland C. Obesity and its health impact in Africa: a systematic review. *Cardiovasc J Afr* 2012; 23: 512–521. 2012/10/31. DOI: [10.5830/cvja-2012-040](https://doi.org/10.5830/cvja-2012-040).
75. Ataguba J. Health care financing in South Africa: moving towards universal coverage. *Continuing Medical Education* 2010; 28. DOI: NA.
76. Gordon T, Booysen F and Mbonigaba J. Socio-economic inequalities in the multiple dimensions of access to healthcare: the case of South Africa. *BMC Public Health* 2020; 20: 1–13. DOI: [10.1186/s12889-020-8368-7](https://doi.org/10.1186/s12889-020-8368-7).
77. Motshudi L. *How comprehensive are workplace wellness programmes?* University of Pretoria, Pretoria, 2015.
78. Conradie CS, van der Merwe Smit E and Malan DP. Corporate Health and Wellness and the Financial Bottom Line: Evidence From South Africa. *J Occup Environ Med* 2016; 58: e45–e53. 2016/02/06. DOI: [10.1097/jom.0000000000000653](https://doi.org/10.1097/jom.0000000000000653).
79. Kolbe-Alexander TL, Buckmaster C, Nossel C, et al. Chronic disease risk factors, healthy days and medical claims in South African employees presenting for health risk screening. *BMC Public Health* 2008; 8: 228. DOI: [10.1186/1471-2458-8-228](https://doi.org/10.1186/1471-2458-8-228).
80. The World Bank. Universal Health Coverage: Quality, affordable health care is the foundation for individuals to lead productive and fulfilling lives and for countries to have strong economies. <https://www.worldbank.org/en/topic/universalhealthcoverage#1> (2021).
81. UHC 2030. South Africa's path to universal health coverage: a new Presidential Health Compact, <https://www.uhc2030.org/blog-news-events/uhc2030-news/south-africas-path-to-universal-health-coverage-a-new-presidential-health-compact-555310/> (2019, accessed 2 June 2022).
82. South African Government. National Health Insurance, [https://www.gov.za/about-government/government-programmes/national-health-insurance-0#:~:text=The_National_Health_Insurance_\(NHI,of_their_socio%2Deconomic_status.\(n.d\)](https://www.gov.za/about-government/government-programmes/national-health-insurance-0#:~:text=The_National_Health_Insurance_(NHI,of_their_socio%2Deconomic_status.(n.d)).
83. Mukhari H. The NHI is not a perfect piece of legislation, but is critical for universal health coverage, (accessed 5 April 2023).
84. Day C, Gray A, Cois A, et al. Is South Africa closing the health gaps between districts? Monitoring progress towards universal health service coverage with routine facility data. *BMC Health Serv Res* 2021; 21: 1–13. DOI: [10.1186/s12913-021-06171-3](https://doi.org/10.1186/s12913-021-06171-3).
85. Pauw TL. Catching up with the constitution: An analysis of National Health Insurance in South Africa post-apartheid. *Development Southern Africa* 2021: 1–14. DOI: [10.1080/0376835X.2021.1945911](https://doi.org/10.1080/0376835X.2021.1945911).
86. Docrat S, Besada D, Cleary S, et al. Mental health system costs, resources and constraints in South Africa: a national survey. *Health Policy Plan* 2019; 34: 706–719. DOI: [10.1093/heapol/czz085](https://doi.org/10.1093/heapol/czz085).
87. National Department of Health. Adherence Guidelines for HIV, TB and NCDs: Policy and service guidelines for linkage to care, adherence to treatment and retention in care. 2016.
88. National Department of Health. Adherence Guidelines for HIV, TB and NCDs: Policy and service guidelines for linkage to care, adherence to treatment and retention in care, <https://www.nacosa.org.za/wp-content/uploads/2016/11/Integrated-Adherence-Guidelines-NDOH.pdf> (2016).
89. Liu L, Christie S, Munsamy M, et al. Expansion of a national differentiated service delivery model to support people living with HIV and other chronic conditions in South Africa: a descriptive analysis. *BMC Health Serv Res* 2021; 21: 1–8. DOI: [10.1186/s12913-021-06450-z](https://doi.org/10.1186/s12913-021-06450-z).
90. Fox MP, Pascoe S, Huber AN, et al. Adherence clubs and decentralized medication delivery to support patient retention and sustained viral suppression in care: Results from a cluster-randomized evaluation of differentiated ART delivery models in South Africa. *PLoS Med* 2019; 16: e1002874. DOI: [10.1371/journal.pmed.1002874](https://doi.org/10.1371/journal.pmed.1002874).
91. National Department of Health. Strategy for the prevention and control of obesity in South Africa 2015 - 2020, <https://health-e.org.za/wp-content/uploads/2015/12/National-Strategy-for-prevention-and-Control-of-Obesity-4-August-latest.pdf> (2015).

92. Department of Health. The regulations relating to the reduction of sodium in certain foodstuffs and related matters, R.214 of 20 March 2013: Amendment, https://www.gov.za/sites/default/files/gcis_document/201710/41164gon1071.pdf (2017).
93. Ndinda C, Ndhlovu TP, Juma P, et al. The evolution of non-communicable diseases policies in post-apartheid South Africa. *BMC Public Health* 2018; 18: 956. DOI: [10.1186/s12889-018-5832-8](https://doi.org/10.1186/s12889-018-5832-8).
94. Zhou B, Carrillo-Larco RM, Danaei G, et al. Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. *Lancet* 2021; 398: 957–980. DOI: [10.1016/s0140-6736\(21\)01330-1](https://doi.org/10.1016/s0140-6736(21)01330-1).
95. Katurura MC and Cilliers L. Electronic health record system in the public health care sector of South Africa: A systematic literature review. *Afr J Prim Health Care Fam Med* 2018; 10: e1–e8. 2018/11/21. DOI: [10.4102/phcfm.v10i1.1746](https://doi.org/10.4102/phcfm.v10i1.1746).
96. Nicol E, Hanmer LA, Mukumbang FC, et al. Is the routine health information system ready to support the planned national health insurance scheme in South Africa? *Health Policy Plan* 2021; 36: 639–650. DOI: [10.1093/heapol/czab008](https://doi.org/10.1093/heapol/czab008).
97. Jinabhai CC, Onwubu SC, Sibiyi MN, et al. Accelerating implementation of District Health Information Systems: Perspectives from healthcare workers from KwaZulu-Natal, South Africa. *SA Journal of Information Management* 2021; 23: 8. DOI: [10.4102/sajim.v23i1.1435](https://doi.org/10.4102/sajim.v23i1.1435).
98. van Pinxteren M, Mbokazi N, Murphy K, et al. The impact of persistent precarity on patients' capacity to manage their treatment burden: A comparative qualitative study between urban and rural patients with multimorbidity in South Africa. *Frontiers in medicine* 2023; 10: 1061190. 2023/04/18. DOI: [10.3389/fmed.2023.1061190](https://doi.org/10.3389/fmed.2023.1061190).
99. van Pinxteren M, Mbokazi N, Murphy K, et al. Using qualitative study designs to understand treatment burden and capacity for self-care among patients with HIV/NCD multimorbidity in South Africa: A methods paper. *Journal of multimorbidity and comorbidity* 2023; 13: 26335565231168041. 2023/04/15. DOI: [10.1177/26335565231168041](https://doi.org/10.1177/26335565231168041).
100. Pearson-Stuttard J, Ezzati M and Gregg EW. Multimorbidity - a defining challenge for health systems. *Lancet Public Health* 2019; 4: e599–e600. DOI: [10.1016/S2468-2667\(19\)30222-1](https://doi.org/10.1016/S2468-2667(19)30222-1).
101. The DHS Program. Survey dataset files. South Africa Standard DHS 2016, https://dhsprogram.com/data/dataset/South-Africa_Standard-DHS_2016.cfm?flag=0.
102. Southern Africa Labour and Development Research Unit. National Income Dynamics Study 2017, Wave 5 [dataset]. Version 1.0.0 Pretoria: Department of Planning, Monitoring, and Evaluation [funding agency]. Cape Town: Southern Africa Labour and Development Research Unit [implementer], 2018. Cape Town: DataFirst [distributor], 2018. DOI: <https://doi.org/10.25828/fw3h-v708>.
103. Human Sciences Research Council. *South African National HIV Prevalence, HIV Incidence, Behaviour and Communication Survey (SABSSM) 2017: Combined - All provinces*. [Data set]. SABSSM 2017 Combined. Version 1.0. Pretoria South Africa: Human Sciences Research Council [producer] 2017, Human Sciences Research Council [distributor] 2020. <http://dx.doi.org/doi:10.14749/1585345902>.