



Geography and NCDs

Brief 4

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Research briefs on non-communicable diseases in South Africa

We have developed a series of briefs aiming to explain, explore and quantify the burden of non-communicable diseases (NCDs) in South Africa. Throughout the briefs, we draw together both existing quantitative data as well as emerging qualitative data. The primary qualitative data presented in the form of vignettes, has been collected by Dr Beth Vale, through in-depth ethnographic research.

These briefs are timely, given the rising global burden, and particularly the rising burden in low- and middle-income countries (LMICs), of NCDs. Given South Africa's high prevalence of HIV, there has also been a recent focus on the link between HIV and NCDs as the population living with HIV grow increasingly older with the successful uptake of antiretrovirals. An ageing population is more at risk for NCDs as we will explain in our briefs. As we move towards universal health coverage (UHC) it is imperative that we understand the needs of our population now and how these may change going forward. We have produced twelve briefs in this series.

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- Actuarial Society of South Africa (ASSA): ASSA has an interest in being part of the development of high-quality evidence to support resource allocation and decision-making and the interplay between the supply and demand sides of the health system.
- RGA Reinsurance Company of South Africa Ltd (RGA): RGA has an interest in the ways in which life insurance can be responsive to the changing burden of disease and the ways in which we can use data to drive decision-making.
- Board of Healthcare Funders (BHF): BHF has an interest in an affordable,

accessible, and high-quality private health sector.

- Medscheme: Medscheme has an interest in the ways in which medical schemes can be responsive to the changing burden of disease in order to enable access to affordable and high-quality healthcare in the private health sector.

Take-home messages

- Geography is a strong predictor of health. Specifically, NCD risk, prevalence and mortality differ across geographies, both across and within countries.
- Developing countries are disproportionately worse affected by NCDs, with 86% of NCD-related premature deaths occurring in low- and middle-income countries. Sub-Saharan Africa, specifically, has the highest NCD mortality risk.
- Compared to global prevalence and other LMICs, South Africa has comparatively high levels of obesity, hypertension and diabetes, as well as other NCDs and risk factors.
- Associations between socio-economic status and NCDs are complex: NCDs can be associated with both wealth and poverty. Geography adds an additional layer of complexity to this, given that geography can be a predictor of socio-economic status.
- South Africa faces severe disparities between geographic regions (between provinces, as well as within provinces), largely as a result of Apartheid. These disparities accentuate the intersection of geography and poverty, and therefore have implications for NCD risk.
- South Africa is undergoing rapid urbanisation, and while urbanisation



comes with improved access to health services, education and higher income levels, the dietary changes that are associated with urban life have poor implications for NCD risk. As a result, in general, the burden of NCDs in South Africa is greater in urban areas and provinces.

- The way of life in rural areas is beginning to more closely resemble that typically associated with urban areas, specifically in terms of dietary changes. In addition to this, rural life comes with its' own challenges, such as higher levels of poverty and poorer access to health services.
- Disparities in access to health services still exist between and within provinces, with urban areas typically having better access to health services. This means that those in rural areas are less likely to know their health status and any known existing chronic conditions more likely to be poorly managed, given that it may be difficult or costly to attend the clinic regularly for check-ups.
- In upper-middle-income countries, like South Africa, pollution and behavioural risk factors contribute more or less equally to NCD mortality.

Introduction

Non-communicable diseases (NCDs) are the leading cause of death globally,¹ but the burden of NCDs and their risk factors differ across geographies. This brief sets out to describe the relationship between geography and NCDs. Geography is a critical predictor of health,² largely as a result of its' effects on the social determinants of health, such as poverty. This is particularly relevant in South Africa, whose foundations are laid in a history of spatial inequity, resulting in a pattern of geographic health disparities.

Industrialisation and urbanisation have brought many changes to the way of life in both urban

and rural areas, which have had many various implications on health and more specifically, NCDs. Some of these behavioural changes are beyond the control of individuals and are instead defined by their location. This highlights the need to consider geography in both designing and implementing health interventions.

Data and methods

We use two broad quantitative data sets for this paper: household survey data and medical scheme data. Survey data includes General Household Survey (GHS) data, Demographic and Health Survey (DHS) data and National Income Dynamics Study (NiDS) data. When we analysed the quantitative datasets for comparison against one another, we standardised based on age and sex, given the relationship between age and NCDs (see brief 2), and sex and NCDs (see brief 3). We do this standardisation against the Statistics South Africa mid-year population estimates for 2018 for all datasets for fair comparison.

For the survey data, we use statistical methods to present our data. Statistical significance is a mathematical approach used to determine whether something has happened by chance or is truly as a result of a particular factor. We use asterisks to denote the extent of the significance for the graphs we present:

* = $p < 0.1$: statistically marginally significant

** = $p < 0.05$: statistically significant

*** = $p < 0.01$: statistically highly significant

The medical scheme data used in this brief is from the Council for Medical Schemes (CMS). The CMS publishes a consolidated report annually, which reports on data from all existing medical schemes in South Africa. The medical scheme data used in this brief draw on these annual reports.

The intersection between geography and poverty



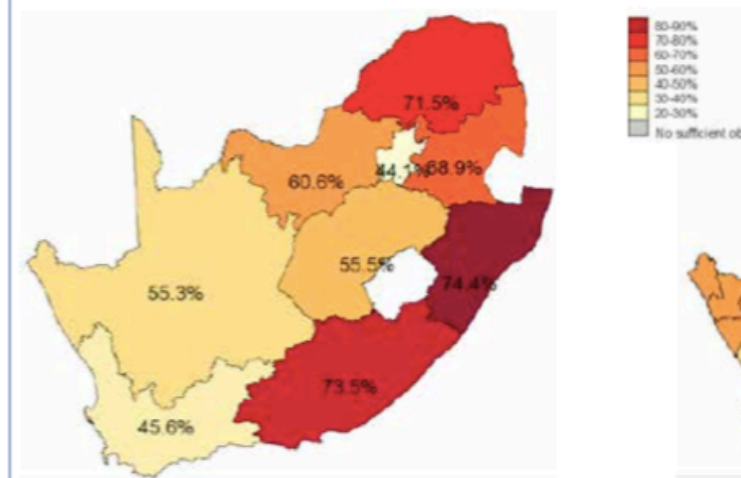
A person's wellbeing is affected to a large extent by the place in which they live, making location a critical predictor of health.² For example, South Africans, on average, are expected to live 20 years less and have an income 14.6 times lower, than the Swiss.³ Switzerland is a high income country, with much lower inequality- contributing to the difference between the two countries. South Africa has the highest income inequality in the world and therefore, despite being classified as an upper-middle income country, it has a far more mixed development index.^{2,4} This makes geographical analysis an important layer when investigating the burden of disease in SA.

South Africa faces severe disparities between geographic regions (between provinces, as well as within provinces), largely as a result of Apartheid. The establishment of the Bantustans during Apartheid, which forced black South Africans to live in rural areas with little infrastructure and access to public services,⁴ set up geographical "pockets of poverty",² still observable today. The provinces with the highest levels of poverty today (the Eastern Cape, KwaZulu-Natal and Limpopo) are where most of the Apartheid homelands were once located (see Figure 1).⁴ A similar story arises within urban centres. The proliferation of informal settlements was buoyed by the spatial Apartheid in cities, forcing people to set up as close to the city as they could get and afford, in order to access jobs.

Figure 1: Distribution of poverty across geographic regions of South Africa (World Bank, 2018⁴)

Figure 58: Pockets of high propensity to poverty in South Africa, 2014/15

a. Probability of remaining poor or falling into poverty, at the province level **b. Probability of remaining poor or falling into poverty, at the district level**



Source: Authors' calculations using NIDS waves 1-4 pooled sample (post-stratified weights).
Notes: In panel b, only districts with at least 400 respondents in NIDS wave 4 were kept.

In South Africa, the proportion of people living in poverty in rural areas is more than two times higher than that of urban areas.⁴ This can be attributed both to South Africa's history under Apartheid and to industrialisation, which has changed the type of work people are able to do.⁵

Poverty, as a social determinant of health (SDH), has various effects on wellbeing. While NCDs are commonly perceived to be diseases of the wealthy, the high prevalence of NCDs in poor countries demonstrate that strong links between poverty and NCDs exist too.⁶ This is because poverty affects exposure to the various NCD risk factors (unhealthy diet, harmful alcohol consumption, tobacco use, physical inactivity, environmental factors and childhood adversity), and so affects NCD prevalence. This highlights that the perception that NCDs are diseases of the wealthy only, is not true; interactions between NCDs and income are complex.

NCDs are now the leading cause of death in both developed and developing countries.¹ Furthermore, developing countries are disproportionately worse affected by NCDs,⁷



with 86% of NCD-related premature deaths occurring in low- and middle-income countries.¹ Sub-Saharan Africa, specifically, has the highest NCD mortality risk, with its' mixed geography making it susceptible to NCDs on several fronts.⁸ Given that Sub-Saharan African countries tend to have weak health systems, a burden of NCDs, on top of an already high burden of infectious diseases poses a severe risk. Notably, while number and cause of death are important metrics, they do not adequately measure the burden of a diseased living population, who require regular medication, consultations and clinical management.

supermarkets and ready-to-eat food are becoming more commonly available in rural areas too.¹⁴ As explained in Vignette 1, farm workers in rural areas usually need to purchase their food at supermarkets in the nearest town, which may be far away. Since transport is costly, rural travellers need to buy food that lasts and can be stored because they may not have a chance to buy fresh produce again soon. This dictates the kinds of food they can buy.

Urbanisation and NCDs

Life in rural areas differs from that in urban areas, which translates to differing exposure to NCD risk factors. The burden of NCDs in developing countries and LMICs has been accelerated by high rates of urbanisation.⁷ A study analysing data from 173 countries between 1980 and 2008 found that urbanisation has largely contributed to an increase in average BMI and cholesterol levels, particularly in LMICs.⁹ This link between urbanisation and NCDs is particularly important in South Africa, where urbanisation is taking place rapidly.¹⁰

While urbanisation comes with improved access to health services, education and higher income levels, the dietary changes that are associated with urban life have poor implications for NCD risk. This includes an increase in consumption of unhealthy foods⁹, which are readily available and tend to be more affordable (saturated fats and sugar), as well as an increase in calorie intake¹¹, in part to ensure adequate energy for physically intensive jobs. The easy access to supermarkets and fast-food vendors in urban areas has contributed to growing prevalence of obesity and associated NCDs.¹² Several years ago, many of these fast food restaurants would target advertising at children (at schools etc), to drum up demand.¹³

However, in South Africa these dietary changes are no longer unique to urban areas:



Vignette 1: Urbanisation and the Karoo: Tekkies' story

Literature on the global rise of NCD's has been replete with references to urbanisation and its consequences for health. City-dwellers are described as more sedentary, more susceptible to stress, more exposed to air pollution, and more likely to consume processed foods, tobacco, and alcohol – all of which are major NCD risk factors. But, an over-focus on urban areas could negate the powerful forces at work in the lives and bodies of rural residents. Urbanisation is not only felt in big cities: it produces effects elsewhere, with real consequences for health. More so, much of what has defined city living is in fact a feature of industrial capitalism, which has expanded far beyond cities.

Over the past six decades, Karoo farms have been shedding labour. Those displaced from farms have often landed in small towns, contributing to regional urbanisation. In the late 1970s, economic decline in the Karoo reached a crisis point, fueled by overgrazing, deepening drought, and shifts in market prices.¹ Some workers had voluntarily moved to town in search of better prospects, while others were forcibly evicted. Smaller farms were consolidated into larger commercial ones, requiring fewer labourers. In the lead-up to the democratic transition, some farm owners sold their farms and/or evicted labourers in anticipation of new land and labour laws.¹

Over the course of my fieldwork, many reported to me that, within a generation, the number of permanent workers on farms had shrunk dramatically, while the population of small towns had swelled. Increasingly, farm labourers were casual workers, whose primary home was in town — close to schools, shops and essential services.

With the institution of the minimum wage, those who kept their jobs on farms had almost all food rations withdrawn, replaced by purely cash-based wages. Far fewer farm owners were producing excess food for self-sufficiency. Instead, they focused only on food for sale. Even those who remained permanently on farms were brought to town each month to buy groceries, shopping in large retail stores, rather than living primarily off farm produce. While cash-based wages meant choice, freedom and a partial escape from feudalism; wages didn't stretch very far in town. Transport was expensive and hard to come by. In this context, processed, cheap and long-lasting foods has gained appeal.

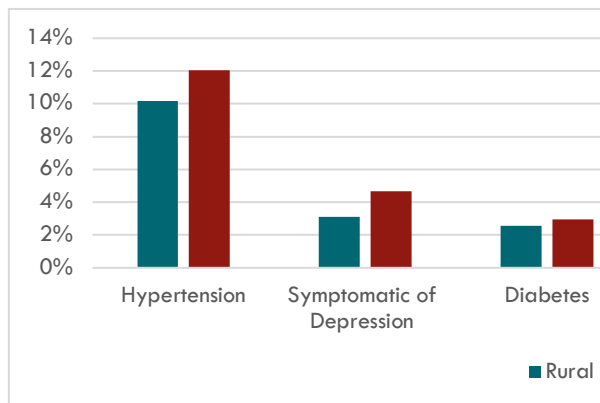
Both those who moved to town, and those who stayed on farms, were thrust into a cash-based economy. This meant a profound change in diet. When arriving in town, some described wanting to 'eat like town people,' who were often seen as more modern, educated, wealthy and free than those on farms. But since farm-dwellers were now also getting the bulk of their food in towns, the urban diet was increasingly the only diet. It is in this context that regional NCD diagnoses have surged.

Among those farm labourers who moved to town in the early years of democracy was Tekkies [pseudonym], and it was not of his own volition. Tekkies is a sheep shearer, who now lives Jansenville — the hub of the mohair industry. On the day I first met Tekkies, he told me he'd be waiting outside the USave — a low-cost supermarket owned by Shoprite, which had become a social hub.

Figure highlights the higher rates of self-reported NCDs in urban areas, standardised for age and sex to account for demographic differences between urban and rural areas.

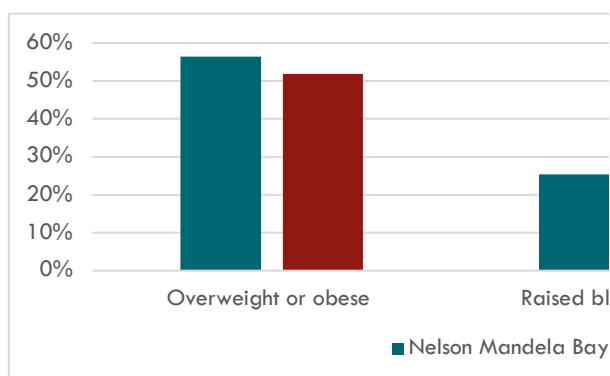


Figure 2: Self-reported NCD prevalence by geography type, age and sex standardised (Own analysis, NiDS 2017)



However, some rural areas, at a sub-district level, have NCD prevalence rates that are very similar to that of urban districts. For example, Figure 3 demonstrates similar prevalence of diabetes, hypertension and obesity in the Nelson Mandela Bay district (urban) and the more rural Sarah Baartman district (where Jansenville is found), both situated in the Eastern Cape. This highlights the fact that while the NCD-related health implications of urbanisation are evident in higher prevalence of NCDs in urban populations, a form of “urbanisation” is also taking place in rural areas, whereby those living in rural towns face many of the same NCD challenges as those living in urban areas.

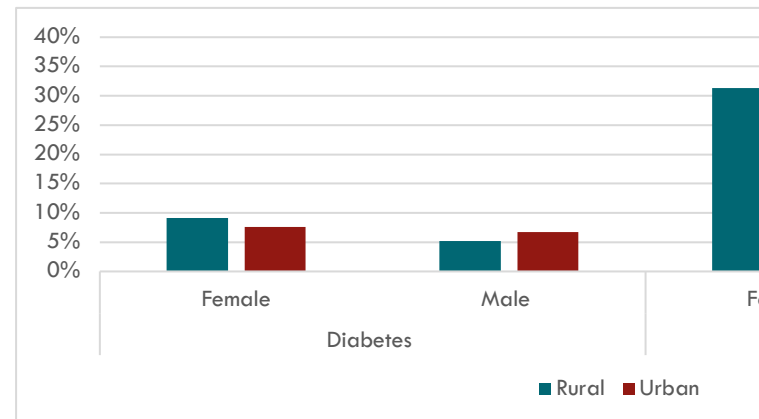
Figure 3: Prevalence of NCDs and risk factors of two Eastern Cape districts (District Health Barometer 2018/19¹⁷)



As seen in Figure 4, blood pressure measurements from the NiDS and DHS confirm that hypertension is more prevalent in urban areas, as observed in self-reported statistics. However, blood sugar measurements from the

DHS show that female diabetes is actually more prevalent in rural areas. This demonstrates the permeation of NCDs and their risk factors into rural South Africa too.

Figure 4: Objective measures of hypertension and diabetes prevalence by geography type, age standardised (Own analysis, DHS 2016)



Urbanisation also has negative impacts on mental health as a result of increased stressors associated with mental disorders, including cramped living conditions, more pollution, higher rates of violence and reduced social support.¹⁸ This translates to higher prevalence of mental illness in urban areas.¹⁸ As seen in



Figure , results from the NiDS show that a higher proportion of those living in urban areas (4.66%) are symptomatic of depression, compared to those living in rural areas (3.1%).

While literature tends to focus on the negative impacts of urbanisation on urban dwellers, urbanisation does not only translate to changes for those moving to urban areas, but also has health implications for those left behind. The way of life in rural areas is beginning to more closely resemble that typically associated with urban areas, specifically in terms of dietary changes. In addition to this, rural life comes with its' own challenges, such as higher levels of poverty and poorer access to health services. As the youth move to urban areas in search of employment, the lives of the elderly who remain are deeply affected.

Vignette 2: Burdens on rural elders

As South Africa has urbanised, increasing numbers of people have left rural areas in search of work in cities. This places a unique burden on the rural elderly, who are often left behind to care for grandchildren. Sometimes these elderly become primary breadwinners in their households, supported by a monthly pension. The responsibilities placed on older people come at a time when they are most vulnerable to NCD's, and in some instances, compound their health risks. In previous briefs, we have shown how caregiving responsibilities are often prioritised over the caregiver's own health seeking.

As rewarding as it might be to care for grandchildren, it can also contribute to stress and anxiety. Oom Rodney, a local farm worker, told me in March 2019 that when his wife was first diagnosed with diabetes, she was getting a lot of headaches. 'Our daughters were working away from home and our grandchildren had just come to live with us. There was a lot of stress. At first I was really angry about it.'

Rodney and his wife are in their sixties, but both are still working. Often, their work entails hard labour. Caring for grandchildren compounds their responsibilities, putting them under immense physical and emotional strain. This has implications for NCDs: potentially compromising adherence, health-seeking and mental health among the elderly.

Using geography as a critical lens then also assists in highlighting the need for research to include a focus on rural areas, to better understand the NCD burden and so, how to best address it.

Health services and geography

While South Africa has made great progress in improving access to health services, specifically in rural areas, disparities in access to health services still exist between and within provinces.¹⁹ Urban dwellers continue to have better access to and higher utilization of health services, and, in general, report higher overall health status than rural dwellers.²⁰ The relationship between poorer overall health status and rurality is likely as a result of access to financial means and poorer social determinants of health. Rural dwellers are generally more vulnerable to many of the social factors that influence health, including poverty, environmental pollutants and poor education.²¹

Poor access to health services poses a twofold problem: those in rural areas less likely to know their health status and any known existing chronic conditions more likely to be poorly managed given that it may be difficult or costly to attend the clinic regularly for check-ups. However, the role of community health workers (CHWs) in NCD screening and management has led to improvements in NCD awareness and outcomes in rural areas in South Africa.²² This is evident in household survey data, which show that the level of under-reporting of NCDs (when comparing self-reported prevalence to objective disease



measures such as blood pressure readings) is similar in rural and urban populations. The role of CHWs in poorly resourced settings is an effective tool that can be drawn on.

This being said, the level of under-reporting is still very high in both rural and urban areas, which speaks volumes about how South Africans perceive their health – an overly optimistic population, especially given the high burden of disease. South Africa learned many lessons from the HIV pandemic on how to enrol and manage chronic patients within the public health system. The NCD burden is now requiring the same response and the system has had to pivot to cope with the additional chronic disease load. One of the responses has been to shift services to communities instead of facilities, to make enrolment, management and adherence easier for clients. Vignette 3 provides insight into the reality of these mobile health services.

Vignette 3: Geography and Health Access

Proximity to clinics, pharmacies and hospitals is an important determinant of health access, and a significant challenge for those living in rural areas. In the context of widespread chronic illness, in which many depend on daily medication and regular check-ups, access to health services is especially important.

Farm workers in the Karoo are often far removed from health facilities with restricted access to transport. Many depend on farm owners to provide lifts into town. In an effort to bring health services closer to farm-based residents, a mobile clinic service has been set up to deliver chronic medication to farm workers. While greatly valued, mobile clinics face numerous challenges in their operation: some days they don't have the requisite fuel; access to farms is occasionally barred by electric gates; and travel distances might be too far to reach all scheduled patients.

In December 2019, I watched as mobile clinic staff attended to a female farm worker with co-morbid bipolar and hypertension. The woman climbed into the makeshift consultation room in the rear of the pick-up truck. Because space was limited, I sat on the edge of the truck tires. The psychiatric medication had to be delivered via injection, but accidentally spilled from the syringe. Frustrated, the nurse gave the patient her high blood pressure pills and told her she would have to come to the town clinic for her injection. The woman sighed, 'I don't know how I'll get a ride to town.' It's possible that this woman might have hitched a ride, but more likely that she would have had to wait — either for the next mobile clinic visit, or the next scheduled trip to town (usually at month-end to collect wages). This would mean missing her monthly dosage.

Despite these shortcomings, mobile clinics have improved access for many who cannot afford to travel to health facilities. However, many men in rural South Africa work away from home on the days that the mobile clinic visits, and so miss this point of access too. This highlights the need for health services that are tailored to the population which they serve. Supporting this is the fact that lives and livelihoods, and so too, health and illness, differ across geographies.

Studies have shown that prevalence of NCD risk factors differ greatly between countries,²³ and within countries. Various studies in South Africa have found that obesity and alcohol consumption are more prevalent in urban areas^{10,23}, while smoking¹⁰ and higher levels of physical activity²⁴ are more common in rural areas. Clearly then, different populations across the country face different NCD risks, and so have differing health needs. This highlights the importance of considering geography in the tailoring of health services, to ensure that the appropriate services are accessible to the population at hand. Contextualised health services are therefore vital for dealing with the burden of NCDs which, as chronic diseases, require lifelong management and care, most likely including regular check-ups and daily medication.



NCDs in South Africa

Compared to global prevalence and other LMICs, South Africa has comparatively high levels of obesity, hypertension and diabetes.^{23,25,26}

This high burden of NCDs in South Africa can be, in part, attributed to the comparatively high rates of poverty and urbanisation in the country⁴, specifically in terms of dietary implications: healthy food is unaffordable for most, and the dietary challenges normally associated with urban life have filtered through to rural areas too. As a country with a violent past and present, the effects of childhood adversity as a risk factor for NCDs are also likely play a role in the country's high NCD burden.

Another risk factor of particular pertinence in South Africa is harmful alcohol use, since South Africa has very high rates of alcohol consumption compared to other countries.²⁷ On average, South Africans aged 15+ consume 9.3 litres of alcohol annually (this measurement is based on litres of pure alcohol), which is almost 1.5 times the global average of 6.4 litres. South Africans aged 15+ who are drinkers consume an average of 29.9 litres of alcohol (measured as litres of pure alcohol) annually, which is almost double that of the global average of 15.1 litres.²⁸

As highlighted in the section addressing the intersection between geography and poverty, associations between NCDs and socio-economic status (SES) are complex and appear to differ across countries. Some studies suggest that NCDs affect those with low SES more in developed countries, while affecting those with high SES more in developing countries.¹⁰ A possible explanation for this is that unhealthy diets are first adopted by affluent groups who can afford to buy pre-packaged convenience food from supermarkets and fast-food vendors. Then, as public knowledge of NCD prevention and access to health services improve, these affluent groups become more aware of the implications of an unhealthy diet on health and adapt accordingly. At the same time, unhealthy diets become more widely available and the NCD burden shifts to weigh heavily on the poor (compounded by the fact that healthy food types are more expensive, making it difficult for people to make the same shift seen in the higher SES population).²⁶

In South Africa, NCDs are less likely to be identified and treated among the poor.⁶ This is evident to an extent in the lower levels of self-reported diabetes and hypertension prevalence in poorer/more rural provinces, such as Limpopo (as seen in Figures 5 and 6), as well as in the difference between national self-reported prevalence and medical scheme data (as seen in Figures 7 and 8).

Figure 5: Self-reported hypertension prevalence by province, age and sex

standardised (Own analysis, GHS 2010 and 2018)

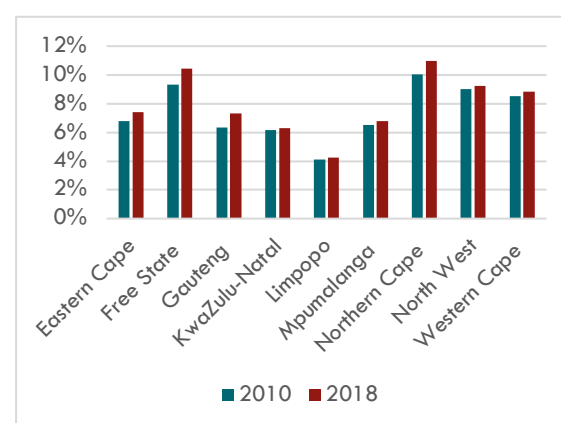




Figure 6: Self-reported diabetes prevalence by province, age and sex standardised (Own analysis, GHS 2010 and 2018)

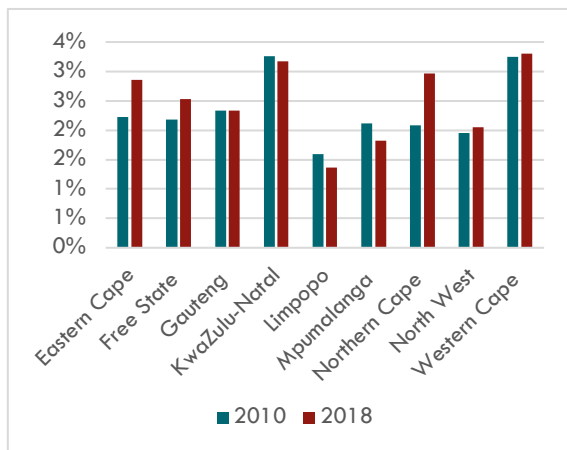


Figure 7: Diabetes prevalence by age (CMS 2017 and NiDS 2017)

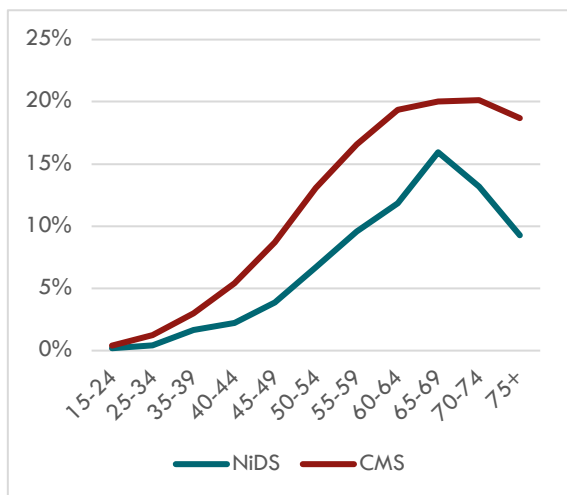
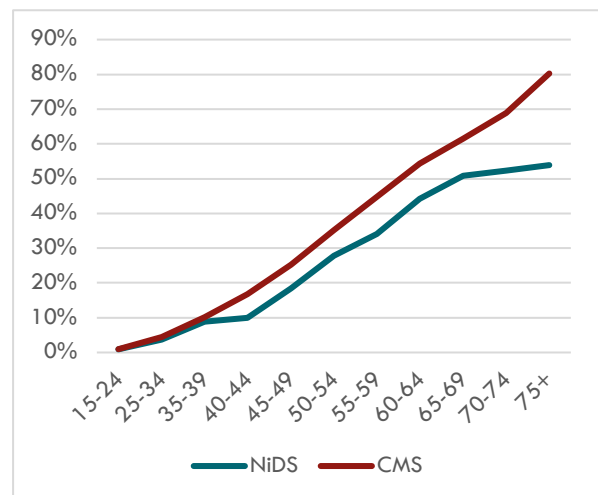


Figure 8: Hypertension prevalence by age (CMS 2017 and NiDS 2017)



While South Africa generally follows the global trend of higher NCD prevalence in urban areas, rural areas are catching up quickly. The impacts of urbanisation have filtered through rural towns and their inhabitants. One such town is Jansenville, the home of Tekkies.



Vignette 4: Tekkies

Tekkies has high blood pressure and diabetes, which he manages by taking five pills each day. He was first diagnosed at the clinic, some years after moving to town.

Tekkies grew up on a farm near Steytleville, until his family was evicted in 1991. ‘[On the farm], we were given payment – or maybe half of our payment – as food’, he tells me. ‘Meat and lots of different vegetables. We never ate bread before, just mielie pap.’

But in the early nineties, the farm was converted into a game lodge, which meant all the workers would need to be removed. Tekkies became one of the 1.7 million people who, for a variety of reasons, were evicted from South African farms, between 1984 and 2004.¹ Game farm conversions are part of this story, demanding not only less labour, but labour of a different type. Instead of sheep shearers, for example, one needed hospitality hands.

When Tekkies and his family were evicted from the farm, it was the only home they ever knew – the home of their ancestors. When they first arrived in Jansenville, the whole family stayed in one house. ‘It was very difficult. You can’t easily get a job without knowing anyone,’ he said. But eventually, Tekkies was referred for a shearing contract, and went on to become a regular contract worker.

When I asked him about the changes he experienced after moving to town, Tekkies said this: ‘On the farm, we didn’t use any money. But here in town, you are forced to work for money. There is limited land to plant vegetables or keep livestock, and municipal water rates are expensive.’

Tekkies’ move to town had ruptured his relationship to the land. Water was no longer free, and food was no longer grown. Instead, it had to be bought, which demanded selling one’s labour for cash. This placed Tekkies’ livelihood under new pressures, since food was inaccessible without cash in hand. It also meant a dramatic change in diet – towards food made by corporations.

Of course there are a number of reasons why Tekkies’ NCD diagnoses might have only come after his move to town: He was older in age and closer to testing and screening services. Awareness of NCDs may also have been increasing. But Tekkies only became symptomatic after his move to town, which had been accompanied by new stresses and significant dietary change. The impact of geography in his illness journey does not seem coincidental.

In 2016, pollution was found to be the second highest cause of NCDs.²⁹ It is estimated that 16% of global NCD deaths can be attributed to pollution (including air, soil, and water pollution in households, communities and workplaces).³⁰

However, the level of contribution of pollution to NCD mortality in countries varies by income level: pollution is the predominant risk factor for NCD mortality in LMICs, whereas behavioural and metabolic risk factors are more prominent causes of NCD deaths in high income countries. In upper-middle-income countries, like South Africa, pollution and behavioural risk factors contribute more or less equally to NCD mortality.³⁰



Conclusion

Life differs vastly across geographies, both between and within countries. This includes differences in environmental factors, as well as differences in quality of life. These differences, in turn, affect the health needs and preferences of populations, specifically in terms of NCDs, which are sensitive to such differences and have great impacts on quality of life. In South Africa, the geographic distribution of people, wealth and health is complex. The establishment of the Bantustans during Apartheid laid the foundations for stark differences in the division of resources, which are still evident today.

This highlights the need for using geography as a critical lens to understand the NCD burden in South Africa, where social determinants of health are so largely affected by geographic divisions of the past.

South Africa faces a comparatively large burden of NCDs. There is also great variation in NCD burden across geographies within the country, which is closely linked to poverty and the social determinants of health, and can largely be traced back to the country's spatial history under Apartheid. Ever more, the impacts of urbanisation are no longer only evident in urban areas, but are being felt in rural regions too. Additionally, pollution (which contributes greatly to NCD mortality) also differs across geographies within South Africa. Geography therefore serves as a valuable tool in understanding which populations are most vulnerable in terms of NCDs, and how to best target interventions to ensure that the health needs of these populations are met.



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