BRIEF ELEVEN

11. Compounding the complexity

The impact of comorbidities on the management of non-communicable diseases

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Research briefs on non-communicable diseases in South Africa

Percept has developed a series of briefs aiming to explain, explore and quantify the burden of non-communicable diseases (NCDs) in South Africa. Throughout the briefs both existing quantitative data as well as emerging qualitative data are drawn together. The primary qualitative data - presented in the form of vignettes - has been collected by Dr. Beth Vale, through in-depth ethnographic research. Given the rising global burden of NCDs, particularly in low- and middle-income countries (LMICs) these briefs are incredibly relevant. Given South Africa's high prevalence of HIV, there's also recently been a focus on the link between HIV and NCDs, as the population living with HIV grows increasingly older with the successful uptake of antiretroviral treatment (ART). As we'll explain in the briefs, an ageing population is more at risk for NCDs. Moving towards universal health coverage (UHC), it's imperative to understand the current needs of our population - and how these may change going forward. We have produced fourteen 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 is a regional representative body of health funders, administrators, and managed-care organisations. It is committed to universal health coverage, value-based healthcare, and accountability for health. Addressing the NCD burden is an important element to achieve some of its objectives.

Take-home messages

- It is likely that the prevalence of co- and multimorbid chronic diseases in South Africa is substantially underestimated.
- Many chronic illnesses are associated with one another in a multitude of ways. This makes disease management more complex for both clinicians and patients, which in turn negatively impacts the quality of care received.
- Limitations in publicly available data for the uninsured population make it challenging to estimate the prevalence of co- and multimorbidity. However, survey data shows that approximately 11% of people have at least two chronic conditions. The prevalence of co- and multimorbidity is higher in women than in men, and three-quarters of people with diabetes have a comorbidity.
- People with multimorbid chronic diseases are 2.73 times more likely to have been hospitalised in the past 6 months
- A person-centred approach that looks at treating the whole person rather than just the disease is needed to manage comorbidities. This should be supported by more integrated clinical guidelines and tools for chronic disease management to measure and manage polypharmacy[a].

[a] the regular intake of five or more medications

Introduction

This brief focuses on the comorbidity and multimorbidity of chronic conditions. For our purposes, we define comorbidity as an individual having two chronic conditions at the same time, and multimorbidity as an individual having more than two chronic conditions at the same time.[1] We use the term chronic conditions, rather than non-communicable diseases (NCDs), to include HIV, which is a communicable disease but also chronic. We don't include medium-duration conditions like tuberculosis (TB) in our definition of comorbidity, as TB is curable. Therefore, this brief looks at long-term, chronic conditions that need to be managed using both medical, behavioural, and/or social interventions for the remainder of a person's life.

In previous briefs, we explained why NCDs are a growing global concern, and highlighted that it has become the leading cause of death worldwide in recent years.[2] However, an area that is still being researched is the impact of comorbidity on health outcomes, as well as the relationship between different types of chronic diseases and their risk factors.

Complex causality and compounded costs of care

Previous briefs in this series explored the causes of chronic diseases. Biological factors like age and sex feature strongly in the onset and type of disease. Similarly, a person's socio-economic status and living conditions contribute to their susceptibility to chronic conditions. These same factors also play a role in comorbidity.

However, some chronic conditions are also widely accepted to be inherently linked due to the **crossover of the factors that first give rise to them (causative factors).** Examples of these conditions are heart disease, hyperlipidaemia (high cholesterol), and hypertension.[3] Therefore, if a person displays the risk factors linked to these conditions, they are also likely to experience all three conditions simultaneously.

Relationships also exist between **infectious diseases and NCDs.** For example, antiretroviral therapy (ART), which is used to treat HIV, has been linked to increased cardiovascular disease, and the human papillomavirus (HPV), a sexually transmitted infection (STI), can cause cervical cancer.4 Both these conditions are particularly relevant for South Africa, given the high prevalence of HIV and STIs. This means that a person's history of infectious diseases can also contribute to their susceptibility to NCDs. This linkage goes in both directions. For example, diabetes makes people more susceptible to acquiring TB and pneumonia, both of which are infectious diseases.[4]

Certain combinations of chronic conditions exhibit what is referred to as superadditive costs of treatment. Superadditivity is when the sum of two elements leads to a value greater than just the additive sum of the two elements. In this sense, having two chronic diseases doesn't simply sum to the cost of treating these two conditions.[5] For example, if a patient has both diabetes and heart disease, and it costs R500 to treat diabetes and R500 to treat heart disease, the cost of treating both conditions together will be greater than R1,000. However, not all chronic conditions are superadditive. Finding the ones that are, and targeting prevention efforts on them can be substantially more effective than a single disease-prevention lens.[5]

One study found that in ten selected chronic conditions[b] (which resulted in 45 combinations of comorbidities that were analysed), 41 combinations of these chronic conditions were found to be superadditive.[5] Diabetes was a particularly significant driver of superadditive costs when co-occurring with another chronic condition; it was found to significantly increase the aggregate cost of treating chronic kidney disease, heart disease, respiratory illnesses, and stroke.[5] A study of health system costs for individual and comorbid NCDs in New Zealand found that 23.8% of the total health expenditure on NCDs could be attributed to the superadditive nature of certain combinations of comorbid chronic conditions.[6]

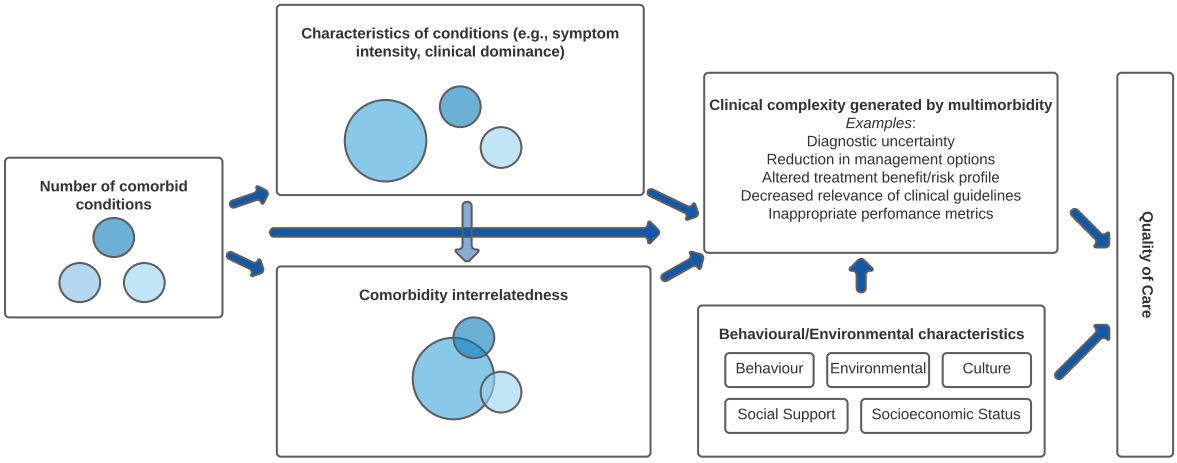
[a] This study specifically looked at stroke, heart disease, cancers (breast, lung, colorecta, stomach, liver, kidney, pancreatic, and oesophageal), diabetes, chronic kidney disease, respiratory illness (chronic obstructive pulmonary disease and asthma), cirrhosis, major depression, neurological disorders, and alcohol-use disorders.[5] Combinations of comorbidities included stroke, heart disease, cancers, diabetes, and chronic kidney disease for each of the ten chronic conditions respectively.[5]

Cortaredona and Ventelou (2017) argue that, "When comorbidity exists and where super-additivity is involved, a given preventive policy leads to greater monetary savings than the costs associated with the single diagnosis, meaning that, the returns from the action are generally underestimated."[5] Therefore, we need to understand both the relationship between risk factors for different conditions and the impact on health needs when someone lives with more than one chronic condition. When both these factors are considered, it becomes clear that our prevention efforts and service-delivery modes need to adapt to urgently stem the tide of, and better support individuals with, comorbidities.

Comorbidities make care more complicated

Figure 1 illustrates how comorbidity influences the complexity of care a patient would require from the health system, making it more difficult to render quality care.[3] It shows that when a patient presents with many chronic conditions simultaneously, care becomes more complicated because of the specific characteristics of each condition, and also how they interact with one another.[3]

Figure 1: Conceptual framework of the influence of comorbidities on clinical complexity and quality of care for patients[3]



When certain chronic conditions are more dominant in terms of the intensity of the symptoms, or the onset of one chronic condition is related to the onset of another, it makes it more difficult to diagnose and manage these conditions from a clinical perspective.[3] The behavioural and environmental factors in a patient's life also play a role in making care more complex in the presence of comorbidities.[3] Figure 1 illustrates how all these factors contribute to the clinical complexity of treating comorbid chronic conditions, and therefore impact the quality of care patients receive.[3]

It's important to understand how diseases cluster together when designing appropriate clinical disease-management guidelines for certain chronic conditions that tend to co-occur.[7] Certain chronic conditions tend to cluster together – and these may vary by gender. This is depicted in Figure 2, where Schäfer et al. (2014) used German insurance claims data to analyse which chronic conditions tend to be associated with one another on an individual level – and of these diseases with high associations, which ones tend to present together as multimorbidities.[7]

Figure 2: Disease associations in multimorbidity clusters for female population[7]

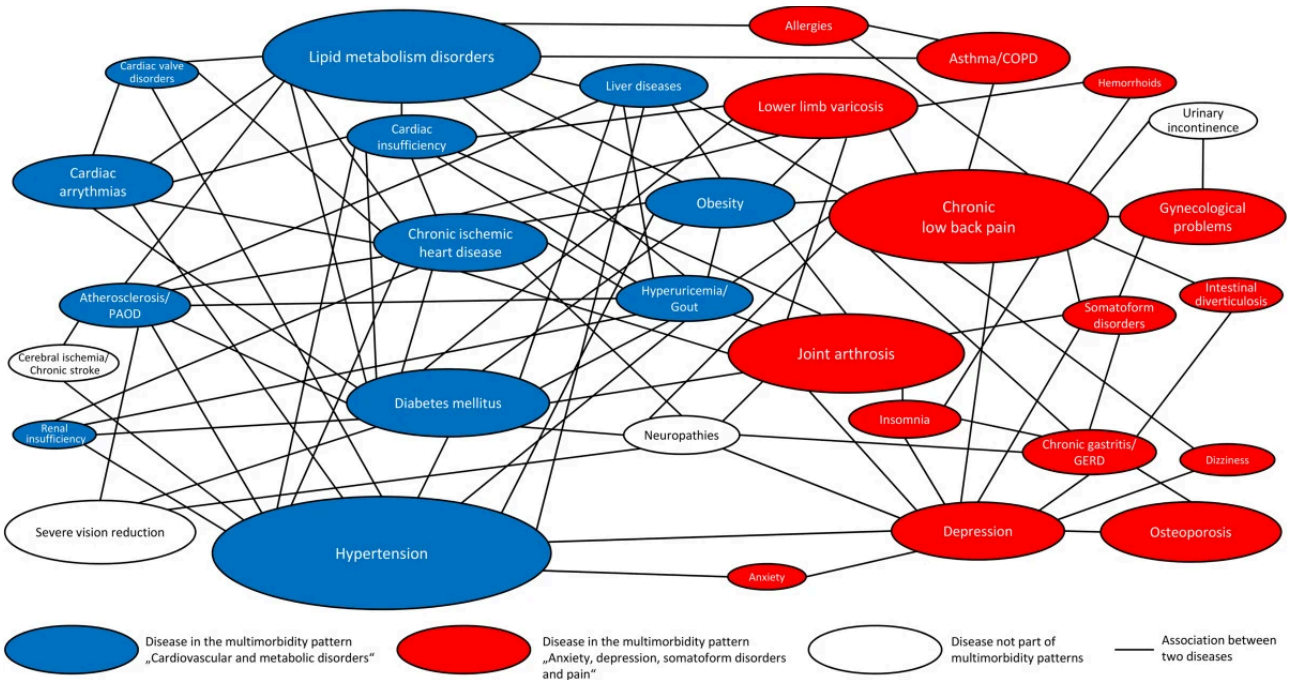


Figure 2 shows that in the population considered, hypertension, lipid metabolism disorders, and chronic lower back pain had the highest number of associations with other chronic conditions among women.[7] It also illustrates the multitudes of associations between diseases classified as metabolic syndrome (such as obesity, hypertension, lipid metabolism disorders, and diabetes) and cardiovascular diseases (such as hypertension, atherosclerosis, chronic ischaemic heart disease).[7] Using this diagram, Schäfer et al. (2014) visually illustrate the complexity of how chronic conditions are associated and the multitude of combinations in which they can co-occur.[7]

The complexities of managing patients with comorbidities are evident in the higher hospitalisation rate among medical scheme members who are registered for more than one NCD. Table 1 shows the risk of having been hospitalised in the previous 6 months among members with NCDs as per medical scheme chronic benefit registration data[c] ,compared to members who aren't registered for an NCD, but are registered for at least one chronic benefit. The results in Table 1 show that as the number of NCDs a medical scheme member is registered for increases, so does the risk of having been hospitalised in the previous six months. The risk of members registered with one NCD is 2.73 times higher of having been hospitalised, compared to members who are not registered for any NCDs. This risk increases to 12.33 times for those registered for five or more chronic conditions.

Table 1: Risk ratio for hospitalisation in previous 6 months, compared to beneficiaries registered for chronic benefits other than NCDs (own analysis, medical scheme data)

NUMBER OF NCDS	RISK RATIO FOR HAVING BEEN HOSPITALISED IN THE PREVIOUS 6 MONTHS
1	2.73
2	4.01

[c] NCDs included are diabetes, hypertension, heart attacks, coronary disease, mental disorders, asthma and arthritis

NUMBER OF NCDS	RISK RATIO FOR HAVING BEEN HOSPITALISED IN THE PREVIOUS 6 MONTHS
3	6.07
4	8.30
5+	12.33

The results in Table 1 clearly illustrate how multimorbidity drives up the cost of care, and this increased risk of hospitalisation is also likely an indication of the increased complexity of caring for patients with multiple different chronic illnesses. This complexity is driven by the fact that clinical management guidelines aren't always explicit about how patients with comorbidities should be treated, given that medications for different chronic conditions may have varying levels of efficacy, or side effects when taken in combination with one another.[8]

Polypharmacy is often the outcome of the clinical complexity of managing multiple chronic conditions and although it is often appropriate or required, it also has additional risks, particularly for the elderly, frail, or cognitively impaired.[8] For example, elderly patients taking more than four medications are at higher risk of falls with each additional medication, regardless of the medication type.[9] For patients, polypharmacy is associated with reduced quality of life, increased risk of problems with mobility, increased contact with and dependence on the healthcare system, and a higher risk of medication non-adherence, disability, adverse drug events, inappropriate use of medication, and long-term care placement.[9] From a quality-of-care perspective, polypharmacy increases clinician workload and reduces their productivity, and also increases the likelihood of medication errors.[9] Overall, polypharmacy increases the cost and burden to the healthcare system.[9]

When a clinician is not actively managing this load and assisting the patient with ways to simplify the mental burden, adherence is likely to suffer – increasing the severity of some or all the conditions (Vignette 1).

Vignette 1: Medication overwhelm

The medication overwhelm for patients with co-morbid NCDs was illustrated most powerfully in one consultation I observed – between a dietician (D) and a woman in her late fifties (W). The woman arrived at the clinic wearing slippers and a grey hoodie. She removed both to be weighed and then took a seat in front of the dietician.

D: Why have you come to see me today?

W: It's my kidneys and my heart. I was short of breath. So, I went to see the doctor and found out that my heart and my kidneys aren't working. They said I must come speak with you about my diet.

The patient paused for a moment and then pulled out a shopping packet, full of medication:

W: I don't know which pills are for my kidneys and which are for my heart. There's such a pile of pills, I don't know what's what.

D: 'Bring them, I'll try. [She looked closely at the packets, boxes, and blister packs] 'Okay, this one is for cholesterol, take it in the evening.'

W: [The woman nodded] In the evening.

D: Do you know what cholesterol is?

W: [The woman shook her head] No.

D: We'll speak about that later. What about this pill? Do you know it? This one is for blood pressure.

W: Okay, so I know the ones in the boxes, but I don't know the ones in these packets.'

D: [The dietician scanned the labels] Okay, this one is for heartburn [holding up a packet]. Can I write that on the label? Take it in the evening... Okay, next one: this one is also for high blood pressure. You take it at lunchtime. So, you have two…no three, three for blood pressure.

By now, the dietician had stopped telling the patient when to take each pill. Even she was becoming overwhelmed. Nevertheless, she kept going:

D: Okay, this is iron. That could be because your kidneys don't work so well, so you have too little iron.'

W: [Now, it was the patient's turn to point at a box] And this one, I know this one is for the heart.

D: Okay. And where's your water pill? Oh, here it is. I'll write it on the package…. And this one, I think if I had to guess, this one is for the heart that doesn't work very well. Yes, this is for the heart. [Slowly, the dietician returned the medicines back to the shopping packet] It's good to ask, the nurses at the pharmacy must explain to you. It's important that you ask. It's your body.

But even she seemed to acknowledge that what was being asked of her patient – a caregiver of three grandchildren – was near impossible.

A study of patient and healthcare provider experiences with the care and management of comorbid chronic diseases at public healthcare facilities providing HIV care across Cape Town found that people living with HIV (PLWHIV) stated that they were inconvenienced by having to collect ART and other chronic medications at different facilities.[10] They also complained of a lack of continuity of care as they were treated by different clinicians at every visit.[10] Healthcare providers also stated that patients often struggled with the high pill burden.[10]

The risk that comes with multiple medications is lessened when someone is in the care of a team of clinicians who are aware of that individual's clinical history. In the private sector, someone can have a designated general practitioner (GP) who supports them. However, GPs mostly work alone, and data is not shared freely between clinicians if a person needs to change GPs or expand her care to a broader care team. In the public sector, while healthcare workers demonstrate better teamwork, a client cannot 'book' with a particular healthcare worker. Therefore, clinicians are reliant on the robustness and depth of clinical notes left by other clinicians, usually documented in paper-based folders. This method of documentation makes patient record-keeping more cumbersome and notes are often less comprehensive than required for streamlined care. Both the public and private systems currently don't lend themselves to quality care for either chronic or comorbid clients. Patients' experience of care and the level of the quality of care provided would improve if the South African health system (private and public sectors) could roll out a single electronic health record.

Complex causality and compounded costs of care

Data on chronic diseases (except for HIV) is scarce in the context of the South African public health sector, which doesn't have unique patient identifiers. This makes it impossible to know the true prevalence of individual chronic conditions and how these conditions interact in people and places. Routine administrative data systems currently only collect data on screenings conducted, with no collection of how many of the screens result in positive case findings. Therefore, we rely on survey data to estimate the prevalence of co- and multimorbidity of chronic conditions.

Public-sector population

Without public-sector data, we need to look to the South African Demographic Health Survey (SADHS) of 2016 to assess comorbidity in the general population. Only four chronic illnesses were included in the results presented in Figure 3: diabetes, hypertension (high blood pressure), HIV, and cancer. The 2016 SADHS uses objective measures of HbA1C, blood pressure, and HIV tests to ascertain the prevalence of diabetes, hypertension (high blood pressure), and HIV status respectively, while cancer is self-reported.[11] Respondents who stated that they were receiving cancer treatment or had been treated for cancer in the past are included in the results presented.

Although objective measures are obtained through tests, they are voluntary, so they don't necessarily represent the population prevalence of these chronic conditions, but rather only the prevalence among the population who volunteered to be tested. People may have refused to be tested because they perceived themselves to be in good health, or they may have feared disclosing their health status. In addition to this, only four chronic conditions are included in this analysis, many others have no objective measures in this dataset, and have not been included. These results should therefore not be seen as a true representation of the prevalence of these diseases or multimorbidity, as they're likely to be underestimated.

Figure 3 shows that 57% of respondents were found to have no chronic conditions, 33% had at least one, 10% had two, while only 1% had three chronic conditions. Women had a higher prevalence of comorbidities than men, with 13% having two or three chronic illnesses, while 9% of men in the sample were found to have two or three chronic illnesses. Only one (female) respondent in the SADHS dataset had all four chronic conditions. Of all the respondents that had chronic conditions, 22.3% had one other comorbidity, and 1.6% had two or more other comorbidities.

Figure 3: Prevalence of comorbidity, SADHS 2016[11]

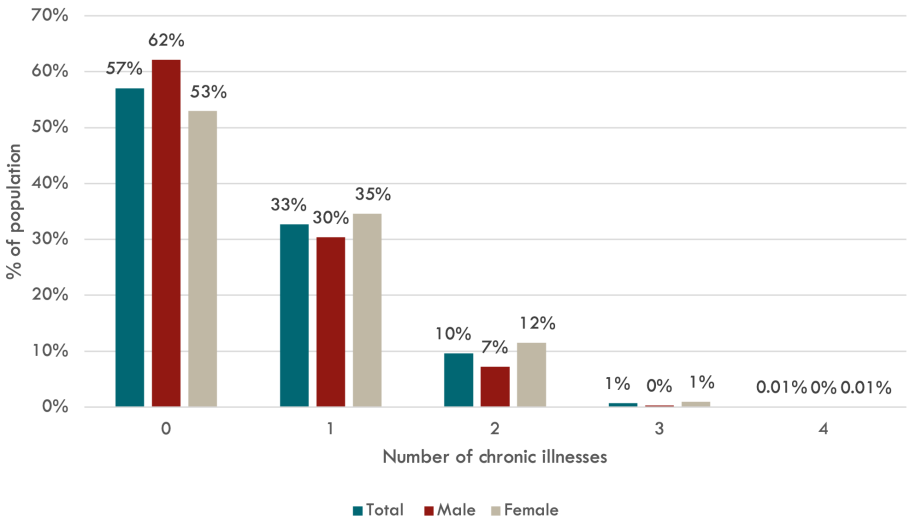
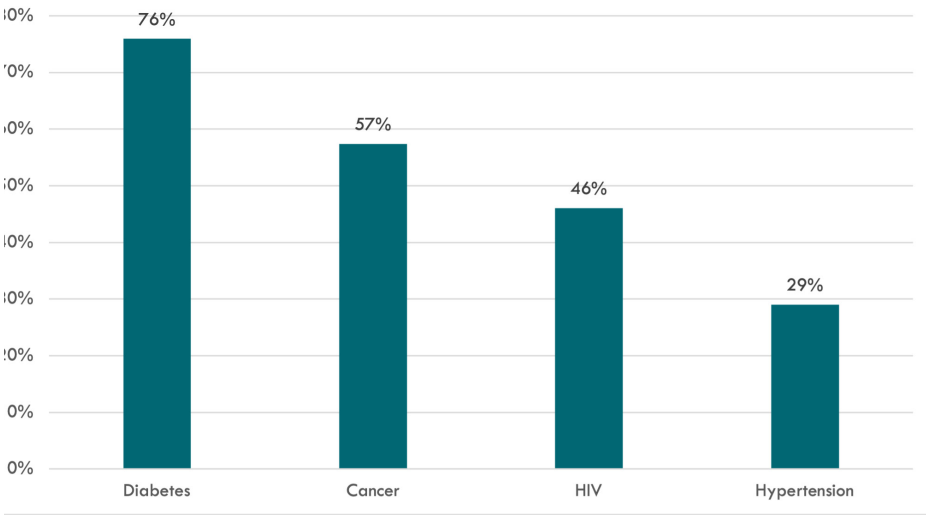


Figure 4 shows the share of SADHS respondents with either diabetes, cancer, HIV, or hypertension that have at least one other chronic illness. The graph shows that 76% of diabetics, 57% of people who are being treated for cancer or have had cancer in the past, 46% of people living with HIV, and 29% of people with hypertension have at least one other chronic illness.

Figure 4: Proportion of respondents with a chronic illness that have at least one other chronic illness, SADHS 2016[11]



Although survey data helps us to quantify the prevalence of the comorbidity of chronic illnesses in South Africa, Vignette 2 illustrates the lived experience of chronicity and comorbidity in one of South Africa's small, rural towns more vividly.

South Africa also routinely publishes statistics on causes of deaths. Unfortunately, cause-of-death data is not a good indicator of the way people lived. Although we've seen a shift in the cause of mortality from infectious to chronic diseases over time, the impact of NCDs is still likely understated in the cause-of-death data.

Vignette 2: Comorbidity on farms

In December 2019, I spent a day following the mobile clinic as it travelled from farm to farm, delivering medication to workers. Plumes of dust billowed out from behind the boxy white van as we travelled the twenty kilometres of dirt road to reach our first stop. We parked the van in front of a row of mud-brown cottages, in a rare strip of tree shade.

Medicines were wrapped in brown paper bags, passed from the back of the van like lunch packs. Those on insulin were handed bundles of plastic syringes with orange pistons. Some patients were weighed, while others had their blood pressure read using a hand-pumped monitor and a well-placed stethoscope. The patient list on that farm alone was:

SINGLE NCD	COMORBID NCDS	COMORBID NCD AND HIV/TB	ONLY HIV
Sonya, a middle-aged woman, collecting **high blood pressure** medication and requesting **pain** killers.	Annette, a middle-aged woman living with co-morbid **hypertension, diabetes** and **schizophrenia**. She also requested **pain** medication.	Rita, a domestic worker, who received **HIV** and **hypertension** medication.	Andre, a middle-aged man on **HIV**-treatment, who complained of lower back and chest **pain**.
Thembeka and Luthando, a husband and wife, both with **hypertension**, and requesting **pain** killers.	Nandi, a young woman, possibly in her **30s**, being treated for **bipolar disorder** and **hypertension**.	Ettie, a young domestic worker who had recently recovered from **TB**, and was in remission from **leukemia**, and managing **hypertension.**	
Lappies, a man in his forties, collecting **high blood pressure** medication			
Miriam, **a diabetic** domestic worker on insulin.			

We closed up the van and drove on to the next farm. Over the course of that day, we'd see about 20 more farmworkers with very similar case profiles. There wasn't a farm we visited that wasn't affected by chronic illness – not one without diabetes, and nearly every one with hypertension. We always encountered a mix of infectious and non-infectious diseases – sometimes in the same households, even occupying the same bodies.

Medical scheme population

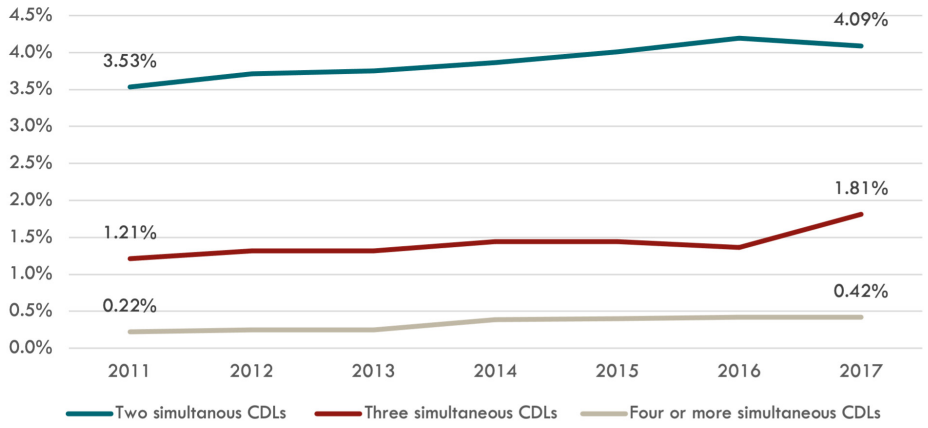
In the private health sector, unlike the public sector, unique patient identifiers are available. However, the industry is fragmented and reliant on the Council for Medical Schemes (CMS) to collate and report on medical scheme population data. The CMS produces annual statistics that track the prevalence of chronic conditions, including comorbidity, and this is helpful in understanding the trend of chronic disease in this population.

Using the CMS data, we've counted the number of people with at least one claim for two or more chronic illnesses (this includes everyone who claimed for a chronic condition at least once in the past year) to estimate the number of medical scheme members with comorbidities. It should be noted that this estimate is likely to underestimate the true prevalence of comorbidities in this population for two reasons. Firstly, not all medical aid members will have been screened for chronic illnesses, so they may be unaware of their conditions. Secondly, not all medical aid members will claim from their medical schemes when purchasing chronic medication or care for chronic illnesses, many will simply pay out of pocket.

The medical scheme population is older than the general South African population and also differs in terms of socio-economic status. As we've explained in earlier briefs within this series, both age and socio-economic status have an impact on the prevalence, incidence, and severity of NCDs. Although older people are more likely to suffer from chronic conditions, people of higher socio-economic status are more likely to have more education, access to better nutrition and better-quality healthcare, and tend to be in better health. It's therefore difficult to say for sure whether the prevalence of comorbidities is higher or lower in the medical scheme population compared to the general population. However, the prevalence of HIV is much higher in the non-medical scheme population, so it's likely that the prevalence of comorbidities related to HIV is higher in this population.

Recently, the CMS has begun to publish a report on chronic conditions and co-occurrence with one another, which has shed light on the prevalence of comorbidity in the insured population. Figure 5 shows the rates of two, three and four or more comorbidities in the medical scheme environment. The data shows an increasing trend between 2011 and 2017 for all numbers of comorbidities. While still being the least prevalent, the number of individuals with four or more chronic conditions has increased by 91% since 2011 (0.22% to 0.42% in 2017). Those with three or more chronic conditions increased by 50% between 2011 and 2017 – a substantial jump in just six years. The medical scheme population shows an overall prevalence of 6% of people (~556,160 individuals) living with comorbid chronic conditions. This is lower than the 11% estimated for the general population using the SADHS survey data.

Figure 5: Comorbidity burden in medical scheme population[12]



Overall, 44% of members who were registered for a chronic condition were registered for two or more chronic conditions. Worryingly, 85% of medical scheme members with diabetes also had one or more other chronic conditions (see Table 2).

Table 2: Comorbidity according to chronic registration for NCDs in medical schemes (own analysis, medical scheme data)

NCD	PERCENTAGE OF THOSE WITH NCD THAT HAVE 1 OR MORE OTHER NCDS
Diabetes	85%
Hypertension	55%
Heart attack	92%
Coronary disease	89%
Mental disorders	66%
Asthma	53%
Arthritis	85%
Any NCD	44%

In brief 10, which addressed mental health, we showed how chronic conditions co-occur with mental health conditions. Mental health conditions can make it difficult for people to adhere to their other chronic medication (and even their mental health-related medication). This makes mental health a key predictor of health outcomes for people living with chronic conditions. Furthermore, mental health conditions, particularly depression and anxiety, often arise after diagnosis with diabetes, hypertension, or HIV.[13,14] Therefore, awareness and screening for mental health conditions in those with other chronic conditions should be a basic standard of care.

Using data obtained from one of South Africa's largest medical schemes, Table 3 shows the risk ratios, by sex, of having a mental health condition given that one already has one of the listed chronic conditions. A risk ratio greater than 1 indicates an increased risk. Therefore, the table shows that people with asthma, heart problems, hypertension, diabetes, and arthritis are at a higher risk of having comorbid mental health conditions relative to those without these chronic illnesses. Compared to the other chronic illnesses, people with arthritis are at the highest risk of having comorbid mental health conditions, as they are 3.94 times as likely to have mental health conditions compared to those without arthritis. Men are also at a higher risk of having comorbid mental health conditions for every chronic illness, except for diabetes, when compared to women. The increased risk for all five of the conditions in the table is perhaps the most noticeable though.

Table 3: Risk ratios for people living with a mental health condition (own analysis using medical scheme data)[d]

	ASTHMA	HEART PROBLEMS	HYPERTENSION	DIABETES	ARTHRITIS
Female	2.62	2.55	1.83	1.78	2.91
Male	2.77	2.91	1.90	1.73	3.94
Both	2.76	2.49	1.84	1.69	3.42

A person-centred approach is required

Managing the care of people with co- or multimorbidities requires a whole person-centred approach as opposed to simply treating the disease. As illustrated in Figure 1, there aren't only clinical considerations, but also behavioural and environmental factors that need to be accounted for when managing multiple chronic conditions.

Figure 2 also shows the relationship between chronic illnesses and the patterns of how these cluster together. Clinical guidelines need to take this into account so that more holistic disease management approaches are designed.[8] To do this, more integrated care approaches need to be adopted. These approaches should allow patients to receive treatment in ways that enable continuity of care and track which medications have been prescribed to minimise polypharmacy where possible. Tools such as STOPP (screening tool of older people's prescriptions) and START (screening tool to alert to right treatment) criteria can be used to assist with decision-making.[9] These tools help clinicians to compare medication lists so that duplication can be identified, and have been found to significantly reduce inappropriate prescriptions.[9] They're also useful for tailoring treatment to the needs of specific individuals, and to prevent resource wastage caused by repeat prescriptions that aren't regularly re-evaluated.

[d] Data obtained from one of South Africa's largest medical schemes

Looking to the future

For a country to understand its comorbidity burden, it needs to be able to track individuals in the health system through a unique patient identifier or electronic health record (EHR). This would allow the health system to know whether someone has been screened, what the result was and whether they are on a medication/treatment regimen as a result. As more conditions arise, an EHR would allow the health system to alert healthcare workers that the person is a high-risk individual requiring more intensive care. As mentioned, only South Africa's medical scheme industry has this system in place.

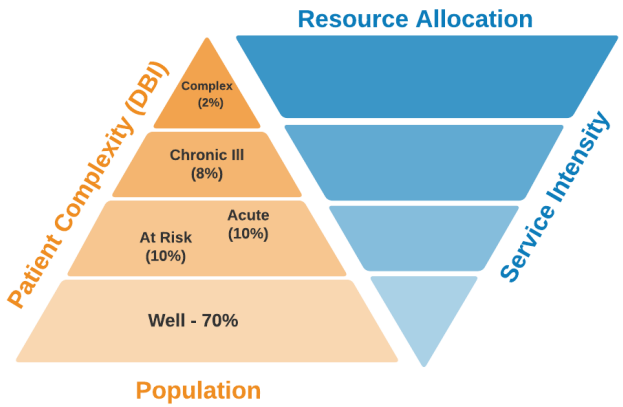
As part of this work, Percept plans to forecast the burden of chronic disease between 2021-2030.

The scarcity of accurate data in the South Africa health system makes this modelling exercise all the more difficult. With the onset of Covid-19, we've seen how important accurate, individual-level patient data is for being able to manage the pandemic. Covid-19 has far worse outcomes for those with certain chronic conditions, and even more so for those with multiple chronic conditions. Therefore, it would be best for this subset of the population to be vaccinated first. However, we simply don't have data available to do so.

Furthermore, disease modelling is most often focused on a single disease, ignoring the interactions between diseases themselves, as well as how these may influence growth rates. The interconnectedness of chronic diseases means that one cannot ignore these influences if you want to accurately estimate the current and future burden of chronic disease.

In this brief, we explained superadditivity, which is where the sum of multiple conditions costs more than the parts, and how chronic conditions are often associated with each other and cluster together. Figure 6 illustrates that resource use is most intense for the small group of people who are the most clinically complex. This is very often those with comorbidities (chronic or otherwise). This means that once we've been able to forecast the most prevalent chronic diseases, we will also be able to determine which conditions should be targeted for prevention activities, to generate the best health outcomes at the lowest possible cost. This can help to free up resources for primary healthcare, which helps to keep the population well.

Figure 6: Resource use relative to clinical complexity[e]



[e] Figure designed by PPO Serve. Ruff, B. 2018

Conclusion

We've highlighted both the interconnectedness of different chronic conditions and the care that these complex patients require in this brief. To provide quality care, the South African health systems need to adapt, allowing for better recordkeeping, easier sharing of data, and comprehensive clinical care. Certain chronic conditions are predictors of others and by targeting one or two of the most prevalent conditions, we could bring down the number of comorbidities at the individual and collective level.

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