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The economy-linked impact of COVID-19 on mortality and health

Early learnings for South Africa's coronavirus-linked recession

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15 July 2020

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15 July 2020

Abstract

The potential public health consequences of Covid-19 have led governments around the globe to take extraordinary measures to protect citizens' health and their countries' health systems. Covid-19 and the associated lockdown decisions have created severe restrictions on the supply- and demand-sides of the South African economy which are likely to deepen the existing recession. There is a large body of international evidence on the relationship between economic recessions and mortality but little of it focuses on low- and middle-income countries (LMICs). On balance international evidence points to recessions leading to a short-term increase in mortality in LMICs, due mainly to unemployment and loss of income. The channels for and types of mortality and ill health are complex and varied. In LMICs and in South Africa specifically, health areas that are likely to be most impacted include infectious diseases (e.g. HIV and TB), non-communicable diseases including preventable cancers, and child health. Data from the NIDS-CRAM Wave 1 survey show that child hunger and general hunger are at high levels and are concerning for future health impacts, in particular, for infectious diseases and child health. A number of policy recommendations are shared that can mitigate the impacts of the economy on health.

Executive summary

The potential public health consequences of Covid-19 have led governments around the globe to take extraordinary measures to protect citizens' health and their countries' health systems. South Africa implemented a strict lockdown in response to the first cases of Covid-19. In the first five weeks of the lockdown, this meant that only a small set of businesses deemed essential services were able to operate: mainly supermarkets, informal food traders, pharmacies and medical services. While the lockdown has since been eased, this created severe restrictions on the supply- and demand-sides of the economy, some of which continue. The existing recession (pre-Covid-19) is likely to deepen and extend as a result of the pandemic. There are several scenarios estimating the magnitude of the recession.

There is a large body of international evidence on the relationship between economic recessions and mortality but little of it focuses on low- and middle-income countries (LMICs). We draw on the best evidence available to not only consider the relationship between recessions and mortality in these countries, but also on other evidence for the relationship between; income and poverty, and both mortality and ill health.

On balance international evidence points to recessions leading to a short-term increase in mortality in LMICs, if not mitigated properly, due mainly to unemployment and loss of income. A study of 5,565 Brazilian municipalities showed that the 2012–2016 economic recession in Brazil was associated with more than 30,000 additional deaths. An increase in the unemployment rate of one percentage-point was associated with a 0.50 increase in mortality per 100,000 population, or a mean relative increase of 1.4% in the rate for adult all-cause mortality (Hone et al. 2019). In Mexico over the period 1993–2004, a 1% decrease in state level GDP per capita was associated with an increase of 0.25% in mortality of the ten poorest states by level of development (Gonzalez & Quast, 2012). These data points show evidence for the negative impact of recessions on mortality.

However, the channels for and types of mortality and ill health are complex and varied. In LMICs and in South Africa specifically, health areas that are likely to be most impacted include infectious diseases (e.g. HIV and TB), non-communicable diseases including preventable cancers, and child health. HIV and TB have long-term and well-known relationships with poverty, and we expect poverty rates to worsen dramatically due to the recession.

Nutrition is strongly linked to many health areas, especially child mortality. According to data from the South African Demographic and Health Survey, 23% of children under the age of three were stunted in 2016 and a quarter of under-five deaths in hospitals were linked to malnutrition (Shung-King, Maylene; Lake, Lori; Sanders; David; Hendricks 2019). Inadequate nutrition can also impact on treatment adherence for individuals with chronic diseases such as HIV and TB (Tupasi et al. 2017). The WHO estimates that 11,000 South Africans contracted TB in 2018. Adequate nutrition is particularly important when treating multi-drug resistant (Tupasi et al. 2017), but most chronic medications need to be taken with food and are more effective when the individual is well-nourished.

From the international literature we know that vulnerable socio-economic groups such as lower income individuals, children, Black individuals, and men (due to stronger linkages to the economy and often-delayed health seeking) are more likely to be impacted. Economy-linked health effects may only manifest years later and at a large cost to health systems and households. Therefore, recession-linked mortality is not always immediately visible. A study of the effects of recessions on the health outcomes of mothers and infants in Peru showed that **a 1% decrease in GDP was associated with a 0.30–0.39% increase in infant mortality** and reduced antenatal care visits (Agüero & Valdivia, 2010). The study also found that recessions have long-term health effects on surviving children, in particular, a permanent reduction in the height of children (stunting).

NiDS-CRAM Wave 1, a telephone survey of individuals based on a near-nationally representative sample of households, was conducted between 7 May and 27 June 2020 to establish the impact of Covid-19

and the associated lockdown response on individuals and households. Data from NIDS-CRAM Wave 1 indicates the following with regards to the economy-linked health channels highlighted above:

Unemployment, an important channel for economy-linked health effects has increased dramatically:

At the time the survey was conducted a broad unemployment rate of 42.5% was reported. This is slightly higher than the broad unemployment rate for the first quarter of 2020, at 39.7% (Statistics South Africa 2020b). By implication, there has been a reduction in both formal and informal income flows, which are likely to eventually filter through to health impacts. There have, however, been off-setting policy actions relating to unemployment insurance.

Both reported child hunger and general hunger are at high levels and are concerning for future health impacts.

In terms of child hunger, it was reported by 15.1% of respondents that a child or children in their household went hungry at least once during the preceding week, relative to 22.3% of adults. 17% of Black respondents reported children in their households went hungry, compared to 3.6% of White respondents.

Those who indicate they require medication for a chronic health need are being particularly impacted by hunger. 18.5% of respondents said they have some type of chronic or on-going health need requiring regular medication. Of this group, 26.3% reported hunger in the household in the preceding week.

Two clear patterns emerge when we compare reported hunger relative to self-assessed health for the bottom 40% and top 60% of the income distribution:

First, a higher percentage of adults in the bottom 40% of the income distribution report going hungry relative to all categories of all self-assessed health (poor, fair, good, very good and excellent). Second, a much higher percentage of respondents in the bottom 40% with poor health status report hunger.

In order to mitigate economy-linked mortality and health impacts, policy-makers should consider the following immediate economic, social and health related policy actions:

- **Evidence-based policy-making:** Collect better data for monitoring the mortality and other health impacts of the Covid-19 linked recession. To do this effectively, we need, at a minimum, quarterly mortality and economic data from before, during and after the lockdown and Covid-19 pandemic, possibly on district or municipal level (variation from nine provinces unlikely to be enough). The data will need to control for time and regional specific effects, to be meaningful and mortality data will need to be by broad cause of death.
- **Strengthen government policy implementation:** South Africa requires more agile implementation mechanisms to make use of its existing infrastructure and systems to adequately protect its population from the effects of recession.
- **Protect health and social services spending:** Ringfence health expenditure to protect it from the effects of the wider recession – this is important to counter-act the recession-related mortality risks discussed in this brief. Recognise the connection between livelihoods, income, and health, and therefore protect and expand existing household transfer programmes such as the child support grant and the newly established Covid-19 Unemployment Grant to avoid short- and long-term effects on health. Ensure that these grants are paid in a timely manner and reach beneficiaries in need.
- **Consider those who fall outside of the social security net:** Alternative mechanisms are required to support the more informal aspects of the economy. The least visible members of society are likely to be the most vulnerable.
- **Provide funding for innovative care pathways:** In a constrained healthcare budget environment, provide support for experimentation with alternative healthcare delivery mechanisms such as telehealth and alternative healthcare access points that may ensure continuity of care at potentially a lower or similar cost to current facility-based alternatives. This could also include support for the indirect costs associated with accessing free public primary care such as subsidies or co-funding for travel (e.g. in the form of vouchers for pregnant mothers) to safeguard access to care.
- **Support access to food, particularly for children:** food vouchers and increased social transfers should be scaffolded by efforts to offset disruptions to food supply. Whilst there were some efforts at food relief, it is clear that these were not sufficient to ameliorate wide-spread hunger.

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ACRONYMS AND ABBREVIATIONS

Acronym	Explanation
GDP	Gross Domestic Product
LMICs	Low- and middle-income countries
US	United States
OECD	Organisation for Economic Co-operation and Development
UHC	Universal Health Coverage

DEFINITION OF TERMS

Term	Definition
Recession	This technical definition will vary according to countries' statistical institutes but generally indicates a period of negative economic growth, i.e. the economy as measured through Gross Domestic Product is shrinking. In South Africa, two consecutive quarters constitute a recession. Some papers used this term to refer to a negative deviation in trend from employment as well.
Economic downturn	A slowdown in economic activity or growth, generally measured by a reduction in Gross Domestic Product. May or may not coincide with the more technical definition of a recession. Some papers used this term to refer to a negative deviation in trend from employment as well.
Slowed economic growth	A reduction in the rate of economic growth.
Aggregate mortality or all-cause mortality	Total mortality aggregated across various sub-types of mortality.
Procyclical	Moves with the business cycle. In the case of mortality, mortality will increase with positive economic growth, while decreasing with negative growth.
Counter-cyclical	Moves in the opposite direction as the business cycle. In the case of mortality, mortality will decrease with positive economic growth, while increasing with negative growth.

Introduction

As the Covid-19 pandemic deepens, there is increasing attention being paid to the mortality consequences: not simply the direct mortality impacts of the disease itself, but also the impacts arising from its economic impacts. This paper addresses the pressing question of how the pandemic has impacted on the economy, and the effects of this on public health and mortality, particularly in low- and middle-income (LMIC) countries.

Responses to Covid-19, including but not limited to government-mandated lockdowns, have triggered economic contractions in most countries. Lockdowns generate immediate supply- and demand-side restrictions and associated economic contractions. The ability of the economy to rebound post-lockdown is dependent on the extent of the medium- to long-term structural damage, with fears that the Covid-19 associated supply-shocks may cause permanent demand shortages (Guerrieri, Lorenzoni, Straub & Werning, 2020).

We have seen major contractions in high-income countries in quarter 1 of 2020, such as a 6.8% contraction in China, 2.2% in Germany and 2% in the United Kingdom. It remains to be seen whether these contractions persist over the year. The possibility of a global recession looms large (Fernandes 2020).

South Africa implemented a five-week lockdown, which reduced consumption and production to only essential services between 27 March and 1 May. Individuals who were able to work from home were encouraged to do so. It is estimated that during this period, two-thirds of the employed were unable to work, with only about a third of the employed able to work in essential services or from home (Kerr and Thornton 2020). A simple average of various economic institutions' (including the South African Reserve Bank and National Treasury) growth predictions is equivalent to a 7% contraction in Gross Domestic Product (GDP) in South Africa and a doubling of the budget deficit (Bhorat et al. 2020).

It is argued that countries with large informal economic sectors may have an accentuated lockdown impact on the most vulnerable in society (Broadbent et al. 2020). Coupled with the loss of income, the benefits of lockdown are not always possible given the density of living spaces and the related deprivation (running water in the home as an example). These debates highlight the complexity of assessing both the economically-driven health impacts of lockdowns and the hardships imposed by a restriction on livelihoods. These debates and concerns also create a need, from a public policy perspective, to proactively anticipate the health effects of economic disruption (as opposed to health system disruption) and put in place the appropriate support to mitigate economy-linked health effects.

It is useful to contextualise the recessionary effects in South Africa as coronavirus-linked and not as entirely lockdown-linked. For example, South Africa's tourism industry would have been adversely impacted regardless of the lockdown due to international travel restrictions and border closures. Likewise, the restaurant and entertainment sector would have been negatively impacted regardless of lockdown decisions, as many individuals would have chosen not to consume these services due to fear of crowds.

There is recognition that unless economies are protected and stimulated sufficiently during the intense periods of the Covid-19 pandemic, further health damage will follow with the economic decline (McKee and Stuckler 2020).

A large body of international evidence considers the relationship between economic recessions and mortality. While much of it rests on associational relationships, increasingly there are studies available that have used robust causal or semi-causal estimation strategies that control for time-, region- or person-specific effects such as those by Ruhm (2000, 2015), Neumeyer (2004) and Gerdtham and Ruhm (2006). The LMIC literature using these techniques tends to focus more on infant and child health such as work by Agüero and Valdivia (2010) and Bhalotra (2010). This body of literature allows for learning on what the likely direction, magnitude, and channels of recession-

induced mortality in South Africa could be. In addition, given a wealth of literature on the relationship between income, and various critical health outcomes for South Africans, we are able to supplement the recession literature with insights on the health areas most likely to be negatively impacted by a decrease in household income levels due to the Covid-19 linked recession.

We draw on the best evidence available to consider the relationship between recessions and mortality in LMICs. We have also analysed available evidence for the relationship between income, poverty and both mortality and ill health. We present descriptive data on hunger and unemployment from the first wave of the National Income Dynamics Study (NiDS) Coronavirus Rapid Mobile Survey (CRAM) hereafter referred to as the NIDS-CRAM survey, that could provide an indication of likely recessionary impacts and channels for the economy-linked health impact.

Summary of main findings

In short, we find that:

- There is **little causal evidence on the relationship between mortality and recessions in LMICs** available. The absence of evidence from these countries seems to be largely due to a lack of good administrative or longitudinal datasets. However, the relatively little evidence that is available points to a more **counter-cyclical** relationship between recessions and mortality for these countries.
- Aggregate all-cause mortality increases in LMICs may increase with recessions, mainly driven by increased mortality from infectious diseases (in SA, particularly HIV and TB), cardiovascular-related deaths and an increase in non-communicable disease (NCDs), some cancers and suicides. **Child and neonatal mortality are extremely vulnerable to negative impacts from recessions.**
- Most of the evidence takes a relatively short-term view, spanning the period of the recession. However, the negative health effects of recessions or even just temporary reduction in employment and income may only become evident years later. While child mortality increased due to economic recessions in Peru, for surviving children there was also a longer term and permanent decrease in height (Agüero & Valdivia, 2010).
- The mortality impacts from recessions are not equally distributed across the population: evidence shows that **men, Black individuals and people of mixed ethnicity** are more affected. Individuals with lower incomes are also far more severely affected. While aggregate mortality impacts may be procyclical in high-income countries, it is very possible that **lesser-educated, lower-paid workers** are bearing the brunt of increased mortality and that this is masked by total deaths in high-income countries. Similar and even more extreme patterns are likely to play out in LMICs, given more restricted access to healthcare and fewer social-protection safety nets. In these countries, women and children are likely to be particularly vulnerable.
- **Unemployment, an important channel for economy-linked health effects, has increased dramatically:** At the time the survey was conducted a broad unemployment rate of 42.5% was reported. This is slightly higher than the broad unemployment rate for the first quarter of 2020, at 39.7% (Statistics South Africa 2020b). By implication, there has been a reduction in both formal and informal income flows, which are likely to eventually filter through to health impacts. There have, however, been off-setting policy actions relating to unemployment insurance.
- **Both reported child hunger and general hunger are at high levels and are concerning for future health impacts.** In terms of child hunger, it was reported by 15.1% of respondents that a child or children in their household went hungry at least once during the preceding week, relative to 22.3% of adults. 17% of Black respondents reported children in their households went hungry, compared to 3.6% of White respondents.
- **Those who indicated they require medication for a chronic health need are being particularly impacted by hunger.** 18.5% of respondents said they have some type of chronic or on-going health need requiring regular medication. Of this group, 26.3% reported hunger in the household in the preceding week.
- **Two clear patterns emerge when we compare reported hunger relative to self-assessed health for the bottom 40% and top 60% of the income distribution:** First, a higher percentage

of adults in the bottom 40% of the income distribution report going hungry relative to all categories of all self-assessed health (poor, fair, good, very good and excellent). Second, a much higher percentage of respondents in the bottom 40% with poor health status report hunger.

There are policy levers that can mediate the mortality effects of recessions. These include high quality universal health coverage, targeted social safety net responses such as unemployment grants and increased child support grants and fiscal responses that provide additional support to health systems or, at the least, do not impose budget cuts.

What are the implications for South Africa?

While the public health impact of Covid-19 is deleterious and required swift policy action, where governments are unable to quickly pivot towards social protection, there is a real risk that while fighting one fire, another will be ignited. The economy-linked health impacts of Covid-19 need to be recognised, and the necessary **preventative policy actions** taken in parallel with the public health policy response. Policy-makers also need to realise that swiftness alone may not solve the problem. The price of these interventions often come at a large cost (10% of GDP or more). Inevitable and hard choices about trade-offs will have to be made and need to be done in an evidence-based and considered manner.

Data

We use data from the NIDS-CRAM survey to provide early indication of economy-linked health effects. It forms part of broader study called the Coronavirus Rapid Mobile Survey (CRAM) which aims to inform policy using rapid reliable research on income, employment and welfare in South Africa, in the context of the global Coronavirus pandemic (Ingle, Brophy, and Daniels 2020). Please see cramsurvey.org more information on this project.

NIDS-CRAM is a broadly representative survey of about 7,000 South African adults. These individuals are a sub-sample of adults from households in the National Income Dynamics Study (NIDS) Wave 5 that was conducted in 2017 (Ingle, Brophy, and Daniels 2020). NIDS is a panel survey which studies the well-being of South Africans, the households they live in and how these change over time. It started in 2008 when around 28 000 individuals were interviewed. People were then re-interviewed, together with anyone they were living with at the time, every two to three years. Almost 40 000 people were interviewed in 2017 NIDS. NIDS was founded and is managed by the South African Labour Development Research Unit (SALDRU), who have agreed to conduct this special follow-up survey on the NIDS sample.

It is important to be aware of some of the data limitations of NIDS-CRAM compared to NIDS. Unlike previous waves of NIDS, NIDS-CRAM did not attempt to interview or collect information on everyone currently living with the sampled individual (Ingle, Brophy, and Daniels 2020). This change in sampling protocol was arrived at after careful consideration of the goals and constraints of NIDS-CRAM.

The NIDS-CRAM survey will be repeated across several waves. This initial wave of data stems from the period 7 May to 27 June 2020. The same group of individuals are phoned each month and are asked a range of questions about their income and employment, their household welfare, receipt of grants, and about their knowledge and behaviour related to Covid-19. Each participant receives a R20 airtime voucher per wave, for participating. The aim is to provide monthly, broadly-nationally-representative data on key outcomes.

Methodology

The descriptive (univariate and bivariate) data analysis in our paper from NIDS-CRAM is positioned in the context of a literature overview on the relationship between recessions and mortality, and poverty and ill health. This allows us to set out the likely channels of transmission between the economy, health, and mortality in South Africa.

The literature scan was done through a search in the economics literature database Econlit, using the search terms “recession”, “mortality” and “effects” to limit identified literature to those using robust causal or semi-causal methods. While some papers on the Great Depression (1930s) were identified in this way, we have not included it in this review as the nature and structure of economies would have changed too much over time to directly compare the effects of these recessions to the likely effects of recessions that will be generated by the implementation of lockdowns in 2020.

There exist strong correlations between health and economic development, however, this does not always translate into a causal relationship. We must therefore be cautious to not use evidence from only purely cross-sectional studies. Due to very few studies on LMICs identified when searching for causal literature, we expanded our search by dropping the term “effects” and did literature searches via MEDLINE and Google Scholar. This allowed for the identification of relevant literature for LMICs using also cross-sectional or associational methods. In recent years (2012-2020) quite a few large dataset studies on LMICs relying on associational analysis have been published. We proceed cautiously with findings from these countries and make it clear where relationships are only associations rather than of a causal nature.

Nuanced thinking is needed on the different mechanisms through which the economy and employment will affect mortality. The strength and relative importance of these mechanisms are likely to vary according to the economic, social support and health system structures of different countries. South Africa will be particularly vulnerable in terms of maternal and child health, infectious diseases (especially TB and HIV) and non-communicable diseases. Impacts are likely to be larger in health areas severely impacted by nutrition and preventative health-seeking behaviour that has relatively large individual indirect costs associated with it.

There is a danger of cherry-picking some of the possible transmission channels to support an argument in one direction or the other. For example, one could show that road accident deaths are substantially down in South Africa as a result of the lockdown - a positive unintended consequence. However, similarly, one could analyse gender-based violence-related deaths and see that these have increased during the lockdown - a negative unintended consequence. Therefore, good data on different types of mortality as well as aggregate mortality and robust causal estimation methods are required to continuously monitor and mitigate impacts.

There is a danger of cherry picking some of the possible transmission channels to support an argument in one direction or the other.

Deaths linked to recessions in LMICs

Findings on aggregate mortality impacts vary by country and the length of the recession. Studies on the relationship between recessions and aggregate mortality rarely use the change in economic growth or GDP per capita as the economic indicator- they mostly use unemployment. This is because it is labour market access, directly or indirectly, that links individuals or households to recessionary impacts. However, in LMICs where there is a large informal sector that may not always be directly captured in employment measures, a focus on unemployment may obscure the effects of the downturn on mortality via other channels.

Most available high-income country studies find total deaths decrease due to recessions or downturns (procyclical relationship), for example, the United States (Ruhm 2000), Germany (Neumayer 2004), Spain (Tapia Granados 2005) and various other OECD countries (Gerdtham and Ruhm 2006). It may therefore seem as if recessions are associated with improved health and mortality. However, the

literature on this topic is marked by the absence of multiple causal studies for LMICs and it is therefore unclear whether the finding of procyclicality would also apply to LMICs. The absence of LMIC studies on this topic is mostly ascribed to the lack of long-running, good quality panel data or sufficiently granular administrative data. Sub-national data, generally required to create a dataset with sufficiently large variation, on both mortality and unemployment, are often not available for these countries (Hone et al. 2019). One of the big constraints in doing these types of studies in LMICs is often weak death and birth registration systems. This raises concerns that any observed association between recessions and mortality may in fact be driven by improvements or changes in both the coverage and accuracy of death registration data over time (Arroyave et al. 2015).

Any observed association between recessions and mortality may in fact be driven by improvements or changes in both the coverage and accuracy of death registration data over time.

However, the few studies available on LMICs do shed light on how the relationship between recessions and mortality is likely to differ at lower levels of development as measured by income, both between and within countries. A study of 5,565 Brazilian municipalities showed that the 2012–2016 economic recession in Brazil was associated **(not causal evidence)** with more than 30,000 **additional deaths**. An increase in unemployment rate of one percentage-point was associated with a 0.50 increase in mortality per 100,000 population, or a **mean relative increase of 1.4% in the rate for adult all-cause mortality** (Hone et al. 2019).

The relationship between mortality and GDP per capita in Colombia has been examined for two periods, 1980-1995 and 2000-2010 (Arroyave et al. 2015). The study (Arroyave et al. 2015) focused on this relationship for three age groups: 20-44 (mainly working age adults), 45-64 (middle-aged working adults) and for individuals aged 65 and older (mostly retired individuals). It finds that during the first period (1980-1995) increases in GDP per capita were not related to mortality (acyclical) for individuals aged 20-64, while mortality decreased with increases in GDP per capita for **men aged 65 and older**. During the second period (2000-2010), the nature of the association changed. The association between GDP per capita changed to acyclical for older individuals (65 plus), while turning **counter-cyclical** for people between the ages of 20 and 64 (mortality decreased with increases in GDP per capita).

A study (Gonzalez and Quast 2010) on the relationship between mortality and the business cycle (state-level using GDP per capita) in Mexico over the period 1993-2004 provides insight on how the relationship plays out at different levels of development, as proxied by GDP per capita within the same country. The national relationship and that for the top ten and bottom ten states by level of development, using the Human Development Index, were estimated separately. While total mortality in Mexico had a procyclical relationship relative to the business cycle at a national level over the period, **there was clear evidence that the ten states at lower levels of development experienced counter-cyclical mortality** (Gonzalez and Quast 2010). In Mexico over the period 1993-2004, a 1% decrease in state level GDP per capita was associated with an increase of 0.25% in mortality in the ten poorest states by level of development (Gonzalez & Quast, 2012).

Inequality can become a mediating factor in determining the cyclical nature of recession-linked mortality.

Depending on the nature and composition of an economy, **inequality can become a mediating factor in determining the cyclical nature of recession-linked mortality**. It is possible that countries with higher poverty levels and high levels of inequality may experience higher mortality levels linked to recessions.

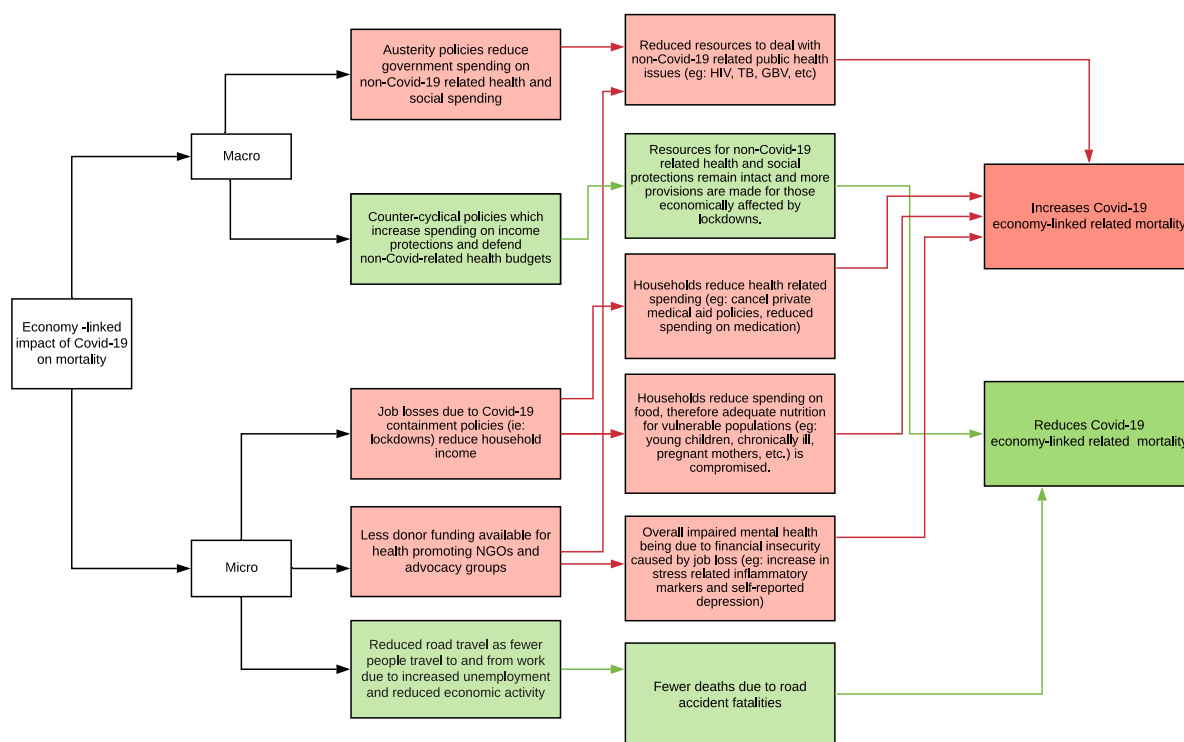
The potential differential impact of recessions on mortality in LMICs could be due to these countries having lower health expenditure and insufficient UHC systems, weaker social protection systems and mechanisms and differently structured labour markets (Hone et al. 2019). Lower levels of nutrition and savings (a factor that typically acts as buffer against income shocks) and deeper pre-existing inequity levels leave these countries more vulnerable. An overview of these potentially mediating factors in the relationship between recessions and mortality is provided in Section 6.

The likely drivers of economy-linked mortality and health impacts in South Africa

Below, we set out the evidence available on mortality by the most frequently explored mortality types. The nature of mortality considered in these studies are likely to vary based on a country's level of development and the comprehensiveness and level of detail available in death registry data. The aggregate level at which mortality is reported often obscures a much more intricate picture of the relationship between recessions, health and overall wellbeing and it is therefore important to also take into account morbidity or ill health that does not immediately translate into more deaths (see Section 4).

Before we move to discussing specific channels and types of mortality and health likely to be affected, we present a summary of the ways in which a recession, in this case the Covid-19-linked recession, is likely to affect mortality and health on both a macro and micro level.

Figure 1: Economy linked impact of Covid -19 on mortality



Source: Adapted from Tejada et al., 2019

Figure 1 above illustrates the potential transmission mechanisms of mortality that are not directly attributed to Covid-19, but potentially represent the concomitant economic effects on overall mortality. Among the potential macro effects, the mortality-reducing impact of a fiscal stimulus is included. In the supplementary budget, delivered by the Minister of Finance on 24 June 2020, the Minister laid out the measures which the government was taking to mitigate the potential economic fallout of the lockdown measures. However narrow unemployment increased to 30.1% in the first quarter while expanded unemployment increased to 39.7%, and it is projected that the economy will contract by 7.2% this year (Statistics South Africa 2020b).

The government has committed to providing relief to the South African consumers and businesses through grants and loan guarantees but implementation of this has been sluggish. It is likely that the government will have to borrow heavily from international financial institutions to finance this

stimulus package. Although these interventions may supplement household incomes temporarily, these measures end in October and this level of government borrowing will eventually require fiscal consolidation in the form of reduced spending in certain areas in the future. If this reduction comes at the expense of health and social care budgets, this may result in more indirect Covid-19 related mortality in the long run.

The transmission mechanisms illustrated in *Figure 1* show some of the pathways through which economic downturns can potentially affect mortality as described in the literature (Oviedo Tejada et al. 2019). The likely health drivers and channels of recession-linked mortality and increases in ill health (morbidity) are described in more detail below.

Table 1 shows the indicators for unemployment and loss of income from the NIDS-CRAM survey. 42.5% of economically active respondents reported being unemployed during Wave 1 of NIDS-CRAM relative to the broad definition of unemployment. This is slightly higher than the broad unemployment rate found by Statistics South Africa for the first quarter of 2020, at 39.7% (Statistics South Africa 2020b). 40.0% of respondents reported losing income since the lockdown began and 31.2% of respondents said they lost income from business or employment.

Table 1: Loss of income and unemployment indicators

Variable	Average (%)
Broadly unemployed	42.5%
Reported losing income since the lockdown began	40.0%
Income lost from business or employment	31.2%

Source: NIDS-CRAM Wave 1 (June 2020)

Hunger and nutrition as a channel of influence

Nutrition and food security are important determinants of health, directly influencing immunity to viral and bacterial disease and susceptibility to growth conditions and non-communicable diseases. Nutrition also impacts the ability to benefit from some treatments.

According to the General Household Survey, **11.3% of individuals** in South Africa experienced hunger in 2018, with 9.7% of households reporting hunger in 2018. The hunger of children is of particular concern as it can lead to wasting and stunting. Data from the Demographic and Health Survey of 2016 showed that 23.4% of children under the age of three years were stunted (Shung-King, Maylene; Lake, Lori; Sanders; David; Hendricks 2019). Poor nutrition in pregnant women and mothers can contribute to stunting. However, stunting is primarily linked to what children eat once exclusive breast-feeding ends. A study found that the prevalence of stunting increased in children between the ages of eight and 23 months (Shung-King, Maylene; Lake, Lori; Sanders; David; Hendricks 2019). Stunting compromises children's cognitive development, education and employment prospects, and increases their risk of being overweight or obese in later life.

Table 2: Indicators of children's nutritional status

	SADHS 2016 Children under five years
Wasting	4.5%
Under-weight	9.3%
Stunting	23.4% (1 – 3 years)
Over-weight	10.6%

Source: Demographic and Health Survey 2016 (as reported in the Child Gauge, 2019)

For those with NCDs, and infectious diseases such as TB and HIV, adequate nutrition is an important part of maintaining one's health and it is critically important part of adherence to medication and treatment. Nutrition plays an especially important role in the efficacy of HIV and TB treatment (Somarriba et al. 2010). Good nutrition is needed for individuals being treated for multi-drug resistant TB (MDR-TB) particularly, without this, they are unable to handle the side-effects of the medication and are more likely to drop-off (Tupasi et al. 2017) and suggest changes likely to increase MDR-TB loss to follow up. Only a small percentage have MDR-TB but the treatment for all types of TB are intense and good nutrition can help to stave off the side effects.

NIDS-CRAM asked two sets of questions about hunger in the household. The first question (addressed to the adult respondent) asked "In the last 7 days has anyone in your household gone hungry because there wasn't enough food?". The second question asked "In the past 7 days, has any child in your household gone hungry because there wasn't enough food?". We interpret the first question as mostly capturing adult hunger and most likely even the hunger of the adult respondent, as it was addressed to the adult respondent. This assumption is supported by the responses to the questions (discussed below), with a far lower percentage of respondents reporting hunger for children in their in their households.

The NiDS-CRAM data shows **22.3% of respondents reported living in a household where an adult likely went hungry** and **15.1% reported living in a household where children went hungry** in the seven days preceding the interview.

Table 3 shows that a quarter of adult Black respondents reported hunger in the last seven days in their household, compared to 16% of Coloured respondents, 7% of Indian/Asian respondents and 4% of White respondents. More Black respondents were also more likely to report living in a household where a child had gone hungry. This matches South Africa's historical inequities. Overall, for all race groups, child hunger was less prevalent than adult hunger.

Table 3: Proportions of households that reported hunger in the last seven days

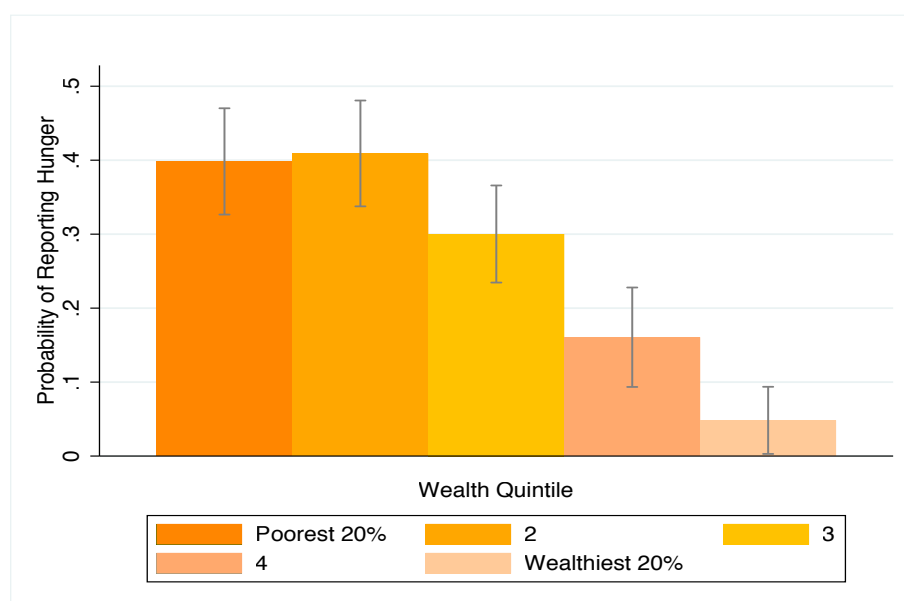
Hunger reported at least once	Adult %	Child %
Black	25.9	17.0
Coloured	16.0	9.0
Asian/Indian	7.5	2.6
White	3.6	2.6

Source: NIDS-CRAM Wave 1 (June 2020)

18.5% of respondents in NIDS-CRAM Wave 1 reported having to take chronic medication for an on-going health need. Of these individuals, 26.3% reported hunger in their households in the preceding week. We do not report the racial breakdown of this sub-sample given the small size of this group.

Figure 2 below shows the distribution of the probability of reporting an adult going hungry for those who reported having a chronic illness compared relative to respondents' income quintiles (based on per capita income). The income quintiles were constructed using household income per capita for the same respondents who answered questions in NIDS Wave 5 (2017). Respondents with chronic illness who have the income are the most likely to report hunger in their household. These findings are particularly troubling as this may have a direct effect on the management of these chronic conditions. In the management of TB and HIV especially, periods of poor disease management (referred to as loss to follow up) place a risk on overall disease management and control in the country in addition to the individual effects of stopping treatment for prolonged periods of time (Mohammed, Berheto, and Haile 2014).

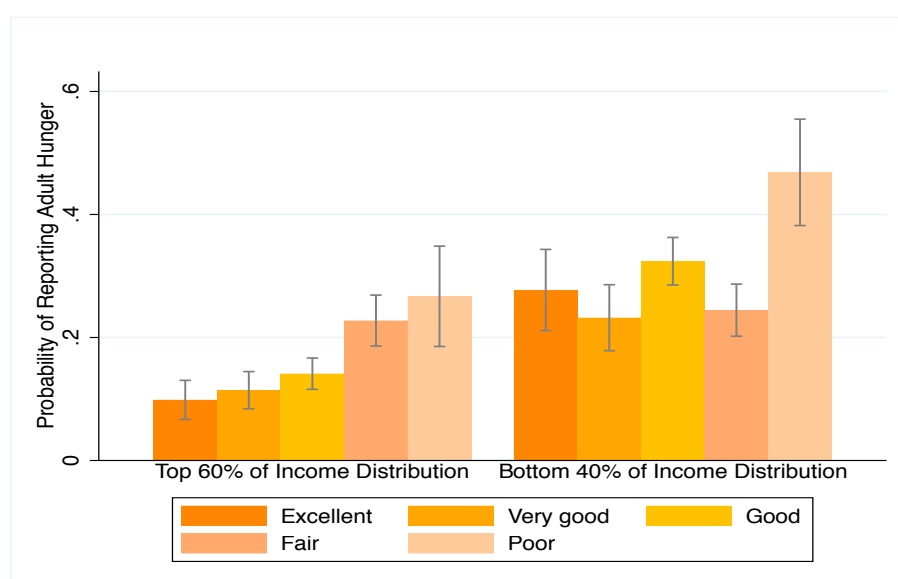
Figure 2: Respondents (adults) who reported hunger and having a chronic illness, relative to per capita income quintile



Source: NIDS-CRAM Wave 1 (June 2020)

The interaction between hunger, health and income becomes clearer when we consider reported adult hunger relative to self-assessed health status. In *Figure 3* we compare the percentage of respondents who reported hunger relative to self-assessed health status for, respectively, the top 60% of the income distribution and the bottom 40% of the income distribution. There are two clear patterns. First, a higher percentage of adults in the bottom 40% of the income distribution report going hungry relative to all categories of all self-assessed health (poor, fair, good, very good and excellent). Second, a much higher percentage of respondents in the bottom 40% with poor health status report hunger. We are not able to identify the direction of causality. The interaction between hunger and health here is likely to be complex.

Figure 3: Percentage of adult respondents reporting hunger relative to self-assessed health for the top 60% and bottom 40% of the income distribution (per capita income)



Source: NIDS-CRAM Wave 1 (June 2020)

Child, infant and neonatal deaths as a channel of influence

Infant mortality generally declines as income, expressed as GDP per capita, increases in LMICs (Pritchett and Summers 1996). Given that recessions are by definition characterised by decreases in GDP, it follows that recessions may lead to increases in infant mortality. Several studies have found this to be the case in both high-income and LMICs. There is a well-established link between nutrition, income and child health and mortality. For example, the increase in food prices during the 2008 economic crisis may have contributed to infant mortality through making families more food insecure, leading to under nutrition in pregnant mothers and infants (Christian 2010). Given the prominence of nutrition, we have included it as a separate driver in the section above.

A study of 204 countries between 1980 and 2001 using data on GDP and child mortality from 1981 to 2010 found a strong relationship between economic downturns and child mortality (counter-cyclical) (Maruthappu et al. 2016). At the global level, downturns were associated with significant ($p < 0.0001$) deteriorations in each child mortality measure, compared to non-downturn years. Stronger (larger falls in the growth rate of GDP/capita) and longer (lasting two years rather than one) downturns were associated with larger significant deteriorations ($p < 0.001$).

Higher income countries have also been affected by a counter-cyclical relationship between recessions and child mortality. A study of the effects of recessions on infant mortality in OECD countries shows that economic contractions lead to **a more than proportional increase** in infant mortality, particularly in countries which already had relatively higher levels of infant mortality. In countries at the median of the global infant mortality distribution, a **1%** annual reduction in GDP corresponded to a 2.0% increase in infant mortality, while those in the 90th percentile of the distribution experienced a 3.4% increase in infant mortality (Alexander, Harding, and Lamarche 2011). LMICs are more likely to fall within the 90th percentile, making child and infant mortality an important consideration during economic downturns. Notably, findings from a sample of 17 middle-income countries outside Sub-Saharan Africa on the relationship between infant mortality and macroeconomic shocks (positive or negative) are mixed, most being **procyclical** or **acyclical**, but when GDP contracts by **15% or more** this is consistently associated with higher infant mortality (Schady and Smits 2010). This shows that middle income countries are often working off a stronger base (i.e. less infant mortality generally).

However, the same is not true for LMICs. Evidence shows **an overwhelmingly counter-cyclical relationship between recessions and child mortality** in lower-income and lower-middle income countries. In a review of empirical literature, UNICEF finds that for a sample of 57 LMICs, infant mortality by 56,000-138,000 (an estimated range) in 2009 following the global financial crisis (Mendoza and Rees 2009). In a sample of Sub-Saharan countries, a 1% reduction in per capita GDP (linked to the 2008/9 financial crisis) was associated with a clear increase in infant mortality of between 0.34 per 1,000 to 0.48 per 1,000 (Friedman & Schady 2013). This is a much more sensitive relationship than that seen in the 17 middle income countries referenced above. The results suggest 28,000–50,000 excess infant deaths in Sub-Saharan Africa in the crisis-affected year of 2009. A negative income shock (state-level income) of median size (4.4%) was estimated to raise infant mortality for children India by 0.136 percentage points. This is found to be almost half of the total annual decrease in mortality in India in 1970–99 (Bhalotra 2010), i.e. undid half the decrease in infant mortality over the study period.

The effects on child health from depressed economic circumstances not only result in mortality for some children and infants but persist into adulthood. A study of the effects of recessions on the health outcomes of mothers and infants in Peru showed that **a 1% decrease in GDP was associated with a 0.30-0.39% increase in infant mortality** and reduced antenatal care visits before the birth of children. The study also found that recessions have long term health effects on surviving children, in particular a permanent reduction in the height of children (Agüero & Valdivia 2010).

Infectious diseases as a channel of influence

The burden of infectious diseases in South Africa is mainly attributable to TB and HIV. South Africa is one of eight countries which make up two-thirds of the global burden of TB and has the highest number of people living with HIV in the world (WHO 2019; UNAIDS 2020). The WHO estimated the TB incidence to be approximately 301,000 in 2018, which amounts to about 502 new TB infections per 100,000 people (WHO 2019). There are 7.7 million people living with HIV in South Africa and adult prevalence rate is 20.4% (UNAIDS 2020). TB is a leading cause of death in South Africa and the strong link between HIV and TB co-infection cannot be ignored; of the 63,000 people in SA who died of TB in 2018, two thirds were HIV-positive (WHO 2019).

Given the absence of good recession-mortality studies on LMICs, where there is generally a higher prevalence of infectious diseases, there is not much evidence available on how mortality from these diseases is affected by recessions. A systematic review of the impact of recessions on infectious disease transmission showed that infectious disease outcomes are worse during recessions (Suhrcke et al. 2011). This was as a result of economic hardship placing people in poorer living conditions, causing inadequate access to therapy, and suboptimal treatment retention. Infants and elderly people were considered especially susceptible to infectious diseases during times of economic hardship.

A longitudinal study of 21 European countries showed that a USD100 decline in spending on public health services during the 2008 financial crisis was associated with a 2.74% decline in mean tuberculosis (TB) detection rates. A decline in detection increases the number of people an individual may be able to detect before they seek care. Therefore, austerity policies, which result in a decline in healthcare spending, may lead to an increase in TB incidence (Aaron Reeves et al. 2015). In Mexico, in the bottom poorest ten states (by state-level development) there was a counter-cyclical relationship between infectious and parasitic diseases over the period 1993-2000 (Gonzalez and Quast 2010). The authors speculate that it may show how people in these poorer states were only able to obtain better access to healthcare during periods of economic expansion.

In interviews with NGOs, Government and UN officials in South Africa, Harper and Jones (2010) identified that the financial crisis of 2008 affected HIV prevention and treatment in three primary ways. First, through travel costs, as loss of income makes transport to clinics to collect ART unaffordable, which undermines adherence to treatment (Jones and Harper 2012). Second, budgets for prevention programmes are cut. Lastly, during times of economic hardship, social protection programmes are overwhelmed, and services can become “crowded out” by competing components of social protection programmes. This, coupled with the limited capacity of social workers with immense workloads, stifles the government’s ability to administer social protection programmes effectively. All these factors come together to undermine HIV/AIDS treatment and prevention measures during economic crises.

Non-communicable disease (NCD) as a channel of influence

Non-communicable diseases (NCDs) include a variety of diseases such as diabetes, cardiovascular diseases, cancer and mental health conditions. The economics literature does not always distinguish between particular disease categories, but NCDs other than cancer and cancer are typically reported on separately.

NCDs (excluding cancer)

Overall, cardiovascular and non-communicable disease deaths in high-income countries have been mostly procyclical, i.e. reducing with recession, in most studies (Ruhm 2015). In an analysis for the US over the period 1970-1992, a 1% point increase in state-level unemployment was estimated to decrease deaths due to cardiovascular disease by 0.5% (Ruhm 2000). In the same study, a 1% point increase in state-level unemployment led to small reductions in death due to liver disease, mostly linked to excessive alcohol consumption (Ruhm 2000).

The lower mortality experienced in high-income countries is thought to be mainly driven by a reduction in harmful activities, such as drinking, tobacco use and purchasing fast food, during these periods. Traffic also reduced (see section below) which leads to a reduction in road accident-related deaths. A study by Ruhm and Black (2002) showed that alcohol consumption is procyclical in existing drinkers, and the decrease in alcohol use during economic downturns (estimated using regional employment data) is mainly among heavy drinkers. Given that heavy drinking is associated with an unhealthy relationship with alcohol, he concludes that alcohol abuse is in fact procyclical (Ruhm and Black 2002). This may explain the finding that the incidence of cardiovascular disease and death due to liver disease are also procyclical (Ruhm 2000; 2015). In these studies, Ruhm (2000 & 2015) found that the incidence of cardiovascular disease decreased when the economy was in recession and the deaths due to liver disease fell during times of higher unemployment. Although the relationship between alcohol consumption and cardiovascular disease is debated (Piano 2017), the causal link between excessive alcohol consumption and liver disease is well established (Bellentani et al. 1997; Becker et al. 1996). However, it is important to note that liver disease takes time to arise and worsen, and therefore the relationship with recessions can only really be ascertained when the research spans a long enough time period. Otherwise, we may well be seeing liver disease in recessions due to prolonged alcohol abuse during times of economic growth.

However, the available evidence from LMICs shows a likely more **counter-cyclical** relationship between both cardiovascular and the broader category of non-communicable disease deaths. An increase in unemployment rate of 1% point amongst 5,556 Brazilian municipalities between 2012 and 2017 was associated with an increase of 0.22 deaths per 100,000 due to cardiovascular disease (Hone et al. 2019). In Mexico, while the top ten states by level of development experienced counter-cyclical cardiovascular disease mortality, the bottom ten states experienced higher mortality in non-communicable diseases (Gonzalez and Quast 2010).

NCDs account for 51% of deaths in South Africa (WHO 2018a) and studies have shown clear links between poverty and deprivation and prevalence of NCDs, chronic disease and access to treatment (Schneider et al. 2009). A 2017 study using NiDS data has shown a clear association between living in deprived neighbourhoods and depression, which shows the impact of structural poverty and wellbeing (Dowdall, Ward, and Lund 2017). This is consistent with earlier finding by Ardington and Case (2010) which showed a strong linear inverse relationship between household expenditure and number of assets owned and depression; meaning that those with lower levels of household expenditure and assets had higher depression scores (Ardington and Case 2010). More and more evidence is beginning to show the relationship between poverty and NCDs (Islam et al. 2014) and it is likely that NCD prevalence will increase with recessions, as a result.

Cancer

Maruthappu et al. (2016) found that, in a sample of 75 high- and middle-income countries (1990-2010), a 1% unemployment increase was associated with an increase in mortality for five treatable cancer subtypes: breast and colorectal cancer in women and; lung, prostate and colorectal cancer in men (Maruthappu et al. 2016). This may be because people have less access to preventative care such as screenings during periods of economic recessions. This is likely more severe where health benefits are linked to employment (like in the United States), which means that recessions force people to lose health insurance, which could lead to catastrophic health expenditure. This also highlights the benefit of Universal Health Coverage (UHC) as a protective factor during recessions, given that healthcare is free at point of care. From a regression analysis, the relationship between unemployment and treatable cancers disappeared once UHC status was controlled for. This suggests that, in the presence of social safety nets such as UHC, the health effects of economic hardship can be mitigated (Maruthappu et al. 2016).

However, where UHC or publicly funded health services are available, cuts to public healthcare expenditure as a result of recessions could also result in reduced preventative care by facilities needing to cut back on services. Although treatable cancer mortality was significantly associated with unemployment, no such relationship was found for untreatable cancers. This is no doubt due to

the high impact that prevention can play in reducing cancer fatalities.

Much has been written about the relationship between deprivation and cancer; those who are poor, have lower levels of education, live in low income areas close to factories or live in rural areas far away from well-equipped public health facilities, among other factors, are at higher risk of not having access to adequate treatment and screening services and are more likely to develop cancer (Freeman 1991; Gorey and Vena 1995; Hausauer et al. 2009; Palacio-Mejía et al. 2003). However, there is very little research into these socio-economic factors in the LMIC context, including in South Africa. Loss of income may become a barrier to accessing screening for those who may have to travel some distance to access screening or treatment (Chidyaonga-Maseko, Chirwa, and Muula 2015; Akinyemiju 2012). For certain cancers, there is a clear relationship with HIV status (Rubinstein, Aboulafia, and Zloza 2014). The regular interaction with the health system can be protective for people living with HIV (PLWHIV), given opportunities for NCD and cancer screening. Therefore, treatment adherence is an important factor in preventing late-stage diagnosis, but loss of income can make regular travel to the clinic unaffordable.

Suicide as a channel of influence

‘It is a well-known fact that economic crises have an aggravating effect on suicidal tendency’ (Durkheim 1970).

Suicide is the type of mortality that is most visible during economic recessions or downward economic cycles and closely related to the mental health impacts of recessions. It is also the one cause of death that consistently increases during economic hardship, although these increases may not offset the overall decline in deaths from other causes (Ruhm 2000; Khang, Y. H.; Lynch, J. W.; Kaplan 2005).

In the US, a 1% increase in state-level unemployment results in a 1.3% increase in deaths by suicide (Ruhm 2000). While all-cause mortality decreased in South Korea during the period of the East Asian Financial Crisis during the late 1990s, suicidal death increased sharply (Khang, Lynch, and Kaplan 2005). Clasen and Dunn (2011) find that unemployment duration, not simply unemployment itself, was the driving force behind the relationship between unemployment and suicide over the period 1996-2005, and in addition to this, mass-layoffs were strongly associated with suicide shortly after job loss. A study by Reeves, McKee and Stuckler (2014) showed that in almost all European countries, there was an excess in suicide-related deaths during the 2008-2010 period, correlating with the Great Recession (Aaron Reeves, McKee, and Stuckler 2014). This further supports the counter-cyclical relationship between suicide and recessions. In Mexico, however, in contrast to the findings from high-income countries, suicides were procyclical over the period 1993-2000 (Gonzalez and Quast 2010). This could be as a result of stronger social support mechanisms or higher levels of starting unemployment.

Generally, suicides constitute a relatively small cause of death in LMICs when compared to other causes of death (Statistics South Africa 2018). This could be indicative of the difference in starting points for high income vs LMICs in terms of employment rates or socio-cultural differences, which may make suicide less likely in LMICs.

Road fatalities and motor vehicle accidents as a channel of influence

It is a widely held assumption that mortality due to motor vehicle accidents is likely to decrease sharply during recessionary periods due to less travelling for economic activity and also less disposable income for recreational trips. In a review of evidence from various high-income countries, Ruhm (2015) concludes that motor vehicle deaths are procyclical, i.e. reduce during recessions, in all countries. In the US (1972-1991) a 1% increase in state-level unemployment led to a 3%

decrease in deaths due to motor vehicle accidents (Ruhm 2000). Put differently, a 1% increase in the unemployment rate in the US over the study period 1972-2004 led to a reduction of 1,285 motor vehicle accident deaths (Miller et al. 2009).

A causal study conducted in OECD countries showed that road traffic fatalities largely decreased during the Great Recession (Wegman et al. 2017). This was mainly attributed to a reduction in 'risky' (young) drivers on the road, rather than an actual reduction in kilometres driven (Wegman et al. 2017). Further, the reduction in fatalities can also be linked to retrenchment in younger age groups being more common and a decrease in disposable income that would allow people to purchase alcohol and drugs and drive under the influence of these (International Transport Forum 2015). These explanations also both fit the LMIC environment, where the population structure is younger and where 'luxury' items such as alcohol and drugs quickly become unaffordable when income is reduced.

Evidence on the economy links to other deaths, including non-road accidents and pollution-linked deaths, are reviewed in Appendix A.

Longer-term impacts of recessions on health

Although we have focussed on recession-related mortality, it is true that recessions may also impact health negatively without necessarily causing death. This is therefore also important to consider, when looking at the impact of recessions on health outcomes.

A study using longitudinal data of older adults in the US, collected from 2005 to 2011, showed that the economic hardship experienced during the Great Recession had physiological effects on middle aged adults (Boen and Yang, 2016). Those who had experienced reductions in their net financial worth as a result of the economic crisis were more likely to have higher systolic blood pressure and increased C-reactive protein (a marker for inflammation in the body) than those who had not (Boen and Yang, 2016). Systolic blood pressure is an indication of overall cardiovascular function and a strong predictor of lifetime chronic disease risk and mortality (Boen and Yang, 2016). C-reactive protein is associated with increased likelihood of heart disease, stroke and mortality (Boen and Yang, 2016). The strength of this study is that its data collection points, before and after the Great Recession, provided a natural experiment for analysing the impact of the crisis. The longitudinal nature of the data also allowed for the tracking of changes within the same individuals over time, mitigating some of the problems of confounding variables associated with cross-sectional data analysis. Therefore, the findings of this study provide strong causal evidence of the link between economic shocks and disease risk at an individual level, over the long-term (Boen and Yang, 2016).

This echoes the findings of a 2012 study of data from employed, working age Americans, which showed that workers who reported feeling job insecure after the 2008 recession experienced higher rates of depressive symptoms and were more likely to report being in fair or poor health (as opposed to good health), compared to workers who did not consider themselves at risk of losing their jobs (Burgard, Kalousova, and Seefeldt 2012). This shows that the anxiety of losing one's job during times of macroeconomic downturns affects mental health, even amongst those who are still employed (Burgard, Kalousova, and Seefeldt 2012).

Schwandt and Wachter (2020) identify a long-term causal channel between economic conditions and mortality, by looking at how entering a labour market during a recession affected health outcomes in middle age. They find that cohorts of graduates entering the labour market during a recession have not only shorter life expectancy (**a 3.6 percentage point increase in unemployment decreases life expectancy by six to nine months**), but it also increases the likelihood that this cohort would die as a result of **"deaths of despair"** from external causes, such as lung cancer related to tobacco use, liver disease, and drug poisoning (Schwandt and Wachter 2020). This cohort also had **lower marriage rates, higher divorce rates, and smaller family sizes**, however no causal link is drawn between these outcomes and overall health. The strength of the long-term approach used in this

study is that it accounts for the fact that the health effects of economic hardship may not be felt immediately, and they may be compounded over time.

A study using data which tracked Swedes from 1980 to 1986, showed that unemployment increased the risk of death in the follow-up of each wave of the survey by 46%; from an initial risk of 5.4% at follow-up, to a risk of 7.8% (Gerdtham and Johannesson 2003).

Financial crises, such as the Great Recession, result in governments having to restructure their expenditure in order to manage debt repayment and prioritise spending which stimulates economic growth. This may result in austerity-related budget cuts for public health services which can have a knock-on impact on health access and outcomes.

A study of the impact of the financial crisis on health and mortality in Greece found that compared to the pre-austerity period (2000-2010), mortality in children under five and the elderly increased in the post-austerity period (Tyrovolas. et al. 2018). The country's ongoing austerity measures include a substantial contraction of health-care expenditure, with reports of subsequent negative health consequences. Although all-cause mortality had been steadily increasing between 2000 and 2010, this rise increased sharply after 2010, coinciding with cuts to government expenditure in healthcare. With most of the Greek government's budget dedicated to debt repayment, austerity measures were put in place to manage public spending. This resulted in a cut in healthcare spending, coinciding with a period of major demographic transition: young people moved abroad to find work, leaving Greece with an older average population. This placed a burden on the healthcare system which now had to respond to the needs of an older population, who did not have their children to rely on for care and support (Tyrovolas et al. 2018).

A study by Stevens et al (2015) echoes the findings in Greece using US data. The study disaggregates the data by age group and looks at the effect of unemployment among children, those of working age and the elderly and finds that death rates among the elderly (those over 65) and children under-five are most sensitive to changes in unemployment. In fact, the authors find that 70% of the additional deaths attributed to a decline in unemployment are of people aged 70 or older (Stevens et al. 2015). These age groups of people are usually not economically active, and therefore it is unlikely that the factors driving lower levels of mortality during recessions are driven by their labour force participation or lack thereof. The authors however find that the number of people in skilled nursing homes is counter-cyclical - they go down during times of low unemployment and go up when employment is higher. This speaks to people's ability to afford specialised care during recessionary periods, these deaths can then be linked to recessions. Stevens et al. (2015) also shows that the decline in death by cardiovascular disease during recessions, which is observed by Ruhm (2000 & 2005), is driven primarily by those in the 65+ age group, raising questions about findings on the procyclical relationship between cardiovascular health and recessions. It is also important to note the generally younger population make-up in LMICs, which may make this affect less profound in those settings.

The health of children is likely to suffer due to early-life income, care and nutrition impacts as a result of recessions. As mentioned earlier, not only were economic downturns in Peru associated with increased child mortality, but there is also evidence of reduced antenatal care visits before the birth of children which may have led to unanticipated health outcomes and a permanent long-term health effect on surviving children, in particular a reduction in the height of children (Agüero, Jorge M; Valdivia 2010).

Although these findings may appear to be contradictory, they come together to make an important point: **while mortality may decline during recessions, in the short term, this does not necessarily translate to populations becoming healthier.** More people may be living with stress induced illnesses such as hypertension and mental health disorders, more people may reduce spending on their own healthcare to save money leading to late detection of preventable illnesses, and although all-cause mortality may fall, the effects of the stress caused by recession may show up in ill health later in life. In addition to this, many of the studies that find a procyclical relationship between recessions and mortality were almost exclusively conducted in high-income countries.

Recessions may not have the “protective” effects displayed in high income countries in LMIC contexts where governments with already limited fiscal space may be forced to cut health spending and other social safety protections during recessions, as we discussed in the case of Greece.

While mortality may decline during recession, in the short term, this does not necessarily translate to populations becoming *healthier*.

Who is most likely affected by recession-linked mortality in South Africa?

There is growing evidence that while for some countries there may not be an aggregate (total) mortality effect, there are different effects on sub-groups. Here we provide brief evidence on the groups that are most often affected.

Relatively consistent patterns in terms of race (typically those more vulnerable from a socio-economic perspective) and men (often with poorer access to healthcare and closer ties to the labour market) being more affected, emerge. However, this may vary depending on the type of mortality being considered and on the levels on inequality, poverty, and healthcare access of a specific country and how this is correlated with socio-economic factors. Depending on societal values with regards to women and their autonomy, in certain LMICs women may be more affected. An overall greater biological vulnerability during certain age periods to disease and mortality means that children's mortality is also heavily impacted through recessions. As described in section 3.2, this can result in stunting and greater risk for NCDs later in life.

In the US, although the relationship between business cycles and mortality to date has been an overwhelmingly procyclical relationship, this relationship has not been the same across race groups. White and Hispanic people have generally experienced **procyclical mortality rates**, whereas Black people experienced no statistically significant relationship between mortality and the business cycle, i.e. there was no improvement experienced (Fontenla, Gonzalez, and Quast 2011).

The Brazilian experience of the 2012–2016 economic recession demonstrated that **Black people, people of mixed heritage** and **men** experienced the largest increases in mortality, primarily because these groups were already most likely to experience worse health outcomes compared to White Brazilians and women (Hone et al. 2019). Of course, where race and gender intersect, the effects are magnified.

Over time, men have been at a disadvantage relative to women in terms of the beneficial health effects of recessions. During the 1976 to 1995 period, a one percentage point increase in unemployment resulted in an estimated 0.44% reduction in male mortality and a 0.41% decrease for females (Ruhm 2015). This effect had completely disappeared by 1991–2010 for men but was reduced by only half as much for women, i.e. men (relative to women) were the losers in terms of a diminished recession-linked impact on mortality. The procyclical nature of mortality has been sharply declining for men since 1982 and this group has therefore been benefitting less from positive mortality effects.

In South Africa, men tend to show poor levels of health-seeking behaviour (Mbuthia, Olungah, and Ondicho 2018). One of the reasons men delay seeking care relates to their work (Mbuthia, Olungah, and Ondicho 2018). In South Africa, where men often work far from home, or jobs that do not allow for paid leave or flexibility to attend health services, being employed often exacerbates the lack of access to timely care. When in a recession, we would expect that some of these men would be retrenched or would not be able to work, and that this would allow them to attend health services more readily. However, the opportunity cost of seeking care (potential time lost to seek for a job or travel costs) are likely to be higher during a recessionary period and could undermine the effects of greater availability of time to access care.

Studies have shown that poorer women are more likely to engage in risky/unprotected sex with their male partners if they depend on them financially (Sonia Tladi 2006). This may be because these

women may be less likely to have the power to negotiate safe sex if their livelihood, and perhaps that of their children or other dependents, is dependent on their partners. These complex social dynamics may put economically vulnerable women at higher risk of HIV acquisition when they lose their income.

South African and international research has also shown a relationship between socio-economic status and health status (International Bank for Reconstruction and Development / The World Bank 2018). When people are forced to live in cramped spaces, as is common in South Africa's informal settlements, health outcomes are shown to worsen (International Bank for Reconstruction and Development / The World Bank 2018). Therefore, in places where we are expecting South Africa's lockdown to have resulted in a loss of jobs, we would also expect some people to be forced to move into more cramped areas and spaces. This would increase their health risks and could increase morbidity and mortality.

Interestingly, people with a lower socio-economic status do not always feel disadvantaged health-wise, and in fact are more likely to report being well, despite empirical evidence that shows otherwise (Rossouw, Bago d'Uva, and van Doorslaer 2018). Therefore, for those who were already impoverished and those who will become further so, they may miss the warning signs of ill-health, further contributing to adverse health outcomes due to late presentation and a lack of awareness.

Implications for South Africa

As mentioned in the introduction, there are some protective factors that can help shield populations from the negative health affects related to recessions. Highest on that list is access to free-at-point-of-care, public health services (essentially UHC) (Maruthappu et al. 2016). Along with this, social security nets such as basic income grants, unemployment grants and a robust social services system can all help to safeguard health and well-being. However, too often, governments are forced to implement austerity measures during or after a recession and oftentimes the social services (health, education etc) are also affected (Blecher et al. 2017). Therefore, there is a strong case to be made for the social services sectors to remain protected even during times of recessions.

The World Bank has determined that South Africa has the highest level of inequality in the world, an unenviable position to be in (The World Bank Group 2020). This inequality also speaks to the dual nature of South Africa: an upper-middle-income country which has severe levels of unemployment, poverty, and a high burden of disease. Notwithstanding the dearth of recession-mortality causal research in LMICs, it would still be questionable to place South Africa's trends solely within the LMIC bucket given a relatively comprehensive health system, the largest social grants programme in Africa and a pro-active economic policy response. Below we tailor our policy-related advice to South Africa's particular context and mix of circumstances.

Targeted social support

Section 5 showed that the impact of health outcomes and mortality differ by population groups. Therefore, it is important that policy tools need to be prioritised and targeted appropriately to meet the needs of these specific groups. This will require the implementation of **pro-poor, countercyclical policy instruments targeted at specific groups**.

Loss of income due to unemployment and potential increases in food prices leave people, particularly pregnant mothers, and young children, in danger of under- or malnutrition, with all its requisite risks for later in life (Mendoza and Rees 2009). Therefore, government should prioritise the continued enrolment of children into new and existing grant and feeding schemes. This will require greater fiscal support beyond the short term, and for the duration of the economic downturn. Reeves et al. (2014) found short-term, pro-growth effects with spending on social protection and education during a recessionary period.

Protection of the healthcare budget and healthcare provision

Recession-induced austerity measures often require governments to make difficult fiscal trade-offs. This may result in lower budget allocations to healthcare expenditure to support other areas of the economy. However, findings from studies mentioned earlier show that although this appears to free up fiscal space, it comes at the expense of long-term population level health outcomes, and leaves governments underprepared to deal with future public health crises (Tyrovolas et al. 2018). Austerity and cuts in healthcare expenditure also tend to increase healthcare inequalities in the short and long term (van der Wel et al. 2018). This therefore presents an opportunity for government to strengthen the public health system so that it is more prepared to deal with similar crises in the future. A study by Reeves et al (Aaron; Reeves et al. 2013), using data on 25 EU countries from 1995 to 2010, found that government spending on health has a fiscal multiplier which is greater than one, meaning that this type of spending is absorbed into the domestic economy in a way which creates new employment opportunities and incomes and may have short-term effects that make economic recovery more likely (Aaron; Reeves et al. 2013).

Inasmuch as healthcare spending needs to be expanded, and resources re-deployed to address this new public health threat, support for existing healthcare needs should not be neglected, particularly for those living with chronic illnesses such as HIV, TB and NCDs. Immunisation programmes and the provision of chronic medication must still be prioritised and not crowded out by the need to mobilise around the existing crisis. Failure to do this can lead to adverse population-level health outcomes in the medium to long run. Further, crises like Covid-19 make clear how weak health systems can quickly topple over when there are shocks to the system.

Health systems restructuring as a result of a public health crisis

Although this crisis has highlighted many social inequalities, it also presents an opportunity to narrow those health inequalities using the appropriate mix of expansive, innovative, community based, pro-poor policy tools. As Mazzucato (2020) describes it, Covid-19 presents a **“potential for new alternatives” to “transform societal challenges into a mission for investment”** (Mazzucato 2020). The need for more community information dissemination, widespread testing, and access to care for the sick presents an opportunity for more innovation in community-oriented primary care (COPC), and telemedicine in the public sector. Already we are seeing departments of health pivot to delivering care at the community level to keep both healthcare workers and clients safe. This is something that has long been dreamt of, but Covid-19 has presented the exact right mix of challenges to see the system overhaul to a community-oriented focus, almost overnight.

Separating the channels for South Africa's recession and providing support where needed

Unlike previous recessions, a Covid-19 recession impact on health will be complicated to discern as it is likely to work through two channels. The respective effects of these two channels will have to be carefully disentangled through robust and cautious econometric methods in any future work on the relationship between the Covid-19 recession and mortality in South Africa.

The first channel is the unintended public health consequences of widespread information on the infectiousness of the disease and public health actions taken to avoid further infection. The lockdown was implemented to encourage people to stay home to avoid being infected with the new coronavirus strain. People were both actively encouraged to avoid certain health facilities and also chose to access less care, particularly less primary care, than usual due to fear of being infected with the virus as happened in other countries (Nordling 2020). Media and early policy reports show that health seeking in various areas has decreased (Cleary 2020).

The second channel is the economic effects of the recession on both health-seeking and health status. South Africa has a public health system that is free at point of care and is almost fully

funded (~98%) by public funds. This means that the relationship between health and employment is potentially less tenuous, given that access to healthcare is not linked to employment status, as it is in some countries. However, depending on the length and severity of the recession, health impacts through reduced nutrition, especially for young children, are likely to occur. The recession may also impact the opportunity and indirect costs of seeking care, e.g. travel expenses to clinics. For the 16% of the South African population who do pay for private health insurance, it is possible that some may drop off and fall back into the public health sector. This will place further pressure on an already overburdened public health system, particularly in urban metros, and this may very well cause an uptick in deaths due to late presentation, long waiting times and resource constraints related to human resources and goods.

The Covid-19 models in South Africa predict total Covid-19 related deaths to range between 35,000-88,000, although a far wider range is put forward by other commentators. It is important to note that these estimates are South Africa specific, where there has been a stringent lockdown. We would expect the estimates to rise somewhat if there had not been a lockdown and/or if the lockdown had started later into the pandemic. Further, South Africa was already in an economic downward spiral and therefore the counterfactual includes the existing negative impacts of low to no economic growth in the country. However, local and global lockdowns are likely to substantially deepen and extend the recession.

We suggest tracking closely the following causes of death, as they appear to link closely with economy-linked mortality in LMICs:

Table 4: Number of deaths in vulnerable mortality areas (pre-Covid)¹

Cause of death/vulnerable group	Pre-Covid data point (deaths per 100,000)	Changes from April 2020
Cancer	75.7 ²	To be monitored
TB	50.2	To be monitored
HIV	37.5	To be monitored
Under-5 mortality	44.8	To be monitored
Cerebrovascular disease (NCD)	39.0	To be monitored
Diabetes	44.4	To be monitored
Suicide	12.8 (2016 data) ³	To be monitored

Sources: Statistics South Africa, 2020a & WHO, 2018b

¹ National mortality data is typically made publically available by Statistics South Africa (Stats SA) with a two to three year lag. This is the latest available data which was made public in March 2020 (Statistics South Africa 2020a).

² This is Stats SA's estimated deaths caused by neoplasm (C00-B48) which we have interpreted as deaths by cancer for the purposes of this paper.

³ This estimate is sourced from WHO Global Health Observatory data repository (WHO 2018b)

Recommendations to South African policy-makers

Specific types of mortality where South Africa is particularly vulnerable include:

- child and infant deaths linked to nutrition,
- future NCD and cardiovascular-related deaths,
- deaths due to infectious diseases such as HIV and TB which show clear relationships with poverty and,
- treatable cancer deaths.

This guides our recommendations for policy.

Evidence based policy-making

It will no doubt be difficult to disentangle the direct Covid-19 lockdown and health system effects from the indirect economy-linked mortality effects. However, this research is important and necessary to help the country better tackle what is to come, as we almost definitely are entering a deep and extended recessionary period. To do this effectively, we need, at a minimum, quarterly mortality and economic data from before, during and after the lockdown and Covid-19 pandemic, ideally on district or municipal level (the variation from the nine provinces is unlikely to be sufficient). The data will need to control for time and regional specific effects, to be meaningful. As we can see from the above, death data is woefully out of date, and there are some questions in terms of the accuracy, especially where it comes to non-natural deaths.

The available evidence indicates that we are likely to experience a combination of both pro- and counter-cyclical trends within South Africa given levels of development and the composition of our population, with uncertainty about the nature of the aggregate relationship. The possibility of a counter-cyclical relationship prevailing, however, the risk and magnitude of which will increase with the severity of the recession, prompts the importance of tracking mortality outcomes. Irrespective whether a pro- or counter-cyclical relationship prevails, it is clear that vulnerable groups will suffer the most: lower income individuals, Black people, men⁴ and children.

Protect social services spending

As explained in this brief, austerity can have a negative effect on health status. This is particularly clear where there is a robust publically funded health system as there is in South Africa. Therefore, ringfencing health expenditure to protect it from the effects of the wider recession is an important measure to counter-act the recession-related mortality risks discussed in this brief. This can also be made possible by funding COPC, which is generally lower cost and has a greater focus on health promotion and prevention, counteracting some of the risks of late presentation that recessions can bring.

Our brief also shows the importance of strong social support networks during a recession. Policy-makers should recognise the connection between livelihoods, income and health, and therefore protect and expand existing household transfer programmes such as the child support grant and the newly established Covid19 Unemployment Grant to avoid short- and long-term effects on health. To be effective, these services need to be timely and agile.

Consider those who fall outside of the social security net. Alternative mechanisms are required to support the more informal aspects of the economy. The least visible members of society are likely to be the most vulnerable.

⁴ This group being more severely impacted may seem counter intuitive. Recent evidence on health outcomes in South Africa for certain diseases such as HIV and also Covid show that men are at a disadvantage, primarily due to delayed health seeking.

Strengthen government policy implementation

Although South Africa has a free-at-point-of-care public health system, and an active social grants system, we have seen both struggle during the initial stages of the pandemic. The South African Social Security Agency (SASSA) was unable to distribute the new Covid grant within the first two months of the lockdown. This is concerning as many are starting to feel the effects of the recession. Therefore, simply having the policy is not enough. South Africa requires more agile implementation mechanisms to make use of its existing infrastructure and systems to adequately protect its population from the effects of recession.

Provide funding for innovative care pathways

In a constrained healthcare budget environment, provide support for experimentation with alternative healthcare delivery mechanisms such as telehealth and alternative healthcare access points that may ensure continuity of care at potentially a lower or similar cost to current facility-based alternatives.

This could also support for the indirect costs associated with accessing free public primary care such as subsidies or co-funding for travel (e.g. in the form of vouchers for pregnant mothers) to safeguard access to care.

Conclusions

The available evidence from LMICs (while lower in volume than for high-income countries) points in the direction of counter-cyclical mortality effects. Irrespective of the overall nature of the relationship between the recession and total mortality in South Africa, we know that certain already marginalised and vulnerable groups are likely to suffer more. There exists strong evidence on the relationship between infectious and non-communicable diseases and poverty, while child and infant health is also particularly vulnerable to decreases in income and worse nutrition.

This is one of the factors that needs to be taken into account when weighing different Covid-19 policy responses and in making decisions on the appropriate level of economic activity, given specific levels of Covid-19 infections and deaths in various health districts, sub-districts, and provinces. Being realistic about the country's capabilities and capacity is also an important factor for consideration.

The data from Wave 1 of NIDS-CRAM clearly shows how hunger can be an important channel of influence to health, both in terms of objective health outcomes as well as self-assessed health. Furthermore, broad unemployment is likely to have increased if we compare the CRAM results to findings from the Labour Force Survey for the first quarter of 2020. While some of the effects may be captured in immediate hunger reflected in the data, over time the impact of greater unemployment is likely to increase.

We provide possible immediate actions for policy-makers to consider that would help mitigate the impact of the economy-linked effects of Covid-19 and the associated recession on mortality and health. This provides the country with an initial roadmap of which systems to strengthen as we prepare to weather the remainder of the Covid-19 storm.

Appendix A: Other deaths

Non-transport accidents

A reduction in workplace accidents may contribute to the overall decline in mortality during recessions. Studies of workplace accidents in Spain and Austria found that occupational accidents were affected by economic crisis and resulted in a significant decline in both the number of workplace accidents and the probability of these accidents happening (Boone et al. 2011; De La Fuente et al. 2014). The study authors argued that older and more skilled workers are more likely to be retained in the labour market in times of job shedding caused by crisis, and this work experience may contribute to few accidents (De La Fuente et al. 2014). These fluctuations may also be linked to reporting behaviour, as employees may be less likely to report incidents when jobs are scarce for fear of having their employment terminated, therefore this result may also be driven by under reporting (Boone et al. 2011). However, these studies find no relationship between economic performance and fatal workplace injuries and find that fatal workplace injuries are more affected by overall workplace safety than economic performance (Boone et al. 2011).

In a study of the US for the periods 1976-1995 and also 1991-2010, it was found that non-transport related accidents switched from being strongly procyclical **to being sharply counter-cyclical, i.e. increasing with recession**. A one percentage point increase in unemployment reduced estimated mortality rates by 1.7% in 1976–1995 but increased them by 0.9% in 1991–2010 (Ruhm 2015). The trends in these deaths were dominated by accidental poisonings, which for the US, were thought to be mainly due to drug overdoses associated with opioid prescriptions.

Respiratory and pollution-linked deaths

A study on the effects of economic trends on air pollution, and therefore human health, in the US state of California showed a strong and statistically significant relationship between employment levels and air pollution in the US state. The study found that air pollution levels improved during economic downturns (Davis 2012). Given that air pollution has been found to affect infant mortality and morbidity, it is likely to follow that this reduction in air pollution as a result of economic downturn would have favourable effects on mortality (Davis 2012).

REFERENCES

- Agüero, Jorge M; Valdivia, V. 2010. "The Permanent Effects of Recessions on Child Health: Evidence from Peru." *Estudios Económicos* 25 (1): 247–74.
- Akinyemiju, Tomi F. 2012. "Socio-Economic and Health Access Determinants of Breast and Cervical Cancer Screening in Low-Income Countries: Analysis of the World Health Survey." *PLoS ONE* 7 (11). <https://doi.org/10.1371/journal.pone.0048834>.
- Alexander, Marcus, Matthew Harding, and Carlos Lamarche. 2011. "Quantifying the Impact of Economic Crises on Infant Mortality in Advanced Economies." *Applied Economics* 43 (24): 3313–23. <https://doi.org/10.1080/00036840903559620>.
- Ardington, C, and A Case. 2010. "INTERACTIONS BETWEEN MENTAL HEALTH AND SOCIOECONOMIC STATUS IN THE SOUTH AFRICAN NATIONAL INCOME DYNAMICS STUDY." *Tydskrif Vir Studies in Ekonomie En Ekonometrie = Journal for Studies in Economics and Econometrics*. Vol. 34. NIH Public Access. /pmc/articles/PMC3170771/?report=abstract.
- Arroyave, Ivan, Philipp Hessel, Alex Burdorf, Jesus Rodriguez-Garcia, Doris Cardona, and Mauricio Avendaño. 2015. "The Public Health Impact of Economic Fluctuations in a Latin American Country: Mortality and the Business Cycle in Colombia in the Period 1980-2010." *International Journal for Equity in Health* 14 (1): 1–14. <https://doi.org/10.1186/s12939-015-0176-9>.
- Becker, Ulrik, Allan Deis, Thorkild I.A. Sørensen, Morten Grønbaek, Knut Borch-Johnsen, Cecilia Florvall Müller, Peter Schnohr, and Gorm Jensen. 1996. "Prediction of Risk of Liver Disease by Alcohol Intake, Sex, and Age: A Prospective Population Study." *Hepatology* 23 (5): 1025–29. <https://doi.org/10.1053/jhep.1996.v23.pm0008621128>.
- Bellentani, S., G. Saccoccio, G. Costa, C. Tiribelli, F. Manenti, M. Sodde, L. Saveria Croce', et al. 1997. "Drinking Habits as Cofactors of Risk for Alcohol Induced Liver Damage." *Gut* 41 (6): 845–50. <https://doi.org/10.1136/gut.41.6.845>.
- Bhalotra, Sonia. 2010. "Fatal Fluctuations? Cyclicalities in Infant Mortality in India." *Journal of Development Economics* 93 (1): 7–19. <https://doi.org/10.1016/j.jdeveco.2009.03.006>.
- Bhorat, By Haroon, Tim Köhler, Morné Oosthuizen, and Ben Stanwix. 2020. "The Economics of Covid-19 in South Africa : Early Impressions." DPRU Working Paper 202004.
- Blecher, Mark, Jonatan Daven, Aparna Kollipara, Yasteel Maharaj, Adri Mansvelder, and Ogali Gaarekwe. 2017. "Health Spending at a Time of Low Economic Growth and Fiscal Constraint." In *South African Health Review 2017*, edited by Ashnie Padarath and Peter Barron, 25–40.
- Boen, Courtney, and Y. Claire Yang. 2016. "The Physiological Impacts of Wealth Shocks in Late Life: Evidence from the Great Recession." Article. *Social Science & Medicine* 150: 221–30. <https://doi.org/10.1016/j.socscimed.2015.12.029>.
- Boone, Jan, Jan C Van Ours, Jean-Philippe Wuellrich, and Josef Zweimüller. 2011. "Recessions Are Bad for Workplace Safety." *Journal of Health Economics* 30: 764–73. <https://doi.org/10.1016/j.jhealeco.2011.05.013>.
- Broadbent, Alexander, Damian Walker, Kalipso Chalkidou, Richard Sullivan, and Amanda Glassman. 2020. "Lockdown Is Not Egalitarian: The Costs Fall on the Global Poor." *The Lancet* 396: 21–22. <https://doi.org/10.1377/hlthaff.2020.00652>.
- Burgard, Sarah A., Lucie Kalousova, and Kristin S. Seefeldt. 2012. "Perceived Job Insecurity and Health: The Michigan Recession and Recovery Study." *Journal of Occupational and Environmental Medicine* 54 (9): 1101–6. <https://doi.org/10.1097/JOM.0b013e3182677dad>.

- Chidyaonga-Maseko, Fresier, Maureen Leah Chirwa, and Adamson Sinjani Muula. 2015. "Underutilization of Cervical Cancer Prevention Services in Low and Middle Income Countries: A Review of Contributing Factors." *Pan African Medical Journal*. African Field Epidemiology Network. <https://doi.org/10.11604/pamj.2015.21.231.6350>.
- Christian, Parul. 2010. "Impact of the Economic Crisis and Increase in Food Prices on Child Mortality: Exploring Nutritional Pathways." *The Journal of Nutrition* 140 (1): 177S-181S. <https://doi.org/10.3945/jn.109.111708>.
- Cleary, Kathryn. 2020. "Covid-19: Lockdown Takes Heavy Toll on SA's TB Respon..." *Daily Maverick*, 2020.
- Davis, Mary E. 2012. "Recessions and Health: The Impact of Economic Trends on Air Pollution in California." *American Journal of Public Health* 102 (10): 1951–56. <https://doi.org/10.2105/AJPH.2012.300658>.
- Dowdall, Nicholas, Catherine L. Ward, and Crick Lund. 2017. "The Association between Neighbourhood-Level Deprivation and Depression: Evidence from the South African National Income Dynamics Study." *BMC Psychiatry* 17 (1). <https://doi.org/10.1186/s12888-017-1561-2>.
- Durkheim, E. 1970. *Suicide, a Study in Sociology*. Routledge and Kegan Paul.
- Fernandes, Nuno. 2020. "Economic Effects of Coronavirus Outbreak (COVID-19) on the World Economy Nuno Fernandes Full Professor of Finance IESE Business School Spain." *SSRN Electronic Journal, ISSN 1556-5068, Elsevier BV*, 0–29.
- Fontenla, Matias, Fidel Gonzalez, and Troy Quast. 2011. "Are Recessions Good for Everyone's Health? The Association between Mortality and the Business Cycle by Race/Ethnicity in the US." *Applied Economics Letters* 18 (3): 207–12. <https://doi.org/10.1080/13504851003614120>.
- Freeman, Harold. 1991. "Race, Poverty, and Cancer ." *Journal of the National Cancer Institute* 83 (8): 526–27. <https://academic.oup.com/jnci/article/83/8/526/940261>.
- Friedman, Jed; Schady, Norbert. 2013. "How Many Infants Likely Died in Africa as a Result of the 2008-9 Global Financial Crisis?" *Health Economics* 22: 611–12. <https://doi.org/10.1002/hec>.
- Gerdtham, Ulf G., and Magnus Johannesson. 2003. "A Note on the Effect of Unemployment on Mortality." *Journal of Health Economics* 22 (3): 505–18. [https://doi.org/10.1016/S0167-6296\(03\)00004-3](https://doi.org/10.1016/S0167-6296(03)00004-3).
- Gerdtham, Ulf G., and Christopher J. Ruhm. 2006. "Deaths Rise in Good Economic Times: Evidence from the OECD." *Economics and Human Biology* 4 (3): 298–316. <https://doi.org/10.1016/j.ehb.2006.04.001>.
- Gonzalez, Fidel, and Troy Quast. 2010. "Mortality and Business Cycles by Level of Development: Evidence from Mexico." *Social Science and Medicine* 71 (12): 2066–73. <https://doi.org/10.1016/j.socscimed.2010.09.047>.
- Gorey, Kevin M, and John E Vena. 1995. "The Association of near Poverty Status with Cancer Incidence among Black and White Adults ." *Journal of Community Health* 20 (4): 359–66. <https://scholar.uwindsor.ca/socialworkpubhttps://scholar.uwindsor.ca/socialworkpub/24>.
- Guerrieri, V., Lorenzoni, G., Straub, L., Werning, I. 2020. "Macroeconomic Implications of Covid-19: Can Negative Supply Shocks Cause Demand Shortages?" *NBER Working Paper Series WP 26918*. <https://doi.org/10.1017/CBO9781107415324.004>.

Hausauer, Amelia K., Theresa H.M. Keegan, Ellen T. Chang, Sally L. Glaser, Holly Howe, and Christina A. Clarke. 2009. "Recent Trends in Breast Cancer Incidence in US White Women by County-Level Urban/Rural and Poverty Status." *BMC Medicine* 7 (1): 1–12. <https://doi.org/10.1186/1741-7015-7-31>.

Hone, Thomas, Andrew J. Mirelman, Davide Rasella, Rômulo Paes-Sousa, Mauricio L. Barreto, Rudi Rocha, and Christopher Millett. 2019. "Effect of Economic Recession and Impact of Health and Social Protection Expenditures on Adult Mortality: A Longitudinal Analysis of 5565 Brazilian Municipalities." *The Lancet Global Health* 7 (11): e1575–83. [https://doi.org/10.1016/S2214-109X\(19\)30409-7](https://doi.org/10.1016/S2214-109X(19)30409-7).

Ingle, Kim, Timothy Brophy, and Reza Daniels. 2020. "National Income Dynamics Study - Coronavirus Rapid Mobile Survey (NIDS-CRAM) Panel User Manual." Vol. Version 1. Cape Town.

International Bank for Reconstruction and Development / The World Bank. 2018. "An Assessment of Drivers, Constraints and Opportunities Overcoming Poverty and Inequality in South Africa."

International Transport Forum. 2015. "Why Does Road Safety Improve When Economic Times Are Hard? Why Does Road Safety Improve When Economic Times Are Hard?"

Islam, Sheikh Mohammed Shariful, Tina Dannemann Purnat, Nguyen Thi Anh Phuong, Upendo Mwingira, Karsten Schacht, and Günter Fröschl. 2014. "Non Communicable Diseases in Developing Countries: A Symposium Report." *Globalization and Health* 10 (81). <https://doi.org/10.1186/s12992-014-0081-9>.

Jones, Nicola, and Caroline Harper. 2012. "Turning Crisis into Opportunity for Children Affected by HIV/AIDS: Responding to the Financial, Fuel and Food Crises." *Children in Crisis*, no. March: 165–84. https://doi.org/10.1007/978-0-230-37025-8_9.

Kerr, Andrew, and Amy Thornton. 2020. "Essential Workers , Working from Home and Job Loss Vulnerability in South Africa." DataFirst Technical Paper Series Number 41.

Khang, Young Ho, John W. Lynch, and George A. Kaplan. 2005. "Impact of Economic Crisis on Cause-Specific Mortality in South Korea." *International Journal of Epidemiology* 34 (6): 1291–1301. <https://doi.org/10.1093/ije/dyi224>.

La Fuente, Verónica Sedano De, Miguel A. Camino López, Ignacio Fontaneda González, Oscar J. González Alcántara, and Dale O. Ritzel. 2014. "The Impact of the Economic Crisis on Occupational Injuries." *Journal of Safety Research* 48 (February): 77–85. <https://doi.org/10.1016/j.jsr.2013.12.007>.

Maruthappu, Mahiben, Johnathan Watkins, Aisyah Mohd Noor, Callum Williams, Raghib Ali, Richard Sullivan, Thomas Zeltner, and Rifat Atun. 2016. "Economic Downturns, Universal Health Coverage, and Cancer Mortality in High-Income and Middle-Income Countries, 1990–2010: A Longitudinal Analysis." *The Lancet* 388 (10045): 684–95. [https://doi.org/10.1016/S0140-6736\(16\)00577-8](https://doi.org/10.1016/S0140-6736(16)00577-8).

Mazzucato, Mariana. 2020. "A Challenge-Led Response That Puts the Economy and Society's Challenges on the Same Footing." In *Development Policy and Multilateralism after Covid-19*, edited by United Nations, 8–17. United Nations.

Mbuthia, Grace Wambura, Charles Owour Olungah, and Tom Gesora Ondicho. 2018. "Health-Seeking Pathway and Factors Leading to Delays in Tuberculosis Diagnosis in West Pokot County, Kenya: A Grounded Theory Study." Edited by Elizabeth Fair. *PLOS ONE* 13 (11): e0207995. <https://doi.org/10.1371/journal.pone.0207995>.

McKee, Martin, and David Stuckler. 2020. "If the World Fails to Protect the Economy, COVID-19 Will Damage Health Not Just Now but Also in the Future." *Nature Medicine* 26 (May): 640–42. <https://doi.org/10.1038/s41591-020-0863-y>.

Mendoza, Ronald U., and Nicholas S. Rees. 2009. "Infant Mortality during Economic Downturns and Recovery." *UNICEF Social and Economic Policy Working Paper*. https://doi.org/10.1007/978-0-230-37025-8_3.

Miller, Douglas L., Marianne E. Page, Ann Huff Stevens, and Mateusz Filipowski. 2009. "Why Are Recessions Good for Your Health?" *American Economic Review* 99 (2): 122–27. <https://doi.org/10.1257/aer.99.2.122>.

Mohammed, Salahuddin, TezeraMoshago Berheto, and DemissewBerihun Haile. 2014. "Predictors of Loss to Follow-up in Patients Living with HIV/AIDS after Initiation of Antiretroviral Therapy." *North American Journal of Medical Sciences* 6 (9): 453. <https://doi.org/10.4103/1947-2714.141636>.

Neumayer, Eric. 2004. "Recessions Lower (Some) Mortality Rates: Evidence from Germany." *Social Science and Medicine* 58 (6): 1037–47. [https://doi.org/10.1016/S0277-9536\(03\)00276-4](https://doi.org/10.1016/S0277-9536(03)00276-4).

Nordling, Linda. 2020. "Why South Africa's Coronavirus Outbreak Could Be a 'Catalyst for Transformation.'" *National Geographic*, June 2020.

Oviedo Tejada, Cesar Augusto, Livia Madeira Triaca, Nathiële Hellwig Liermann, Fernanda Ewerling, and Janaína Calu Costa. 2019. "Economic Crises, Child Mortality and the Protective Role of Public Health Expenditure." *Ciencia e Saude Coletiva* 24 (12): 4395–4404. <https://doi.org/10.1590/1413-812320182412.25082019>.

Palacio-Mejía, Lina Sofía, Gudelia Rangel-Gómez, Mauricio Hernández-Avila, and Eduardo Lazcano-Ponce. 2003. "Cervical Cancer, a Disease of Poverty: Mortality Differences between Urban and Rural Areas in Mexico." *Salud Publica de Mexico* 45 (SUPPL. 3): 315–25. <https://doi.org/10.1590/s0036-36342003000900005>.

Piano, Mariann R. 2017. "Alcohol's Effects on the Cardiovascular System." *Alcohol Research : Current Reviews* 38 (2): 219–41.

Pritchett, Lant, and Lawrence H. Summers. 1996. "Wealthier Is Healthier." *Journal of Human Resources* 31 (4): 841–68. <https://doi.org/10.2307/146149>.

Reeves, Aaron; Sanjay Basu, Martin McKee, Christopher and Meissner, and David Stuckler. 2013. "Does Health Spending Stimulate Economic Growth?" *Globalization and Health* 9 (43): 1–12.

Reeves, Aaron, Sanjay Basu, Martin McKee, Andreas Sandgren, David Stuckler, and Jan C Semenza. 2015. "Tuberculosis Control and Economic Recession: Longitudinal Study of Data from 21 European Countries, 1991–2012." *Bulletin of the World Health Organization* 93 (6): 369–79. <https://doi.org/10.2471/BLT.14.142356>.

Reeves, Aaron, Martin McKee, and David Stuckler. 2014. "Economic Suicides in the Great Recession in Europe and North America." *British Journal of Psychiatry* 205 (3): 246–47. <https://doi.org/10.1192/bjp.bp.114.144766>.

Rossouw, Laura, Teresa Bago d'Uva, and Eddy van Doorslaer. 2018. "Poor Health Reporting? Using Vignettes to Recover the Health Gradient by Wealth." *SSRN Electronic Journal*, no. November 2018. <https://doi.org/10.2139/ssrn.2932778>.

Rubinstein, Paul G., David M. Aboulafia, and Andrew Zloza. 2014. "Malignancies in HIV/AIDS: From Epidemiology to Therapeutic Challenges." *AIDS*. NIH Public Access. <https://doi.org/10.1097/QAD.0000000000000071>.

Ruhm, Christopher J. 2000. "Are Recessions Good for Your Health?" *Quarterly Journal of Economics* 115 (2): 617–50.

———. 2015. "Recessions, Healthy No More?" *Journal of Health Economics* 42 (June): 17–28. <https://doi.org/10.1016/j.jhealeco.2015.03.004>.

Ruhm, Christopher J., and William E. Black. 2002. "Does Drinking Really Decrease in Bad Times?" *Journal of Health Economics* 21 (4): 659–78. [https://doi.org/10.1016/S0167-6296\(02\)00033-4](https://doi.org/10.1016/S0167-6296(02)00033-4).

Schady, Norbert, and Marc Francois Smits. 2010. "Aggregate Economic Shocks and Infant Mortality: New Evidence for Middle-Income Countries." *Economics Letters* 108 (2): 145–48. <https://doi.org/10.1016/j.econlet.2010.03.017>.

Schneider, Michelle, Debbie Bradshaw, Rosana Norman, Krisela Steyn, and Ria Laubscher. 2009. "Poverty and Non-Communicable Diseases in South Africa." *Scandinavian Journal of Public Health* 37 (2): 176–86. <https://doi.org/10.1177/1403494808100272>.

Schwandt, Hannes, and Till Wachter. 2020. "Socioeconomic Decline and Death: Midlife Impacts of Graduating in a Recession." *National Bureau of Economic Research*. <https://doi.org/10.3386/w26638>.

Shung-King, Maylene; Lake, Lori; Sanders, David; Hendricks, Michael. 2019. "South African Child Gauge 2019: Child and Adolescent Health; Leave No One Behind." *South African Child Gauge 2019*.

Somarriba, Gabriel, Daniela Neri, Natasha Schaefer, and Tracie L Miller. 2010. "The Effect of Aging, Nutrition, and Exercise during HIV Infection." *HIV/AIDS - Research and Palliative Care* 2 (September): 191. <https://doi.org/10.2147/hiv.s9069>.

Sonia Tladi, Lerato. 2006. "Poverty and HIV/AIDS in South Africa: An Empirical Contribution." *SAHARA-J: Journal of Social Aspects of HIV/AIDS* 3 (1): 369–81. <https://doi.org/10.1080/17290376.2006.9724863>.

Statistics South Africa. 2018. "Mortality and Causes of Death in South Africa, 2016: Findings from Death Notification."

———. 2020a. "Mortality and Causes of Death in South Africa, 2017: Findings from Death Notification." www.statssa.gov.za,info@statssa.gov.za,Tel+27123108911.

———. 2020b. "Quarterly Labour Force Survey- Q1 2020."

Stevens, Ann H., Douglas L. Miller, Marianne E. Page, and Mateusz Filipski. 2015. "The Best of Times, the Worst of Times: Understanding pro-Cyclical Mortality." *American Economic Journal: Economic Policy* 7 (4): 279–311. <https://doi.org/10.1257/pol.20130057>.

Suhrcke, Marc, David Stuckler, Jonathan E. Suk, Monica Desai, Michaela Senek, Martin McKee, Svetla Tsolove, et al. 2011. "The Impact of Economic Crises on Communicable Disease Transmission and Control: A Systematic Review of the Evidence." *PLoS ONE* 6 (6). <https://doi.org/10.1371/journal.pone.0020724>.

Tapia Granados, José A. 2005. "Recessions and Mortality in Spain, 1980-1997." *European Journal of Population* 21 (4): 393–422. <https://doi.org/10.1007/s10680-005-4767-9>.

The World Bank Group. 2020. "World Development Indicators." 2020.

Tupasi, T., A. M.C.G. Garfin, Joan M. Mangan, R. Orillaza-Chi, L. C. Naval, G. I. Balane, R. Basilio, et al. 2017. "Multidrug-Resistant Tuberculosis Patients' Views of Interventions to Reduce Treatment Loss to Follow-Up." *International Journal of Tuberculosis and Lung Disease* 21 (1): 23–31. <https://doi.org/10.5588/ijtld.16.0433>.

Tyrovolas, Stefanos, Nick J. Kassebaum, Andy Stergachis, Haftom N. Abraha, François Alla, Sofia Androudi, Mate Car, et al. 2018. "The Burden of Disease in Greece, Health Loss, Risk Factors, and Health Financing, 2000–16: An Analysis of the Global Burden of Disease Study 2016." *The Lancet Public Health* 3 (8): e395–406. [https://doi.org/10.1016/S2468-2667\(18\)30130-0](https://doi.org/10.1016/S2468-2667(18)30130-0).

UNAIDS. 2020. "South Africa | UNAIDS." 2020. <https://www.unaids.org/en/regionscountries/countries/southafrica>.

Wegman, Fred, Richard Allsop, Constantinos Antoniou, Ruth Bergel-Hayat, Rune Elvik, Sylvain Lassarre, Daryl Lloyd, and Wim Wijnen. 2017. "How Did the Economic Recession (2008–2010) Influence Traffic Fatalities in OECD-Countries?" *Accident Analysis and Prevention* 102: 51–59. <https://doi.org/10.1016/j.aap.2017.01.022>.

Wel, Kjetil A. van der, Therese Saltkjel, Wen-Hao Chen, Espen Dahl, and Knut Halvorsen. 2018. "European Health Inequality through the 'Great Recession': Social Policy Matters." *Sociology of Health & Illness* 40 (4): 750–68. <https://doi.org/10.1111/1467-9566.12723>.

WHO. 2018a. "WHO NCD Country Profile: South Africa." 2018. https://www.who.int/nmh/countries/zaf_en.pdf.

———. 2018b. "Global Health Observatory Data Repository: Suicide Rate Estimates, Age-Standardized - Estimates by Country." WHO. World Health Organization. July 17, 2018.

———. 2019. "Global Tuberculosis Report 2019." Geneva. <https://doi.org/Licence: CC BY-NC-SA 3.0 IGO>.

World Health Organization. 2019. "Global Tuberculosis Report 2019." Geneva.

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