4

WAVE 2

National Income Dynamics Study (NIDS) – Coronavirus Rapid Mobile Survey (CRAM)

Navigating COVID in the post-lockdown period:

Shifting risk perceptions and compliance with preventative measures

Ronelle Burger - University of Stellenbosch

Carmen Christian - University of the Western Cape

René English - University of Stellenbosch

Brendan Maughan-Brown - University of Cape Town

Laura Rossouw - University of the Witwatersrand

30 September 2020

N.i.D.S.
NATIONAL INCOME DYNAMICS STUDY

CRAM
CORONAVIRUS RAPID MOBILE SURVEY 2020

Navigating COVID in the post-lockdown period: Shifting risk perceptions and compliance with preventative measures

Ronelle Burger, Professor, Economics Department, University of Stellenbosch

Carmen Christian, Lecturer, Economics Department, University of the Western Cape

René English, Head: Division of Health Systems and Public Health, University of Stellenbosch

Brendan Maughan-Brown, Chief Research Officer, Southern Africa Labour and Development Research Unit, University of Cape Town

Laura Rossouw, Senior lecturer, School of Economics and Finance, University of the Witwatersrand

Abstract

South Africa's lockdown in March and April has saved lives by containing the spread of COVID-19 but it has done so at a tremendous social and economic cost. To avoid a second surge and another lockdown, it is vital to prioritise adherence to non-pharmaceutical interventions (NPIs) as a first line of defence against containing COVID-19. NPIs can save lives without having to risk livelihoods. But to have an impact, it requires sufficiently high levels of public adherence.

This paper considers adherence to NPIs and risk perceptions against the backdrop of an increase in freedom of movement with the relaxation of alert level 4 to alert level 3 in July. At the same time, there was a steep rise in objective COVID-19 risk with the surge in cases. The study examines the relationship of NPI adherence and the perceived risk of contracting COVID-19, the perceived effectiveness of NPIs and the accuracy of information held. We find a large increase in perceived infection risk and mask-wearing over this period. There are encouraging signs of the widespread credibility of high-impact NPIs and few resort to unproven prevention measures and poor science.

Executive summary

In July and August (wave 2), 74% of respondents said that they are wearing masks, falling shy of the 80% target for mask-wearing. Models suggest that 80% compliance with mask-wearing requirements could change the trajectory of the disease. While still below the target, there is a strong increase in mask-wearing compared to the wave 1 levels in May and June when only 49% of these same respondents were wearing masks.

With the return to work and expanded freedom of movement in July and August, we see a drop in physical distancing (23% to 19%), avoiding large groups (16% to 7%) and staying at home (43% to 36%). As expected, we find a trade-off between staying at home and wearing masks. This trade-off has strengthened in July and August.

We find high levels of agency and empowerment with 87% of respondents saying that they believe they can avoid the virus. Respondents who thought that they were unlikely to get Coronavirus explained that this belief was based on their adherence to NPIs, and specifically staying at home and mask-wearing.

It is encouraging to see that there was little evidence of respondents placing their trust in poor science, with respectively less than 1% and 2% of respondents saying that they were protecting themselves against COVID-19 by drinking hot lemon water and eating garlic. Of those who thought that they were unlikely to contract the Coronavirus, fewer than 1% of respondents said that they did not believe in the Coronavirus and fewer than 0.5% of respondents said that they did not think that the Coronavirus would affect them.

As expected, given the surge of COVID-19 cases, we see a strong rise in risk perceptions, with the share of respondents saying that they think they are likely to get Coronavirus increasing from 33% in May and June to 50% in July and August.

It is disappointing to see that there is no evidence of effective targeting of messages to high-risk groups such as the elderly, the chronically ill and those with elevated blood pressure. These groups tend to be no more informed and are no more likely to employ high-impact COVID-19 prevention measures. The only exception is a significant and positive relationship between obesity and high-impact prevention strategies.

Introduction

The COVID-19 crisis creates an urgent need to better understand progress with awareness and behavioural change in South Africa to mitigate the virus's effects on the health of the population. The objective of this study is to generate evidence that can help reduce the medium- and long-term impacts of the COVID-19 pandemic, but particularly its effect on the most vulnerable in society. Lessons learnt from COVID-19 can also help to inform and guide preventative health care in South Africa, where there is still considerable room for improvement.

This policy paper provides a summary of adherence to non-pharmaceutical interventions (NPIs)[1] in May to August of this year. In a preemptive response following the arrival of the first COVID-19 cases in South Africa and a rising crisis in the UK and Italy, schools and borders were closed on 15 and 18 March and the country entered a national lockdown on the 26th of March 2020. At the time of writing this policy paper, the daily increase in COVID-19 cases has declined to around 2000 cases per day, less than a fifth of what it was at the peak in July. In response to the slowdown in cases, the country moved to alert level 2 on 18 August, which allowed travel between provinces, social visits and opened gyms, parks and beaches.

NPIs remain vital at this point in our country's fight against COVID-19 because they allow us to alter the trade-offs between saving lives and livelihoods, enabling us to work and live while limiting exposure to COVID-19. Until South Africa has access to a vaccine for COVID-19, we remain highly reliant on NPIs to control the spread of the pandemic and prevent health system overload, which is a situation common for many developing countries (Chowdhury et al., 2020). The extremely high social and economic cost of a lockdown (Jain, Budlender, Zizzamia & Bassier, 2020; Ranchhod & Daniels, 2020; Rogan & Skinner, 2020; Van der Berg, Zuze & Bridgman, 2020; Wills, Patel, Van der Berg & Mpeta, 2020) has highlighted the importance of preventative behaviours and has strengthened the commitment to improving adherence to key NPIs. Although the effectiveness of NPIs to decrease transmission remains contested (Greenhalgh et al., 2020), the evidence base in support of its efficacy continues to increase at a rapid pace (Ali et al., 2020; Brauner et al., 2020; Brooks et al., 2020; Eikenberry et al., 2020; Greenhalgh et al., 2020; Li et al., 2020; López & Rodó, 2020; Lyu & Wehby, 2020). In this paper the focus is primarily on five NPIs: staying at home, avoiding mass gatherings, physical distancing, wearing masks and hand hygiene. The success of these preventative measures depends on changing human behaviour, which is typically very difficult to accomplish.

Challenges of promoting COVID-19 preventative strategies

Preventative behaviour during epidemics or pandemics are public goods games. The individual benefits of complying with preventative measures are far smaller than the social benefits. What is particularly challenging with COVID-19 is that the mortality risk is concentrated amongst a relatively small subgroup, which means that containment requires sacrifices from the broad public while the benefits of avoiding death are concentrated amongst a much smaller group. Solidarity and altruism are therefore essential levers.

Chapman and Loewenstein (2020) argue that adherence to COVID-19 preventative measures is further complicated because the objective risk of contracting it and dying from it is relatively low, while the risk-reducing impact of adherence to preventative measures is often not visible or tangible. Enke and Graeber (2019) show that people tend to not change behaviour if such behaviour change will only have a small or uncertain impact on low-probability events. People are reluctant to engage in preventative behaviour unless it eliminates risk. Slovic et al (2016) showed a preference for a vaccine that completely eliminated a 10% risk of contracting a disease over one that decreased the risk from 20% to 10%. The aforementioned biases intersect with optimism bias, one of the most consistent, prevalent, and robust biases where people tend to overestimate the likelihood of positive events and underestimate the likelihood of negative events (Sharot, 2011). In the case of COVID-19, optimism bias may manifest as an underestimation of the likelihood of contracting the virus. This evidence suggests that it will be difficult to promote adherence to COVID-19 preventative measures because these measures will only lead to a reduction -- and not an elimination -- of risk.

1 The Centres for Disease Control and Prevention defines this as actions -- apart from getting vaccinated and taking medicine -- that people and communities can take to help slow the spread of illnesses. (https://www.cdc.gov/nonpharmaceutical-interventions/index.html)

Adherence to preventative measures is also affected by the lack of a visible and tangible impact of our actions. We cannot verify or observe whether our actions have had an impact. When engaging in COVID-19 prevention measures, we do not receive feedback about the impact that our efforts and actions have had on the risk of contracting an invisible virus or the risk of transmitting the virus if asymptomatic (Chapman and Loewenstein, 2020). If our healthy state of health before preventative actions remains as such when our preventative actions work, it may seem like the actions achieved nothing. The lack of observed feedback also creates fertile ground for motivated reasoning and erroneous learning. An example of erroneous learning from feedback in this context would be someone believing that they are not at a high risk because they have not become infected as yet (Loewenstein, 1999). Such misperceptions can occur because we cannot see the negative outcome – contracting the virus – that might have occurred in the absence of vigilance. This heuristic explains the beliefs of anti-vaxxers, who believe that the low rates of the diseases that are vaccinated against are proof that the vaccine is not necessary (World Health Organization, 2013).

Lack of adherence may also be attributable to hot-cold empathy gaps. When we are in a "cold" state we often struggle to imagine how we will react in a specific emotional situation (or in a "hot" state). For instance, when we are in a state of good health it is difficult to imagine ourselves being sick, which can help explain why people fail to adhere to NPIs and neglect to take life-saving medication (Loewenstein, 2020; Jackevicius et al., 2002).

The key challenge for NPI adherence looking forward may however be the long timeframe over which these preventative measures need to be maintained. Adaptation means that the power of our fears will weaken over time. Eventually, we get used to living with risks and stop being afraid. The spread of COVID-19 was highly salient over the first six months when there was substantial media coverage and fears about adequate hospital capacity, but it is likely to decrease in the future as people adapt to the so-called new normal. The effect of adaption is particularly strong when there is little perceived hope of improvement in the situation, i.e. effort exerted will not have a big impact (Smith et al., 2009). Motivated reasoning or confirmation bias can also work against adherence, justifying the decision to no longer bear the burden of small daily inconveniences by adjusting the beliefs about one's own susceptibility to COVID-19 risk or beliefs about the effectiveness of the government's COVID-19 plan.

Due to the challenges described above, Chapman and Loewenstein (2020) emphasise the importance of promoting a realistic, feasible and simple set of preventative measures alongside a clear vision of hope. To convince individuals to engage in these behaviours, it may be helpful to increase the salience of the social impact and the common good. In this context, the hope of exiting the situation impedes complacency and may be a useful tool to motivate and sustain behavioural change, especially in a context like South Africa where there is a reasonably strong sense of community, a shared fate and a consequent responsibility towards each other. In addition, having a realistic, well-defined set of feasible tasks can facilitate habit formation as individuals introduce these tasks and measures into their daily routines. In promoting such behaviour it is equally important to consider new habits that impede or replace old habits, e.g. elbow greeting in order not to greet with hugs or handshakes.

Role of face masks in containing COVID-19

Wearing face masks is a simple and low cost NPI that can be implemented with relatively minimal disruption of social practices. While earlier studies pointed to a lack of evidence for face masks providing effective protection against COVID-19 infection (Feng et al., 2020), more recently a growing body of literature shows that mask-wearing flattens the COVID-19 curve (Brooks et al., 2020; Eikenberry et al., 2020; Li et al., 2020; Lyu & Wehby, 2020) and should be actively promoted (Greenhalgh et al., 2020).

Li et al. (2020) investigated the potential impact of using normal surgical masks in public to reduce the spread of COVID-19. The study considered three key factors that contribute to the impact of masks on the epidemic curve, including the mask aerosol reduction rate, the mask population uptake, and mask availability. The findings show that wearing a face mask, in combination with physical distancing, can be effective in flattening the COVID-19 curve.

Lyu & Wehby (2020) provide evidence from their natural experiment on the effects of mandatory mask-wearing in public issued by fifteen US states plus Washington, D.C., between 8 April and 15 May, 2020. The event study examined changes in the daily county-level COVID-19 growth rates between 31 March and 22 May, 2020. The results showed that mandating mask-wearing in public was associated with a decline in the daily COVID-19 growth rate by up to two percentage points in 21 or more days after state mask-wearing orders were promulgated. The study estimates that making mask-wearing mandatory averted more than 200,000 COVID-19 cases by May 22, 2020.

A new US study assessed the community-wide effect of mask-wearing by the general, asymptomatic public, under the assumption that some may be asymptomatically infectious (Eikenberry et al., 2020). Using model simulations and COVID-19 data relevant to New York and Washington, the study suggests that broad adoption of, and adherence to, mask-wearing may meaningfully reduce community transmission of COVID-19, as well as reduce epidemiologic outcomes (peak hospitalisations and deaths). More specifically, mask-wearing mitigated the spread of COVID-19 in nearly linear proportion to the mask quality and mask coverage rate. In contrast, the study found that the impact on epidemiologic outcomes was highly nonlinear, implying that mask-wearing could be complementary to other NPIs (such as physical distancing).

Importantly, Eikenberry et al. (2020) found mask-wearing to be effective in preventing disease in healthy persons as well as preventing asymptomatic transmission. In their hypothetical mask adoption scenarios they found that immediate near-universal (80%) adoption of moderately (50%) effective masks could prevent approximately 17% to 45% of projected deaths over two months in New York, while simultaneously reducing the daily peak death rate by 34% to 58% (holding changes in epidemic dynamics constant). The models demonstrated that even poor quality masks (20% effective) could still be useful if the underlying COVID-19 transmission rate was relatively low or decreasing, like in Washington. Under such conditions, an 80% adoption of poor-quality masks could reduce mortality by about 24% to 65% (and peak deaths by 15% to 69%), compared to a 2% to 9% mortality reduction in New York (peak death reduction 9% to 18%). In summary, the study showed that community-wide benefits of mask-wearing are likely to be greatest when masks are used in conjunction with other NPIs (like physical distancing), and when adoption is nearly universal with high levels of adherence.

Considering compliance costs amongst the poor and vulnerable

With a few exceptions, most of the literature cited above is based on research conducted in developed countries that describes decision-making and adherence in a context that is specific to these countries. When applying these ideas to low-resource and poor neighbourhoods in South Africa, we need to be cognisant of how the higher psychological and resource costs of compliance with preventative measures will impact behaviour.

Compliance cost has, for example, emerged as an important concept that considers social justice amidst the pandemic. Resource gaps may affect the financial and emotional costs of complying with lockdown policies and NPIs and result in the poor and vulnerable carrying a disproportionate share of the burden of the COVID-19 pandemic. There are, amongst other things, worries that adherence to physical distancing may not be realistic in dense, urban informal settlements where multi-generational households share small living spaces, and household members may share beds. For example, a study of two major Cape Town informal settlements (Masiphumelele and Klipfontein Glebe) found that, on average, the distance between each house and its three nearest neighbours is 0.6m, 1.2m, and 1.75m respectively. In addition to this extreme closeness, most households are overcrowded and many of these homes have central public points of access to important services such as water and toilets (Gibson & Rush, 2020). Within this context, adhering to effective physical distancing behaviour is a near-impossible task. In addition to the difficulties in physical distancing, other guidelines on preventative measures, such as handwashing and mask-wearing, may lack credibility in communities where there are no reliable sources of clean, potable water inside homes to wash hands or masks, and a lack of disposable income to buy more than one mask.

Compliance with preventative measures will determine the trajectory of the virus, and will also have a substantial impact on the future of our country. At a time where the focus is on avoiding a costly second surge in the pandemic, the paper considers adherence to key NPIs, namely staying at home, avoiding mass gatherings, physical distancing, wearing masks and hand hygiene.

NIDS & NIDS-CRAM panel studies

The analysis will rely on the Coronavirus Rapid Mobile Survey (CRAM). CRAM is a follow-up survey based on a carefully selected subsample of 7074 individuals from the National Income Dynamics Study panel (NIDS). The CRAM survey focuses on how the lockdown and the threat of COVID-19 have affected migration, jobs, income, nutrition and health. NIDS was instituted as a nationally-representative panel study following the lives of 28,000 South Africans every two years since 2008. NIDS was managed by the South African Labour Development Research Unit at UCT.

The NIDS-CRAM survey sample was obtained through a batch sampling process of participants in the fifth wave (2017) of the NIDS survey. In 2017, the NIDS survey was broadly representative of adults aged 15 and older in South Africa. The batch sampling process involved dividing the 2017 NIDS sample into 99 strata according to household per capita income decile, age, race and urban/rural place of residence. At first, a batch of 2500 respondents were randomly drawn from each of the 99 strata and were approached to participate in NIDS-CRAM. Then, higher numbers of participants from strata with lower response rates were sampled, and lower numbers from strata with higher response rates, until the final size was reached with equal representation from all strata. In total, 17 568 individuals were asked to participate, of whom 7 074 (40%) completed the questionnaire. The data collection for wave 1 occurred between 7 May and 27 June 2020. The sample weight of each individual in NIDS-CRAM is a function of the corresponding 2017 NIDS sample weight and the sampling rate of each stratum in NIDS-CRAM.

The NIDS-CRAM wave 2 questionnaire was adapted to take account of changing circumstances and context. The survey was administered to the same NIDS-CRAM sample between 13 July and 13 August. Interviews were conducted with 5 676 of the original 7 074 respondents, which represents attrition of 19%. The attrition calculation excludes 22 (or 0.3%) wave 1 respondents who died and 7 wave 1 respondents who moved overseas. Seventeen percent of those who attrited -- or were lost to follow up -- were classified as uncontactable. Attrition was notably higher amongst urban residents, the employed, those with missing household income and the most affluent (top per capita income quintile in NIDS Wave 5). Panel weights correct for this attrition as well as wave 1 non-response by adjusting the wave 1 weights by the inverse of the probability of a wave 1 respondent being re-interviewed in wave 2. The analysis here is based on a balanced sample -- only including respondents who were interviewed in both waves of the survey, unless indicated otherwise.

It should be kept in mind that the original NIDS sample, which was nationally representative in 2008, experienced four rounds of attrition, and consequently the wave 5 (2017) sample was no longer fully representative of South Africa. Additionally, it needs to be acknowledged that the reliance on telephonic interviews will affect both how people respond and their willingness to participate in the survey. However, given the parameters for surveys during the lockdown, these challenges will also be experienced by other surveys. While the survey comes with its caveats, there is no better alternative source to answer these questions.

In our analysis, we do not examine variation by province because NIDS and NIDS-CRAM was stratified by district council. Due to concerns about the reliability of geographical information in wave 1, we use wave 2 geographical information for all individuals who have not moved since wave 1.

We can get information from CRAM about age and chronic disease (based on self-identification in CRAM wave 1). But we can also get information on their biometrics three years ago from NIDS wave 5: the survey captured both their BMI -- through two repeated measurements of length and weight

-- and their blood pressure through two measurements in the left arm after a 5 min rest period using an automated BP monitor[2]. These biometrics are useful even though they are three years old: it is exceptional for blood pressure and obesity to decline dramatically, and risk for chronic diseases such as cardiac problems and diabetes accumulate over a lifetime so it tends to be slow to change.

Tables 1 and 2 (see Appendix) provide basic descriptive analysis on the NIDS-CRAM wave 1 and 2 sample.

To promote legibility and accessibility and avoid crowding the text with confidence intervals and p-values, we have omitted the details of our regression analysis and our significance testing. When the p-value is lower than 0.1 but above 0.01 we will report the relationship to be significant, but if the p-value is below 0.01, we will describe it as highly significant.

Risk perceptions and prevention strategies in the post-lockdown period

The focus of our analysis is on how individuals reacted to the move from an environment where exposure to COVID-19 was minimal and managed via staying at home, to where they returned to public life, went back to school and work, and consequently had to become comfortable with allowing more risk back into their lives.

Under lockdown alert levels 5 and 4 there were severe restrictions on movement and choice. South Africa's lockdown alert level 5 was notoriously one of the most restrictive globally (Gustafsson, 2020), not allowing movement outside one's own yard, with military enforcement. Exceptions were allowed only for grocery shopping, medical needs and essential workers. Under alert level 4 only a limited number of priority sectors' workers were allowed to return to work and exercise was only allowed between 6am and 9am. Importantly, the wave 2 surveys captured a major transition with the introduction of lockdown alert level 3, where individuals regained considerable freedom, choice and responsibility about how to make decisions to navigate COVID-19 risks. With the move to alert level 3, economic activity was expanded to include most jobs - apart from a few exceptions such as personal care services and gyms deemed to be high-risk, and outdoor exercise was allowed at all times. Schools were also gradually opened, allowing Grade 7 and 12 learners to return on 1 June. Other important changes within the period where the country was under alert level 3 include restaurants reopening and some sports matches resuming on 26 June.

The prevailing public narrative was that behaviour change and adherence to NPIs were at the centre of containing the disease. The government messaging was one of responsibility. For instance, the health minister Zweli Mkhize said that "it is not about what nurses and doctors can do, but what each and every one of us can do" in a media interview with Jacaranda FM on 6 June and in a speech during a visit to the Eastern Cape on 23 June he said that we need to look after ourselves, our neighbours and those with co-morbidities, adding that it was "up to South Africans to deal with this fight."

It is also important to note that the increase in freedom and responsibility came amidst growing fears about the steep trajectory of COVID-19 cases. On 8 July, the minister of health declared to parliament that the "storm that we have been warning about has arrived". There were worries about the rapid increase in cases and fears about running out of hospital capacity, which prompted the reinstitution of the alcohol ban on 12 July and the re-closure of schools from 27 July to 24 August. Both hospital admissions and the daily increases in COVID-19 cases peaked in July, but a shortage of hospital beds was not experienced.

Our data provide insights into how attitudes and behaviours adjusted to the move from the lockdown to the greater freedoms allowed under alert level 3. Wave 1 ran from 7 May to 27 June: which covered

2 They were tested with a Omron M7 BP, multi-size cuff, which was factory-calibrated.

both alert level 4 (survey period from 7 May until 31 May) and alert level 3 (survey period from 1 to 27 June). Wave 2 ran from 13 July until 13 August, with the entire period categorised as alert level 3. However, because of the batch sampling approach - which drew and released repeated random sample draws from the NIDS sample - we can look at broad changes over the interview date timeline to consider how South African views and behaviour have changed with the move from alert level 4 to alert level 3. We add time to our analysis by creating a variable that categorises observations based on the date of interview, in half-month blocks of time. To avoid concerns about variation in the sample interviewed over time, we compare the visual information in our graphs with regression analysis including controls for strata.

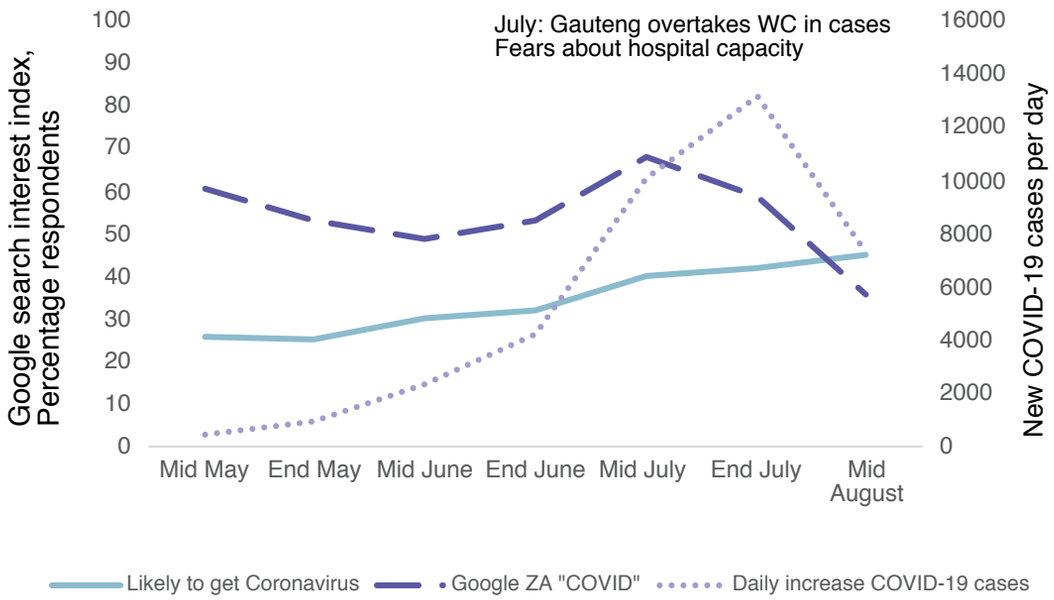
Who believes that they are at risk of contracting the Coronavirus?

In this section, we examine how different groups in the population reported their own chances of contracting COVID-19. The survey asked respondents whether they thought it was likely that they would contract COVID-19 and whether they felt that they could avoid getting the virus. While the use of a short telephonic interview does not allow us to understand these relationships in qualitative detail, we can track the major observed changes in how people think about COVID-19 and navigate these risks, including the increased awareness of COVID-19 infection risk and changing behaviour to affect the trajectory of the disease.

We are interested in the self-reported risk of contracting COVID-19 because it can flag inaccurate perceptions of infection risk due to lack of awareness or the human tendency for overconfidence. It can also identify exaggerated fear or panic that may lead to an over-response which may include avoiding crucial non COVID-19 healthcare visits.

It is difficult to measure the accuracy of risk assessment because we cannot directly compare the self-reported assessment of the individual's infection risk with the objective risk. This measure is therefore complicated to interpret at face value. Also, we must bear in mind that the reported risk of infection would incorporate the individual's exposure risk and the precautionary measures (perceived and actual) that they are taking. In fact, our analysis shows that precautionary behaviour and adherence to NPIs have a strong relationship with the self-assessed risk of contracting the virus.

Figure 1: Trends in perceived likelihood of getting Coronavirus over time, cf. local Google searches for Coronavirus and progress of the disease



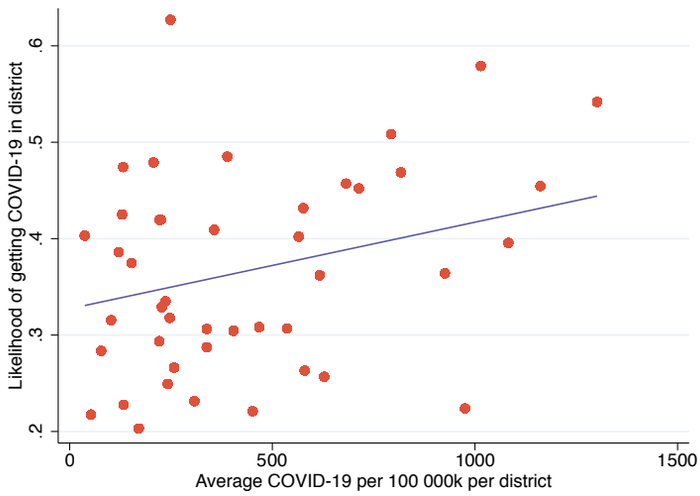
Sources: NIDS-CRAM waves 1 and 2, Google Trends & Mediahack (2020)
Note: Google interest index represents search interest relative to the highest point for the past 12 months with a value of 100 representing peak popularity. Trend in survey responses was estimated for half-months, controlling for the sampling structure of NIDS-CRAM batches. The x-axis values were named using the endpoint of a 2-week period, i.e. Mid May is the first half of May. For the survey responses, the value represent averages over the half-month; for Google trends, it represent the Google interest index for a median week in this half-month period; and for the Mediahack COVID-19 cases, it present the daily new cases on either the 22nd or the 7th day of the month..

We track changes in the perceived likelihood of getting the Coronavirus over time, in Figure 1. The line shows a gradual upward slope that tracks neither the trajectory of Google searches for COVID nor daily accumulation of COVID-19 cases, which both show a decline post-July. The lack of a decline in the perceived likelihood is understandable: once respondents have learnt more about COVID-19 and their own risk (via for instance, Google searches) and the seriousness of this threat has been established (via the surge) we would not expect respondents to lower their perceived risk as the surge subsides. One would not have expected a decline in the perceived risk, but the further increase in perceived risk from the last half of July to the first half of August is more difficult to explain.

We also examine the relationship between perceived likelihood of getting the Coronavirus and having a child in school. The likelihood that the respondents thought they were likely to get the Coronavirus increased by 4 percentage points when they had a child attend school over the last 7 days. The relationship was strong and **significant**, even when controlling in regressions for the following list of factors: COVID-19 cases per 100 000 in their district, piped water, educational attainment, wealth, gender, mortality risk factors (being over 60, chronic disease), general risk factors (obesity and high blood pressure), district fixed effects and time fixed effects.[3]

3 This is additional analysis not shown here, but available from the authors upon request.

Figure 2: Scatterplot comparing district averages of perceived likelihood of getting Coronavirus and COVID-19 cases per 100 000

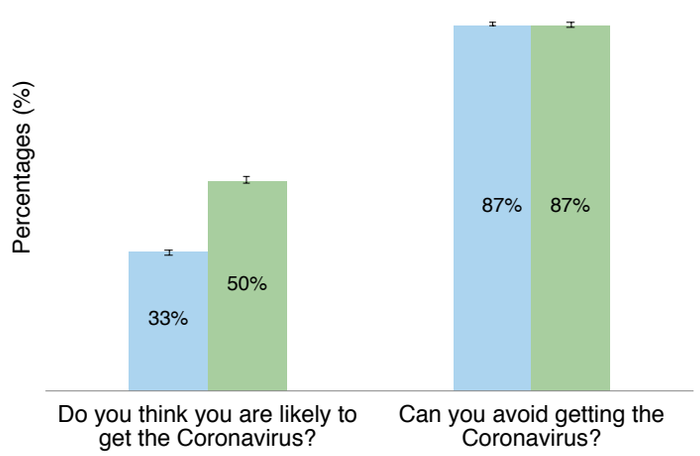


Sources: NIDS-CRAM waves 1 and 2 & Mediahack (2020)

Figure 2 is a scatter plot showing the relationship between district level per capita cases and perceived likelihood of contracting the Coronavirus (also on district level). The graph shows a strong positive relationship, which is also observed in two-way and multivariate analyses (with the control variables mentioned above) and is highly statistically significant.

Figure 3 compares the changes between wave 1 (May-June) and wave 2 (July-August) in the perceived likelihood of contracting the virus and the belief that you can avoid getting the Coronavirus. Half of respondents in wave 2 believed that they were likely to get the COVID-19, which represents a 17 percentage point rise from the wave 1 level of 33%. Contrary to what may have been expected, the increase in the likelihood of getting the Coronavirus was not accompanied by a decline in the perceived likelihood of being able to avoid getting the Coronavirus. Respondents remain overwhelmingly confident that they can avoid getting the virus with 87% reporting that they believe that they can avoid it.

Figure 3: Likelihood of getting Coronavirus and perceived ability to avoid getting the Coronavirus



Sources: NIDS-CRAM waves 1 and 2 (2020)

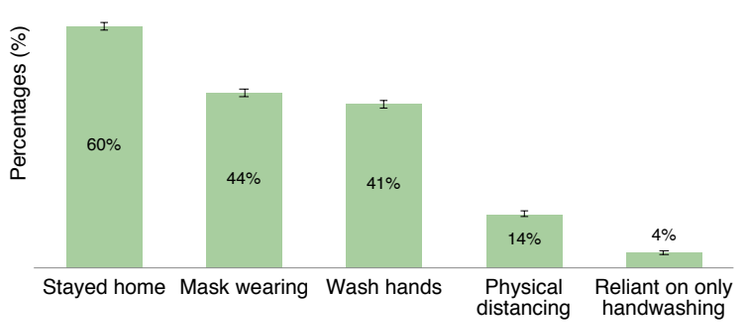
There appears to be some tension between the results stating that 87% of respondents say that they can avoid contracting the virus while 50% of respondents believe that they are likely to get the Coronavirus. Examining how respondents replied to these two questions in combination, it is easier to understand the 45% of respondents who say that they can avoid the Coronavirus and don't

think that they will get the Coronavirus. It is more puzzling to understand 42% of respondents who both think that they can avoid the Coronavirus and that they will get the Coronavirus. However, it is plausible that some may interpret the term “can” in the question about whether one can avoid the Coronavirus as referring to a hypothetical case, which would then amount to a question about the presumed efficacy and effectiveness of NPIs, and leaving the gap between the two answers to be explained by the individual’s self-assessed lack of adequate compliance or adherence to strategies that help in avoiding the virus. We explore this interpretation and find that this group -- who say that they think they are likely to get the virus, but think one can avoid getting it -- are significantly less likely to stay at home, but significantly more likely to wear masks, practice physical distancing and wash hands. The patterns we see in this data would then be consistent with a worry about whether anything but staying at home will adequately safeguard respondents from the Coronavirus. This is particularly interesting given that the survey was conducted in a period where most individuals had recently returned to work and schools after being largely housebound in April and May. When we consider how this relationship has changed over time, we find that the relationship is inverse and insignificant in May, but significant and with the expected sign in June, July and August when people returned to school and work and could no longer stay home as much.

This interpretation is further supported with respondent replies to a wave 2 question about the reasons why they thought they were unlikely to get the Coronavirus. Respondents could give as many replies as they wanted and no options were read out to them. There was a strong sense of agency that emerged from this question, with respondents most frequently referring to highly-effective behaviour changes, but again we find a strong reliance on staying at home, which is cited by 64% of respondents. It is noteworthy that the most cited answer remains staying at home, as this is the most reliable and safest option, enabling the avoidance of contact with any possible infected people or surfaces. Also, one may argue that this is the prevention strategy that is the least reliant on further assumptions because it involves limiting contact. This may explain its strong relationship with the belief that it can effectively help you avoid getting the Coronavirus. Although the context is admittedly very different, it is interesting to note that Kantor and Kantor (2020) found that in the US, 31% of the 1005 respondents they surveyed were not convinced of the efficacy and impact of mask-wearing. This result may also relate to the findings of Enke and Graeber (2019) and Slovic et al (2016) that showed a preference for prevention measures that fully eliminate risk.

As Figure 4 below shows, South African respondents were also less convinced of other NPIs than staying at home, with only 44% of respondents saying that they were unlikely to get the Coronavirus because they wore masks and 41% because they washed their hands. It is encouraging to see that the belief that you are unlikely to get the Coronavirus is strongly rooted in preventative behaviour. Fewer than 1% of respondents said that they did not believe in the Coronavirus and fewer than 0.5% of respondents said that they did not think that the Coronavirus would affect them.

Figure 4: Why do you think you are unlikely to get the Coronavirus?



Sources: NIDS-CRAM wave 2 (2020)

Our analysis presented above shows a positive relationship between self-perceived risk and preventative behaviour. Those who reported that they did not change any of their behaviour in response to COVID-19 were significantly less likely to think that they would get the Coronavirus. We find this in two-way analysis, but also in multivariate analysis, with controls for age and chronic disease, and other correlates.

Our two-way and multivariate analyses also show that those 60 years and above tend to think that they are less likely to contract the disease (37% vs. 42%). This aligns with COVID-19 case data - we used Mediahack - showing that individuals older than 60 are less likely to contract the disease, presumably because of their lower level of social interaction and engagement and greater adherence with stay-at-home policies cf young and prime age adults. This aligns with what we find in the data: 48% of respondents 60 and older reported staying at home, but only 39% of adults under 60 -- and the difference is highly significant.

We look at the perceived infection risk for individuals with a higher mortality risk. Although there is no evidence on the infection risk of higher mortality risk groups, such as the chronically ill, or hypertensives or the obese, there is no reason ex ante to believe that those with higher mortality risk would be more likely to contract the disease. We see that the obese and the chronically ill do tend to perceive themselves to be more likely to contract the Coronavirus. We find that the obese (47% vs. 38%), the overweight (46% vs 36%), hypertensives (43% vs 40%) and those with chronic ailments (48% vs 40%) are more likely to report that they think they will contract the virus. These significantly higher levels of perceived risk assessments remain when we control for the cumulative COVID-19 cases per 100 000 in the district at the time of the interview.These patterns may thus may be indicative of an emotional response where dread of a disease exaggerates the perceived vulnerability. Previous behavioural findings show that risk perceptions and decision-making have an affective or emotional dimension (e.g. Loewenstein, et al, 2001; Fischhoff et al, 1978) and specifically, that the magnified dread associated with contracting a disease when you have a comparatively higher risk of dying could increase the risk associated with infections (Slovic, 1997). This magnification of perceived risk also tends to happen when there is greater uncertainty and less control: when a risk is catastrophic but with little known levers, the risk is often perceived to be larger than the objective risk (Slovic, 1997; Loewenstein & Mather, 1990). Based on these past findings, it is thus conceivable that the higher levels of perceived infection risk amongst the elderly may be due to either the higher levels of dread or higher perceived levels of helplessness.

Our analysis shows that the affluent also tend to have higher levels of perceived risk. We find that the percentage of individuals reporting that they are likely to contract COVID-19 increases substantially from 33% for the poorest quintile (based on an asset index compiled on NIDS wave 5 household assets[4]) to 51% for the richest quintile. The self-assessed infection risk for the affluent remains significantly higher after controlling for the cumulative COVID-19 cases per 100 000 in the district at the time of the interview. It is plausible that some share of this higher level of perceived risk may relate to behavioural findings that individuals have limited capacity for worry, and thus priority concerns tend to crowd out lower priority worries (Ehlert, Seidel & Weisenfeld, 2019; Weber, 2006; Hansen, Marx & Weber, 2004; Elster, 1998). Relatively speaking more affluent households tend to face less hardship and trauma, and have more resources. It is plausible that relatively speaking COVID-19 infection may be a higher priority worry for affluent households - especially if we bear in mind that this was a particularly challenging period for many poor families with distressing levels of hunger and job loss. An additional contributing factor to the gap in the burden of worries may be that the burden of disease is much lower amongst affluent communities -- in particular communicable diseases such as HIV & TB, maternal and child deaths and accidents and trauma (Biney, Amoateng & Ewemooje, 2020).

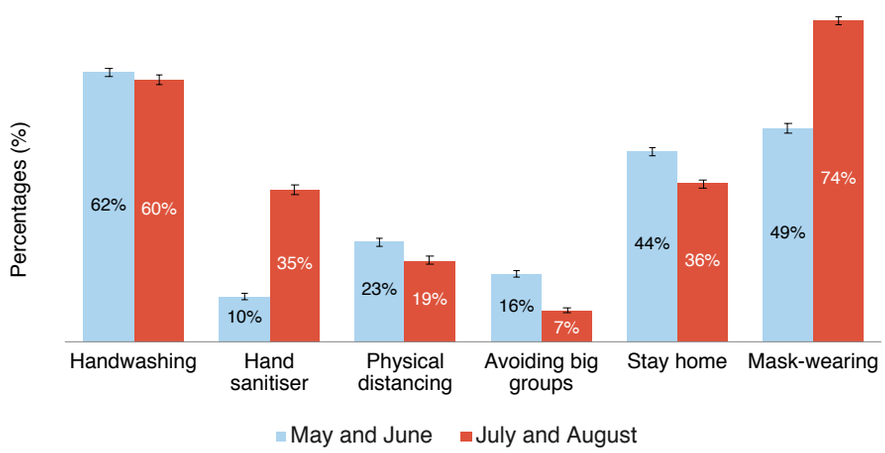
4 The list of household assets included ownership of a range of marketable assets, access to a savings account, access to clean water, access to electricity and access to adequate sanitation.

Post-lockdown changes in preventative behaviour

Parallel to this increased risk perception, we also observe a shift in preventative behaviour as South Africa moved to less stricter levels of lockdown. In the survey respondents were asked how they have changed their behaviour and were allowed to list as many options as they wished and were not provided any prompts. With all these changes in behaviour, it is important to bear in mind that reported change could be slight and, due to social desirability bias, it may be overreported. However, because we did not provide a list to tick -- to guard against a very strong social desirability bias --- it is also possible that some respondents may have forgotten or neglected to provide a comprehensive list of their changes in behaviour since the COVID-19 pandemic.[5]

There were important changes to lockdown legislation during July and August when the wave 2 survey was administered. These changes included a return to economic activity on 1 June for a large share of the population, as well as a move to mandatory mask-wearing in public from 12 July. Figure 5 below shows that during this period of greater freedom of movement and return to economic activity and schools, self-reported hand sanitiser usage increased from 10% in May and June to 35% in July and August. Self-reported mask-wearing behaviour increased from 49% to 74% over the same time period, which brings it closer to the 80% mask-wearing target regarded as necessary to have a significant impact on curbing the spread of the virus (Eikenberry, et al, 2020; Kai et al, 2020; Stutt, et al. 2020). In contrast, there was a drop in respondents reporting that they adhere to physical distancing (from 23% to 19%), avoid big groups (from 16% to 7%) and stay at home (43% to 36%). We have omitted the comparison of rarely cited preventative behaviour from the graph below, but because of public and media concern about rumours and fake remedies, we think it is important to mention that in the second wave only 1% of respondents indicated that they drank hot water and lemon and 2% said that they took garlic to help protect against COVID-19.

Figure 5: NPIs reported by respondents



Sources: NIDS-CRAM waves 1 and 2 (2020)

The increase in reported mask-wearing is a considerable improvement that is expected to have a substantial impact on the trajectory of the disease based on existing studies and modelling projections (Brooks et al., 2020; Eikenberry et al., 2020; Li et al., 2020; Lyu & Wehby, 2020). We currently understand that the virus spreads mainly via droplets and thus mask-wearing can be an effective strategy for protecting others from contracting the virus (Li et al., 2020; Prather, Wang and Schooley, 2020).

Due to the perception of fairness and potential stigmatisation, mandatory mask policy accompanied by effective messaging has been recommended to be a more effective policy than a voluntary mask policy. Recent evidence from a hypothetical scenario experiment in Germany revealed that individuals perceive mask-wearing to be a social-contract, and see those wearing masks as pro-

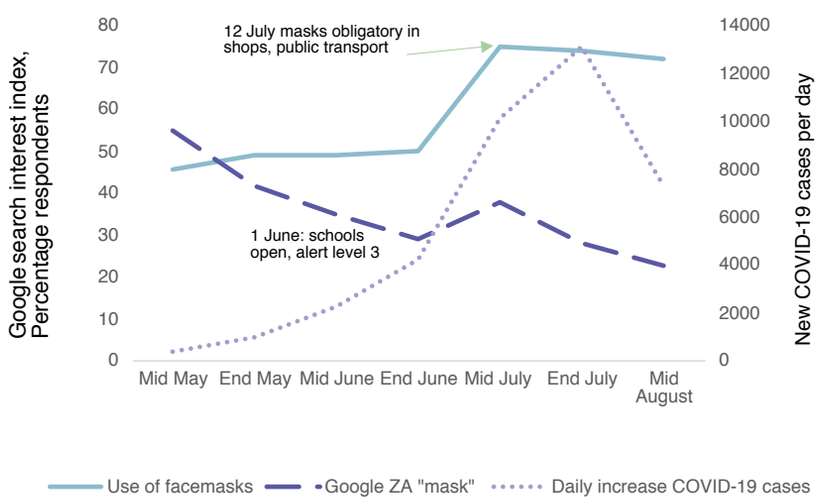
5 We asked a separate question on mask wearing over the past 7 days and received an almost universal positive response - apart from 3% who did not need to wear masks because they did not go out.

social. However, in a hypothetical scenario of a voluntary mask policy (as opposed to a mandatory policy), mask-wearing introduced the perception among some respondents that the wearer was at risk, but not necessarily sick. Voluntary policies were also considered less fair than mandatory policies, especially by risk groups (Betsch et al., 2020). Mandatory mask-wearing can also increase compliance by diminishing the influence of social concerns that can push people away from mask-wearing, including worries about stigma or causing offense because others may read mask-wearing as a signal that you think they may be ill or that you know or suspect that you may be ill. When mask-wearing is mandated, it reduces the influence of these avoidance motivations because you do not need to justify and explain mask-wearing as many may feel obliged to do if it was a voluntary choice.[6]

Because masks are visual, enforcement is feasible as it would be very difficult to hide non-compliance. It is therefore plausible that the government's policy decision to move from a voluntary to mandatory policy in July could potentially be lauded as a contributor to promoting mask-wearing adherence.

Figure 6 below tracks the increase in respondents' mask-wearing over time. We find that increased mask-wearing amongst our sample does not follow the curves of either daily new cases or social media searches for masks. The steady upward slope is more likely to be due to greater public awareness and supporting policies such as the mandatory mask-wearing policy.

Figure 6: Trends in mask-wearing over time, cf. local Google searches for masks and progress of the disease



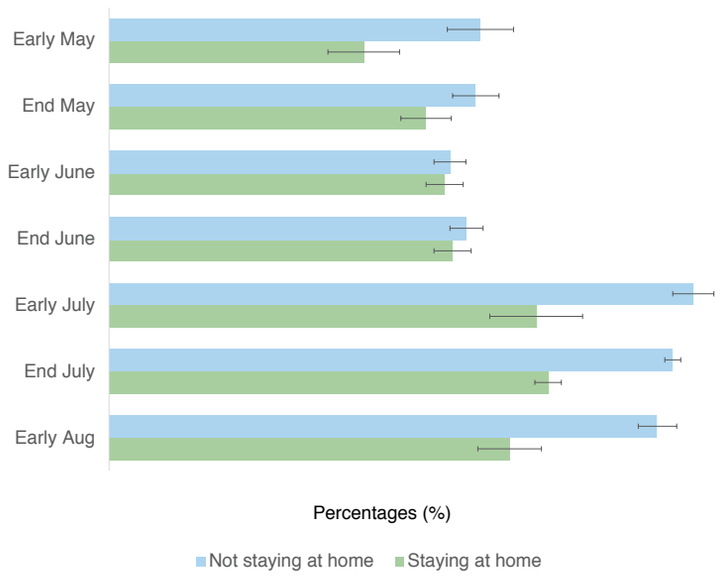
Sources: NIDS-CRAM waves 1 and 2, Google Trends & Mediahack (2020)
Note: Google interest index represents search interest relative to the highest point for the past 12 months with a value of 100 representing peak popularity. Trend in survey responses was estimated for half-months, controlling for the sampling structure of NIDS-CRAM batches. The x-axis values were named using the endpoint of a 2-week period, i.e. Mid May is the first half of May. For the survey responses, the value represent averages over the half-month; for Google trends, it represent the Google interest index for a median week in this half-month period; and for the Mediahack COVID-19 cases, it present the daily new cases on either the 22nd or the 7th day of the month.

Given that respondents were able to list more than one self-reported behaviour change, the NIDS-CRAM survey can also be used to assess whether there are complementarities or trade-offs in the behavioural choices individuals make. For instance, individuals who report that they stay at home may have less reason to wear masks given that their exposure to public spaces is limited or non-existent. Conversely, mask-wearing would be expected to become more important and more prominent as South Africa moved from lockdown alert level 4 to 3. Figure 7 below shows evidence of trade-offs between staying at home and mask-wearing - with mask-wearing being more likely if the respondent did not mention staying at home as a NPI. But it is also interesting to note that these trade-offs appear to change over time, and are much larger in July and August than in May and June. We would expect individuals to make their own decisions about how to navigate and mitigate risk, with a decline in certain behaviours prompting an uptake in others. For instance, adopting more

6 This would be aligned with Lewin (1951)'s idea that behaviour can be encouraged either by promoting the factors motivating and encouraging such behaviour (approach motivation) or by diminishing the factors pushing people away from such behaviour (avoidance motivation).

protective behaviour on one front might create appetite for risk on another. However, there is no global evidence of this during the pandemic and it has been argued that fear of risk-mitigation may impede effective policy making (Betsch et al., 2020; Mantzari, Rubin and Marteau, 2020).

Figure 7: Likelihood to wear a mask for those who stay at home, and those who do not over time



Sources: NIDS-CRAM waves 1 and 2 (2020)

Because these NPIs are all public goods that only have an impact on the disease if others comply too, we investigate to what extent respondents thought that their neighbourhood's residents complied with lockdown regulations prohibiting socialising and alcohol consumption and requiring residents to stay at home. Thirty-eight percent of respondents report that more than half of people in their communities continued to socialise and drink during the lockdown, while 44% of respondents said that only half of people or less (few, none) in their communities stayed home during the lockdown (Figure 8).

Figure 8: Drinking, socialising and going out in your neighbourhood during lockdown

Sources: NIDS-CRAM wave 2 (2020)

Compliance cost has emerged as an important concept during debates about how to best contain the epidemic. Resource gaps, due to structural inequality, may manifest in an unequal distribution of the COVID-19 burden due to the relationship between resources and the financial and emotional costs of complying with lockdown policies and NPIs. There have been worries, for instance, about the fairness of rigid stay-at-home policies for residents of informal settlements and how realistic physical distancing is in crowded areas. There have also been concerns about compliance with hand-washing regulations in neighbourhoods without access to clean running water. Although compliance cost is expected to play an important role in adherence to NPIs in a country with such stark inequalities and high levels of poverty, the survey does not provide evidence of an overwhelming or dominant role

for compliance cost. But our evidence needs to be interpreted carefully because the data shows compliance, not the cost of compliance. One cannot conclude that there is no observed difference in compliance cost based on no observed difference in compliance, especially when the expected threat and risk is assessed to be large.

We do not, for instance, see any evidence that informal settlement residents have lower levels of compliance with physical distancing or staying at home – compared to those who live in other residential areas. Informal settlement residents are not less likely to stay at home and they are slightly -- but insignificantly so -- less likely to physically distance themselves (38% vs 40%).

We do not see a significant relationship between convenient access to piped water (inside the house or yard) and a higher likelihood to engage in more frequent handwashing in response to COVID-19. Lacking convenient access to piped water would no doubt function as an impediment, but this effect appears to be dwarfed by the high share of people with easy access to clean water who are not washing their hands. An alternative explanation could be that access to water at one's workplace – where one would more often come into contact with others – may be more crucial than access to water at one's house. But this would only be relevant for essential workers and those who have been going to their work place to work during this period.

We find that handwashing is significantly higher amongst the poorest quintiles cf the most affluent quintile (64% vs 61%), but this gap is off-set by the significantly higher reporting of sanitiser use amongst the most affluent compared to the poorest quintile (27% vs 18%).

Both the affluent and the poorest individuals are significantly more likely to report staying at home, but only in wave 1. This could be due to the concentration of essential workers in the middle quintiles -- which represents low-wage and low skilled workers -- but the survey does unfortunately not allow us to test this hypothesis. The difference is no longer evident in wave 2.

Compared to the most affluent quintile, the poorest quintile is significantly less likely to report that they respond to the pandemic with physical distancing (14% vs 23%), but significantly more likely to report that they wear masks (65% vs. 63%). There was not a significant difference by socioeconomic status in the likelihood to avoid big groups.

Where we do see clear differences is with the perceived compliance of people in your community with stay-at-home guidelines during lockdown and prohibition of drinking and socialising. Fifty-one percent of respondents living in informal settlements reported that most of the people in their area did not comply with prohibition of drinking and socialising (cf 37% for other types of neighbourhoods). And 44% of informal settlement resident respondents reported that most of the people in their neighbourhood did not stay at home during the lockdown (cf. 32% for other types of neighbourhoods).

Lack of effective targeting of high-risk groups

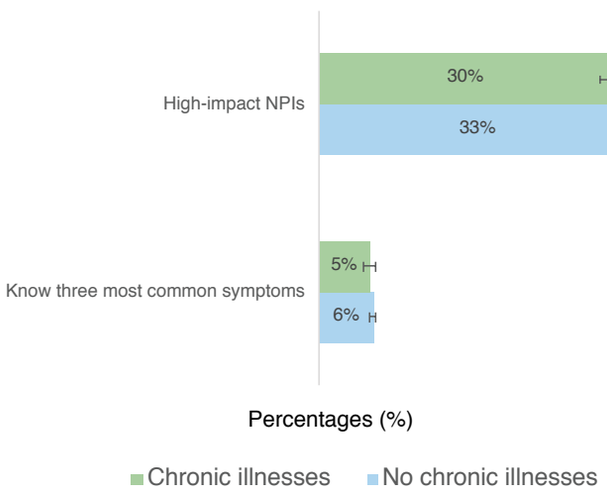
We consider two measures of accurate information and effective preventative behaviour, namely knowing the three most common COVID-19 symptoms (as classified by the CDC, i.e. tiredness, fever, coughing) and adhering to the three most effective prevention strategies (mask-wearing, physical distancing/avoiding people and staying at home). Given large differences in mortality risk based on age and underlying co-morbidities, it is disappointing to see that there is no evidence that at-risk groups have better COVID-19 knowledge or are taking more care in safeguarding against COVID-19.

We infer targeted messaging by examining whether we find evidence of better COVID-19 knowledge or preventative behaviour amongst high-risk groups. Knowledge is assessed by considering the respondent's awareness of the three most common COVID-19 symptoms as cited by the CDC at the time of the survey -- namely, coughing, fever and tiredness. We consider adherence to high-impact

NPIs, specifically mask-wearing, staying at home or avoiding big groups and physical distancing. Hand hygiene is an important NPI, but we omit it from this indicator both because it is not novel or a pandemic-specific NPI and thus cannot be used to gauge the effectiveness of Corona-specific communication and messaging. We consider the omission permissible also because hand hygiene is not expected to be effective on its own.

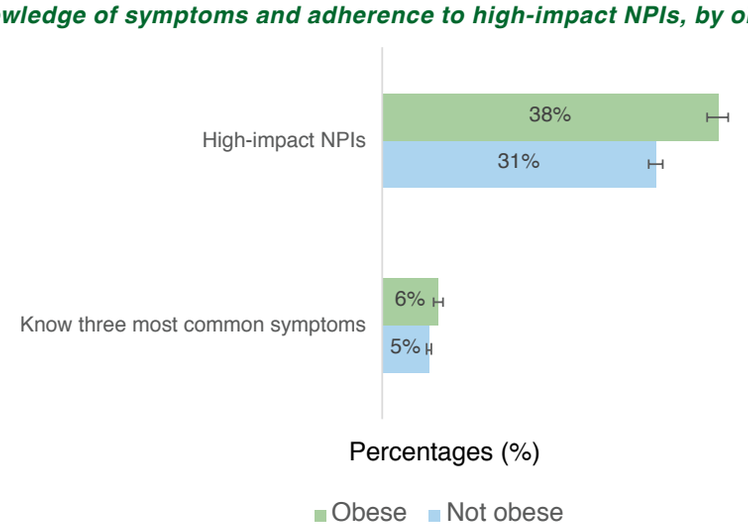
The data allows us to consider four high-risk groups: the elderly, the obese, the chronically ill and hypertensives. The differences are all insignificant -- save for the obese who are significantly more likely to adhere to high-impact NPIs. Figures 9,10 and 11 below illustrate the knowledge of symptoms and adherence to high-impact NPIs for respondents with chronic illnesses, obesity and high blood pressure.

Figure 9: Knowledge of symptoms and adherence to high-impact NPIs, by chronic illnesses



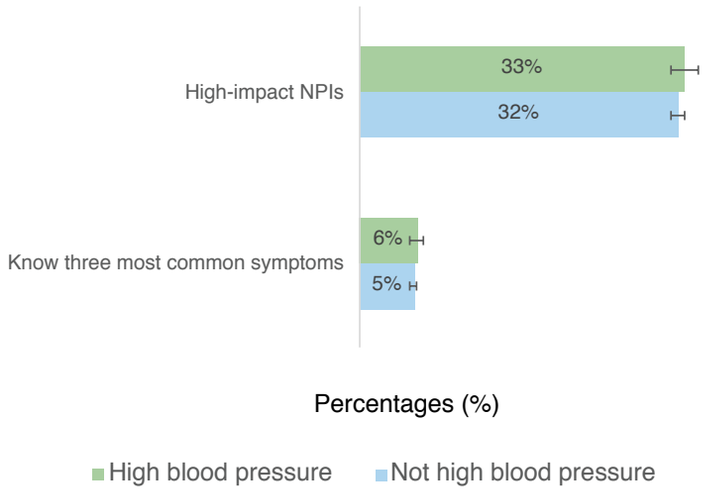
Sources: NIDS-CRAM waves 1 and 2 (2020)

Figure 10: Knowledge of symptoms and adherence to high-impact NPIs, by obesity



Sources: NIDS-CRAM waves 1 and 2 (2020)

Figure 11: Knowledge of symptoms and adherence to high-impact NPIs, by hypertension



Sources: NIDS-CRAM waves 1 and 2 (2020)

We do not see evidence of improved COVID-19 knowledge or more effort in prevention amongst any of these four high-risk groups. It is concerning because with well-targeted campaigns and support strategies, we would have expected to see higher compliance amongst this at-risk group.

Policy conclusions

In summary, the study finds that in July and August (wave 2) 74% of respondents said that they were wearing masks. This is slightly below the recommended 80% mask-wearing target that models project is necessary to change the trajectory of the disease. It is encouraging to see an increase from 49% in May/June to 74% in July/August. Some of this increase may be driven by the increase in mobility and freedom, and the drop in staying at home. As expected, there is evidence of a trade-off between staying at home and mask-wearing. This trade-off has strengthened in July and August. As expected, we see a drop in physical distancing (23% to 9%), avoiding large groups (16% to 7%) and staying at home (43% to 36%) as the economy opened up and people returned to school and work.

It is also encouraging that the study finds high levels of agency and empowerment with 87% of respondents saying that they believe they can avoid the virus. Respondents who thought that they were unlikely to get Coronavirus, explained that this belief was based on their adherence to NPIs, and specifically staying at home and mask-wearing. Few respondents placed their beliefs in poor science.

The section below considers policy advice, rooted partly in the analysis shown here, but also in part in the international literature on behavioural science and NPIs and previous research on the South African health system. The behavioural literature would suggest that it may be tough to encourage people to continue adhering to NPIs when the threat of the pandemic subside, media coverage is lower and life starts to return to its pre-COVID rhythms. The pandemic will become less visible and salient and under such circumstances it will be more difficult to motivate the daily sacrifices of NPIs. Many may be tempted to succumb to erroneous learning, reasoning that their risk may be low because they have not yet contracted the virus.

To avoid a second surge amidst these challenges, we need to enhance and sustain **clear, concise, consistent and targeted communication and messaging.** This pertains to several areas:

- **Individual's perception of risk:** Because the risk of infection is complicated, intangible and varies over time and space, it is difficult to communicate this clearly or in a manner that will encourage and sustain behavioural change. In particular, it is challenging to relay that one can feel fine and yet be infected and spread the disease. Visual narratives can be effective

in relaying this information. It is also crucial to acknowledge that we may need segmented strategies to support different at-risk groups (viz. older individuals, those with co-morbidities) in their assessment of risks to further promote knowledge of the disease and adherence to NPIs. It may also be worthwhile to provide additional risk assessment communication training to frontline health workers, auxiliary workers and community health workers and other community-based actors so that they understand the priority of relaying this information to at-risk patients and can communicate clearly and consistently.

- **Mask-wearing and physical distancing:** South Africa has done well to communicate the importance of and enforce the wearing of face coverings, physical distancing and hand hygiene. The effective communication of the salience of these behaviours as important preventative measures must however be increased and sustained in order to overcome compliance fatigue. Any inconsistencies in messaging around mask-wearing need to be countered by concise and persistent messaging, which is consistent across all stakeholders and communication channels, where possible. The impact of mask-wearing on risk of transmission must also be consistently communicated and the positive social consequences of these actions must be emphasised as part of the messaging. It is important to reposition these behaviours as the social norm and leverage the fact that people respond to public opinion and what they see other people doing. Appeals by role models and credible public figures have been shown to be effective in other countries and may be an important avenue to consider.
- **Reaching high-risk groups.** From our results, it appears that the elderly and those at risk have low levels of knowledge of the most common COVID-19 symptoms, which may suggest that they are not accessing or receiving accurate information. Better targeting of messages may be required. They appear to be less likely to adhere to high-impact NPIs and did not have better knowledge of symptoms than lower-risk groups.
- **Specific and actionable recommendations on key preventative behaviours - with a focus on mask-wearing and physical distancing.** Several studies show that information is more impactful in changing behaviour when it is actionable, and simply urging people to change behaviour usually does not work (Ratner and Riis, 2014; Riis and Ratner, 2016). For example, “Riding in taxis - WEAR A MASK”, “Shopping - WEAR A MASK.” These messages may be more effective than a more general exhortation to “wear a mask.” These messages can link the wearing of masks to behaviours identified as high risk.

Broader recommendations

Create an enabling environment, rather than just asking people to do things. While communication efforts are important, it is necessary to not just ask people in our communities to take up and maintain preventative behaviours but to invest and innovate in redesigning social contexts and service delivery to make it feasible for everyone to do so (Greenhalgh, 2020). These measures could include:

- **Providing recommended preventative health products,** such as masks, for free can help to ensure mass uptake: It has been shown that the uptake of preventative health products, such as vaccines, is highly sensitive to price.[7] Multiple masks should be provided per person along with instructions on how to wear and care for them. People need many masks - they should have easy access to free masks. Expecting people to wash their masks daily is not realistic. Communities, non-governmental organisations and industry should be mobilised to provide free masks or to enable communities to make their own masks.
- **Local context and ownership are required for changing social norms:** Mandating mask-wearing has value in increasing adherence within communities. Because mask-wearing and physical distancing are social norms and we require long-term adherence to avoid a second surge, top-down national and provincial messages and campaigns are likely to be insufficient

7 A large body of evidence shows that uptake reduces dramatically even with small price increases, and especially so for products with large social externalities. For example, when a program in Kenya moved from free provision of deworming tablets to charging US$0.30 per child, uptake fell from 75% to 18% (Kremer and Miguel 2007). Furthermore, preventative products distributed for free have generally been put to good use.

to resonate strongly enough to create the change we need without deeper community roots and specifically, creating local champions via partnerships with local faith groups, youth groups and small businesses or NPOs.

- **Reduce barriers to access to information on COVID-19 symptoms:** It is essential to prioritise clear and concise communication on what the symptoms are and what to do if you have symptoms. Importantly, given the inadequate knowledge of symptoms, systems should make it easy for individuals to access information and seek advice if they are uncertain about symptoms being experienced. If people need to exert effort to remember or find the hotline numbers, it is less likely that they will use them. For example, the Western Cape Provincial hotline to call if symptomatic - 021 928 4102 - will not be remembered. It would be much more effective to have a simple number, and to create a catchy slogan that would help people remember the number: "Not feeling great? Call 888"

Anchor messages in hope and a positive vision for the future. The literature shows that compliance is affected by a clear vision of why sacrifices are being made. Messages based on fear will not work. Given the expected long duration of this pandemic's threat, positive and hopeful messages from all sectors of society, led by the President, to motivate citizens to remain vigilant and make daily sacrifices should continue. It is important to use language that appeals to the sense of community and frequently thank people for their cooperation.

REFERENCES

Ali, S. T., Wang, L., Lau, E. H. Y., Xu, X.-K., Du, Z., Wu, Y., Leung, G. M., & Cowling, B. J. (2020). Serial interval of SARS-CoV-2 was shortened over time by nonpharmaceutical interventions. Science, 369(6507), eabc9004. https://doi.org/10.1126/science.abc9004

Betsch, C., Korn, L., Sprengholz, P., Felgendreff, L., Eitze, S., Schmid, P. and Böhm, R., 2020. Social and behavioral consequences of mask policies during the COVID-19 pandemic. Proceedings of the National Academy of Sciences.

Biney, E., Amoateng, A. Y., & Ewemooje, O. S. (2020). Inequalities in morbidity in South Africa: A family perspective. SSM-Population Health, 100653.

Brauner, J. M., Mindermann, S., Sharma, M., Stephenson, A. B., Gavenčiak, T., Johnston, D., Leech, G., Salvatier, J., Altman, G., Norman, A. J., Monrad, J. T., Besiroglu, T., Ge, H., Mikulik, V., Hartwick, M. A., Teh, Y. W., Chindelevitch, L., Gal, Y., & Kulveit, J. (2020). The effectiveness of eight nonpharmaceutical interventions against COVID-19 in 41 countries. MedRxiv, 2020.05.28.20116129.

Brooks, J. T., Butler, J. C., & Redfield, R. R. (2020). Universal Masking to Prevent SARS-CoV-2 Transmission - The Time Is Now. In JAMA - Journal of the American Medical Association (Vol. 324, Issue 7, pp. 635–637). American Medical Association. https://doi.org/10.1001/jama.2020.13107

CDC (Centers for Disease Control and Prevention). (2019). "500 Cities: Local Data for Better Health." 2019 release. Atlanta: Centers for Disease Control and Prevention.

Chapman, G., & Loewenstein, G. (2020). Why Americans are tiring of social distancing and hand-washing – 2 behavioral scientists explain. The Conversation. Available: https://theconversation.com/why-americans-are-tiring-of-social-distancing-and-hand-washing-2-behavioral-scientists-explain-139625 [9 June 2020]

Chowdhury, R., Heng, K., Shawon, M. S. R., Goh, G., Okonofua, D., Ochoa-Rosales, C., Gonzalez-Jaramillo, V., Bhuiya, A., Reidpath, D., Prathapan, S., Shahzad, S., Althaus, C. L., Gonzalez-Jaramillo, N., & Franco, O. H. (2020). Dynamic interventions to control COVID-19 pandemic: a multivariate prediction modelling study comparing 16 worldwide countries. European Journal of Epidemiology, 35(5), 389–399. https://doi.org/10.1007/s10654-020-00649-w

Ehlert, A., Seidel, J., & Weisenfeld, U. (2019). Trouble on my mind: the effect of catastrophic events on people's worries. Empirical Economics, 1-25.

Eikenberry, S. E., Mancuso, M., Iboi, E., Phan, T., Eikenberry, K., Kuang, Y., Kostelich, E., & Gumel, A. B. (2020). To mask or not to mask: Modeling the potential for face mask use by the general public to curtail the COVID-19 pandemic. Infectious Disease Modelling, 5, 293–308. https://doi.org/10.1016/j.idm.2020.04.001

Elster, J. (1998). A plea for mechanisms. In: Hedström P, Swedberg R (eds) Social mechanisms: an analytical approach to social theory. Cambridge University Press, Cambridge, pp 45–73.

Enke, B., & Graeber, T. (2019). Cognitive uncertainty. https://doi.org/10.3386/w26518

Feng, S., Shen, C., Xia, N., Song, W., Fan, M., & Cowling, B. J. (2020). Rational use of face masks in the COVID-19 pandemic. In The Lancet Respiratory Medicine (Vol. 8, Issue 5, pp. 434–436). Lancet Publishing Group. https://doi.org/10.1016/S2213-2600(20)30134-X

Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S., and Combs, B. (1978). How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. Policy Studies, 9, 127-152.

Gibson, L., & Rush, D. (2020). Novel coronavirus in Cape Town informal settlements: Feasibility of using informal dwelling outlines to identify high risk areas for COVID-19 transmission from a social distancing perspective. JMIR Public Health and Surveillance, 6(2), e18844. https://doi.org/10.2196/18844

Greenhalgh, T. (2020). Will COVID-19 be evidence-based medicine's nemesis? PLOS Medicine, 17(6), e1003266. https://doi.org/10.1371/journal.pmed.1003266

Greenhalgh, T., Schmid, M. B., Czypionka, T., Bassler, D., & Gruer, L. (2020). Face masks for the public during the covid-19 crisis. The BMJ, 369. https://doi.org/10.1136/bmj.m1435

Gustafsson, M. (2020). How does South Africa's Covid-19 response compare globally? A preliminary analysis using the new OxCGRT dataset. University of Stellenbosch Department of Economics working paper. http://resep.sun.ac.za/wp-content/uploads/2020/04/wp072020-1.pdf

Hansen, J., Marx, S., & Weber, E. U. (2004). The Rule of climate perceptions, expectations and forecasts in farmer decision making: The Argentine Pampas and South Florida. Technical Report 04-01. Palisades, NY: International Research Institute for Climcate Prediction (IRI).

Jackevicius, C. A., Mamdani, M., & Tu, J. V. (2002). Adherence with statin therapy in elderly patients with and without acute coronary syndromes. Journal of the American Medical Association, 288(4), 462–467. https://doi.org/10.1001/jama.288.4.462.

Jain, R., Budlender, J., Zizzamia, R., & Bassier, I. (2020) The labour market and poverty impacts of COVID-19 in South Africa. https://cramsurvey.org/reports/

Kai, D., Goldstein G.-P., Morgunov A., Nangalia V., Rotkirch A. (2020). Universal masking is urgent in the COVID-19 pandemic: SEIR and agent based models, empirical validation, policy recommendations. https://arxiv.org/pdf/2004.13553.pdf

Kantor, B. N., & Kantor, J. (2020). Nonpharmaceutical interventions for pandemic COVID-19: A cross-sectional investigation of US general public beliefs, attitudes, and actions. MedRxiv, 2020.04.26.20078618.

Kremer, M., & Miguel, E. (2007). The illusion of sustainability. The Quarterly Journal of Economics, 122(3), 1007–1065. https://doi.org/10.1162/qjec.122.3.1007

Lewin, K. (1951). Field theory in social science. (edited by D. Cartwright). New York: Harper.

Li, T., Liu, Y., Li, M., Qian, X., & Dai, S. Y. (2020). Mask or no mask for COVID-19: A public health and market study. PLOS ONE, 15(8), e0237691. https://doi.org/10.1371/journal.pone.0237691

Loewenstein, G., Hsee, C.K., Weber, E.U., Welch, N. (2001). Risk as Feelings. Psychological Bulletin, 127(2): 267-286.

Loewenstein, G. (1999). Experimental economics from the vantage-point of behavioural economics. The Economic Journal, 109(453), 25–34. https://doi.org/10.1111/1468-0297.00400

Loewenstein, G. (2020). Psychological factors affecting the success of measures to decrease the spread of COVID-19. Busara Center; IBEN webinar. https://youtu.be/puQf0Eh3rr8

Loewenstein, G., & Mather, J. (1990). Dynamic processes in risk perception. Journal of Risk and Uncertainty, 3(2), 155-175.

López, L., & Rodó, X. (2020). The end of social confinement and COVID-19 re-emergence risk. Nature Human Behaviour, 4(7), 746–755. https://doi.org/10.1038/s41562-020-0908-8

Lyu, W., & Wehby, G. L. (2020). Community Use of face masks and COVID-19: Evidence from a natural experiment of state mandates in the US. Health Affairs, 39(8), 1419–1425. https://doi.org/10.1377/hlthaff.2020.00818

Mantzari, E., Rubin, G.J. and Marteau, T.M., (2020). Is risk compensation threatening public health in the covid-19 pandemic?. BMJ, 370.

Mediahack. (2020). Coronavirus SA - Dashboard. Available: https://mediahack.co.za/datastories/coronavirus/dashboard/ [7 July 2020]

National Income Dynamics Study-Coronavirus Rapid Mobile Survey (NIDS-CRAM). (2020). Wave 1 [dataset]. Version 1. Cape Town: Allan Gray Orbis Foundation Endowment [funding agency]. Cape Town: Southern Africa Labour and Development Research Unit [implementer], 2020. Cape Town: DataFirst [distributor], 2018.

Prather, K. A., Wang, C. C., & Schooley, R. T. (2020). Reducing transmission of SARS-CoV-2. Science, 368(6498), eabc6197. https://doi.org/10.1126/science.abc6197.

Ranchhod, V. & Daniels, R. C (2020) Labour market dynamics in the time of COVID-19. https://cramsurvey.org/reports/

Ratner, R. & Riis, J. (2014). Communicating science-based recommendations with memorable and actionable guidelines Proceedings of the National Academy of Sciences 111(Supplement 4), 13634-13641. https://dx.doi.org/10.1073/pnas.1320649111

Riis, J., Ratner, R. (2016). Communicating for Action: The Importance of Memorability and Actionability. In Roberto, C. & Kawachi, I. Behavioral Economics and Public health. New York: Oxford University Press. https://dx.doi.org/10.1093/med/9780199398331.003.0006

Rogan, M. & Skinner, C. (2020) 'The COVID-19 crisis and the South African informal economy: 'Locked out' of livelihoods and employment'. https://cramsurvey.org/reports/https://cramsurvey.org/reports/

Sharot, T. (2011). The optimism bias. Current Biology, 21(23), R941–R945. https://doi.org/10.1016/j.cub.2011.10.030

Slovic, P., Fischhoff, B., Lichtenstein, S., Fischhoff, B., & Lichtenstein, S. (2016). Response mode, framing and information-processing effects in risk assessment. In The Perception of Risk (pp. 192–205). Routledge. https://doi.org/10.4324/9781315661773-19.

Slovic, P. (1997). Trust, emotion, sex, politics and science: Surveying the risk-assessment abttlefield. In M. Bazerman, D. Messick, A. Tenbrunsel and K. Wade-Benzoni (eds.), Psychological perspectives to environmental and ethical issues in management. San Francisco: Jossey-Bass.

Smith, D. M., Loewenstein, G., Jankovic, A., & Ubel, P. A. (2009). Happily Hopeless: Adaptation to a Permanent, But Not to a Temporary, Disability. Health Psychology, 28(6), 787–791. https://doi.org/10.1037/a0016624

Southern Africa Labour and Development Research Unit (SALDRU). (2018). National Income Dynamics Study 2017, Wave 5 [dataset]. Version 1.0.0 Pretoria: Department of Planning, Monitoring, and Evaluation [funding agency]. Cape Town: Southern Africa Labour and Development Research Unit [implementer], 2018. Cape Town: DataFirst [distributor], 2018. https://doi.org/10.25828/fw3h-v708

Spaull, N., Wills, G., Makaluza, N., Carel, D., Ingle, K., Brophy, T., Daniels, R., Burger, R., Burger, R., Posel, D., Ranchood, V., Van der Berg, S. (2020). The NIDS-CRAM Wave 1 Questionnaire. NIDS-CRAM Technical Document A. (Online). Available: https://cramsurvey.org/reports/ [15 July 2020]

Stutt, R. O. J. H, Retkute, R., Bradley, M., Gilligan, C. A. & Colvin, J. (2020). A modelling framework to assess the likely effectiveness of facemasks in combination with 'lock-down' in managing the COVID-19 pandemic Proceedings of the Royal Society A. http://doi.org/10.1098/rspa.2020.0376

Van der Berg, S., Zuze, L., & Bridgman, G. (2020) Coronavirus, Lockdown and Children: Some impacts of the current crisis in child welfare using data from NIDS-CRAM Wave 1. https://cramsurvey.org/reports/

Weber, E.U. (2006). Experience-based and description-based perceptions of long-term risk: Why global warming does not scare us (yet)? Climate Change, 70, 103-120.

Wills, G., Patel, L., Van der Berg, S., & Mpeta, B. (2020) Household resource flows and food poverty during South Africa's lockdown: Short-term policy implications for three channels of social protection. https://cramsurvey.org/reports/

World Health Organization. (2013). Six common misconceptions about immunization. In WHO. World Health Organization. Available: https://www.who.int/vaccine_safety/initiative/detection/immunization_misconceptions/en/ [14 June 2020]

Appendix

Appendix Table 1: Wave 1 NIDS-CRAM summary statistics

Variable	Count	%
Total	**7074**	
Mean Age (Standard Deviation)	**38,81 (15.43)**	
Gender		
Man	2754	38.9
Woman	4314	60.9
Other	6	0.1
Population		
African/Black	6048	85.5
Coloured	612	8.7
Indian/Asian	79	1.1
White	325	4.6
Other/Refuse/Don't know	10	0.1
Income Quintile		
First Quintile	912	12.9
Second Quintile	1047	14.7
Third Quintile	967	13.7
Fourth Quintile	884	12.6
Fifth Quintile	595	8.7
Other/Refuse/Don't know	2641	37.3
Education		
Grade R/No Schooling	398	1.7
Primary Education	982	13.9
Secondary Education	3877	58.1
Tertiary Education	1817	25.7
Other/Refuse/Don't know	45	0.6

Appendix Table 2: Wave 2 NIDS-CRAM summary statistics

Variable	Count	%
Total	**5676**	
Mean Age (Standard Deviation)	**40.9 (15.7)**	
Gender		
Man	2200	38.8
Woman	3476	61.2
Population		
African/Black	4885	85.5
Coloured	482	8.7
Indian/Asian	50	8.5
White	259	4.6
Income Quintile		
First Quintile	741	13.1
Second Quintile	864	15.2
Third Quintile	830	14.6
Fourth Quintile	704	12.4
Fifth Quintile	471	8.3
Other/Refuse/Don't know	10	0.2
Education		
Grade R/No Schooling	85	1.5
Primary Education	814	14.3
Secondary Education	3321	58.5
Tertiary Education	1445	25.5
Other/Refuse/Don't know	11	0.2

For further information please see **cramsurvey.org**