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WAVE 1

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

COVID-19 risk perception, knowledge and behaviour

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15 July 2020

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

CRAM
CORONAVIRUS RAPID MOBILE SURVEY 2020

COVID-19 risk perception, knowledge and behaviour

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Abstract

The rapid spread of COVID-19 in South Africa threatens to amplify an unequal and polarised health system, with poor and vulnerable populations bearing a greater share of the COVID-19 infection and mortality burden. Available evidence suggests that preventative measures would have a protective effect against the spread of the virus. However, the success of these measures depends on whether the public receives, internalises and acts on appropriate messaging.

Given our reliance on preventative measures for containing the spread of COVID-19, compliance with preventative measures is lower than desired. Energy is frequently misdirected: with higher compliance with low-impact measures aimed at preventing atypical transmissions via surfaces and lower compliance with a first-best set of preventative measures such as avoiding people, physical distancing and mask-wearing that aim to prevent droplet transmission, which is more typical.

It is also concerning that only 6% of respondents in our NIDS-CRAM survey knew the three most common COVID-19 symptoms. This lack of knowledge may hamper early identification which is key to stopping the spread of COVID-19.

It is discouraging to see that high-risk groups such as the elderly and those with chronic conditions are not more informed and are no more likely to employ effective prevention strategies.

1 We want to thank Kai Barron, Peter Barron, Juanita O. Arendse, Najma Shaik, Maylene Shung King, Uta Lehamnn-Grube, Graeme Hoddinott, Mark Tomlinson, Jonatan Daven, Noxolo Madela and Anita Bron for their useful feedback on our instrument design. We want to thank Pamela Halse, Alex O'Riordan and Glen Takalani for their superb research assistance. We want to thank Reza Daniels, Tim Brophy and Kim Ingle from the South African Labour and Development Research Unit for their relentless commitment to data quality and their attention to detail. All remaining mistakes however remain entirely our responsibility.

Executive summary

The rapid spread of COVID-19 in South Africa threatens to amplify an unequal and polarised health system, with poor and vulnerable populations bearing a greater share of the COVID-19 infection and mortality burden. Available evidence suggests that preventative measures would have a protective effect against the spread of the virus. However, the success of these measures depends on whether the public receives, internalises and acts on appropriate messaging. We consider risk perceptions, knowledge and behaviour of high-risk groups such as the elderly and those suffering from chronic diseases; and consider the role of resources by examining differences across the income distribution.

Forty and fifty-year olds underestimate their relative infection risk. Respondents in the middle age group tend to underestimate their risk cf. others.

Underestimated infection risk tied to underinvestment in preventative behaviour Those that did not change any of their behaviour in response to COVID-19 (did not enact preventative behaviours) were significantly less likely to think that they would contract the virus or were unaware of their infection risk.

Affluent South Africans have exaggerated infection risk perceptions compared to poor South Africans Affluent individuals in the top household income per capita quintile are almost twice as likely (52%) to believe that they will contract COVID-19 cf. those in the poorest quintile (25%).

Knowledge about the three most common COVID-19 symptoms, and in particular tiredness, is limited Although 64% of respondents listed coughing as a symptom, and 63% listed fever, only 11% listed tiredness as a symptom. This implies that many South Africans would not be in a good position to make decisions about when it would be vital to quarantine and/or seek care for COVID-19 symptoms. This is expected to have negative consequences for individuals but also more broadly for society because it hampers the containment of the disease.

Compliance with effective preventative behaviour is low While 91% of respondents reported changing their behaviour in some way to try and prevent contracting or spreading the virus, much of this effort is expended on low-impact strategies. As droplet transmission is the most common means of spreading the disease, the best strategies are widely acknowledged to be avoiding large groups of people, physical distancing and mask-wearing. Of those that reported changing behaviour, only 35% reported enacting a high-impact set of preventative behaviours.

Little evidence of well-targeted information campaigns Knowledge of symptoms and compliance with preventative behaviour were not significantly higher amongst high-risk groups such as the elderly and those with chronic health conditions.

News media is the most trusted source of information Almost four in five respondents listed news media as their trusted source of information about COVID-19. Other trusted information sources include government (14%), social media (13%) and discussions with health workers (11%).

Sources of information matter for conveying knowledge and preventative behaviour Those who are reliant on health workers, social media and government sources of information have more accurate knowledge of symptoms and are more likely to follow best prevention strategies.

Policy recommendations

A multifaceted approach to behaviour change is necessary because multiple factors influence behaviour. Therefore, we recommend that government considers adopting the following approaches or policies:

- Clear, concise and consistent communication is required
- Reduce barriers to access to information on COVID-19 symptoms
- Provide specific and actionable recommendations on key preventative behaviours - with a focus on mask-wearing and physical distancing
- News media should be used more effectively in COVID-19 communications
- Enhance reliance on government and health workers as a trusted source of information
- Provide recommended preventive health products such as masks for free to ensure mass uptake
- Restructure the delivery of services to promote physical distancing
- Local ownership and champions are required for changing social norms
- Anchor messages in hope and a positive vision for the future

Introduction

At the time of writing, the COVID-19 outbreak in South Africa is yet to reach its peak despite having recorded over 205 000 confirmed cases, the highest in Africa, by 7 July 2020 (Mediahack, 2020). The COVID-19 crisis creates an urgent need to better understand progress with awareness and behavioural change in South Africa. 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.

Currently, with countries around the world fighting against COVID-19, most governments are focusing on the most urgent needs. This includes extending the social assistance net to protect the most vulnerable. In parallel, governments are strengthening their public health systems and implementing rules and regulations regarding prevention measures. The latter, however, requires behavioural change, which comes with its own set of challenges. On a global scale, governments have implemented a range of socially restrictive policies to curb the spread of COVID-19, including the use of face masks, regular hand washing, and maintaining physical distance (World Health Organization, 2020). Until a vaccine for COVID-19 has been developed, governments remain highly reliant on these non-pharmaceutical interventions to control the spread of the pandemic and prevent health system overload (Chowdhury et al., 2020). In fact, in South Africa, Professor Shabir Madhi has acknowledged that the future trajectory of the disease is entirely reliant on human behaviour, and specifically avoiding mass gatherings, physical distancing and wearing masks.

However, the success of these preventative measures depends on whether the general public receives these messages, finds them credible, adopts them and can remain adherent. Appropriate knowledge is a significant determinant of protective health behaviour (Chavarría et al., 2020). Misinformation and miscommunication can disproportionately affect those with poor access to updated and reliable information (Pirisi, 2000).

Chapman and Loewenstein (2020) argue that adherence to COVID-19 prevention measures is particularly challenging because the objective risk is relatively low and the risk-reducing impact of adherence to preventative measures is often not visible or tangible. Enke and Graeber (2019) show that people tend to be insensitive to changes in probabilities when it comes to low probability events such as the chance of contracting COVID-19. This remains true unless the change in probability results in an absolute certainty that the event will be avoided. It explains why people are not eager to engage in preventive behaviour unless it eliminates risk. For example, one study (Slovic et al., 2016) found that people were more attracted to a vaccine believed to completely eliminate a 10% risk of contracting a disease in comparison to 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, people would, therefore, tend to underrate their chances of contracting the virus, more so than objective measures would warrant. This evidence suggests that it will be difficult to promote adherence to COVID-19 preventative measures because they will only lead to a marginal reduction in an individual's personal risk. A major issue with preventative behaviours during epidemics, in general, is that they essentially constitute public goods games - the personal benefits to complying with preventative measures are far smaller than the social benefits. To convince individuals to engage in these behaviours, it may be helpful to increase the salience of the social impact and the common good.

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 don't receive feedback about the impact that our efforts and actions have had on the risk of contracting an invisible virus (Chapman and Loewenstein, 2020). If our state of health before preventative actions – not being ill – 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 high risk because they have not become infected as yet (Loewenstein, 1999). This is because we cannot see the negative outcome – contracting the virus – that might have occurred in the absence of vigilance. Taking actions when healthy makes it feel like there was no impact on preventative behaviour. This heuristic explains the behavioural pattern of anti-vaxxers, who believe that low rates of diseases that are vaccinated against are proof that the vaccine is not necessary (World Health Organization, 2013). People may also experience intrapersonal hot-cold empathy gaps, wherein a state of good health it is difficult to imagine being sick in the past or the future (Loewenstein, 2020) which helps to explain non-adherence to life-saving medication (Jackevicius et al., 2002).

The long timeframe over which these preventative measures would need to be maintained presents a further challenge. 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 is highly salient now, but it is likely to decrease in the future as people adapt. 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. 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 addition to tasks that facilitate habits, it is equally important to consider tasks that impede habits e.g. elbow greeting in order not to greet with hugs or handshakes.

In developing countries, physical distancing may not be workable in dense, urban informal settlements where multi-generational households share one shack, 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 household 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 settlements have central public points of access to important services such as water and toilets (Gibson & Rush, 2020). Within this context, adhering to effective social distancing behaviour is a near-impossible task. In addition to the

difficulties in physical distancing, even rudimentary measures such as hand washing and mask-wearing guidelines 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.

Egger et al. (2020) note that lockdowns in developing and low-income regions are fundamentally collective action problems for which, to be effective, high levels of trust are required. A lack of trust in leadership and information about the virus itself, which is common in poorer regions (Bedrosian et al., 2016), can result in limited adherence to, and acceptance of, lockdown measures. In more severe cases, resistance to lockdown measures can result in harmful levels of dissent and social unrest. Therefore, African lockdown regulations will need to consider the limited level of preparedness of most regions in order to avoid dissent and unrest as much as possible (Egger et al., 2020). Within the South African context, the government, in anticipation of dissent, deployed the military to help enforce its plans The fear of dissent stems from the fact that poor communities shoulder a disproportionate share of South Africa's burden of disease. In many communities COVID-19 would pose a no bigger threat than existing perils such as alcohol-related violence and injury, HIV, TB, and maternal and child mortality. And a hard lockdown would have dire financial implications for many households. An important consideration is the concept of trust and how excess force may destroy trust, especially in regions where adherence is challenging. In this context, co-operation may be more effective than punishment.

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 cost of compliance with preventative measures will impact behaviour.

Our paper examines preventative and precautionary behaviour in response to the threat of the pandemic in South Africa. We consider risk awareness, knowledge of symptoms, behaviour change and information sources, also examining the relationship between these factors. Given the high social and economic cost of a lockdown, it is increasingly recognised that the future trajectory of the disease will depend on compliance with preventative behaviour, and in particular, mask-wearing, avoiding close contact with people, and avoiding big groups of people.

CRAM wave 1 data

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 is a nationally-representative panel study following the lives of 28,000 South Africans every two years since 2008. NIDS is 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 of the 2017 NIDS survey. In 2017, this 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 samples, 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 (40.3%) completed the questionnaire. 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.

It should be borne in mind that the NIDS wave 5 sample has suffered four rounds of attrition since the first draw in 2008, and have consequently become increasingly less representative of South Africa over time. 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 breakdowns by province because NIDS and NIDS-CRAM stratification was by the district council. We also do not consider rural-urban divides in our analysis because of concerns about the reliability of these indicators in wave 1 of the survey.

An important caveat to interpreting the income quintile results is that the income variable was imperfectly measured, implying that we can only calculate income quintiles for two-thirds of the sample. All other analyses uses the full NIDS-CRAM sample.

Appendix Table 1 provides basic descriptive analysis on the NIDS-CRAM sample.

Risk perceptions, knowledge, behaviour and information

The analysis below considers in turn, perceptions of the risk of infection, knowledge of symptoms, behaviour change to prevent infection and trusted information channels. A multifaceted approach to behaviour change is required, as intentions are influenced by multiple factors, and behavioural intentions are often difficult to enact for many reasons. Some individuals will have the motivation, but find it difficult to do so; while others will not have the motivation, but will engage in the behaviour if the behaviour is the social norm or required in a specific environment. Impediments along any of these dimensions can substantially lower compliance with preventative measures. This complicated web of relationships is reflected in models of behavioural change in health, including the health belief model (Becker, 1974).

Unfortunately, because we have been reliant on short telephonic interviews that do not allow us to understand these relationship with much depth and granularity, but we can track the prevalence of progress that has been made in increasing the awareness of COVID-19 infection risk, knowledge of the illness and most importantly, changing behaviour to affect the trajectory of the disease.

Who believes that they are at risk?

We consider the self-reported risk of contracting the Coronavirus. We are interested in this variable because it can flag inaccurate perceptions of infection risk due to unawareness or such as oft-reported tendencies for males or the young to underestimate their infection risk. However, we acknowledge that this variable is complicated to interpret on its own, at face value because the reported risk of infection would incorporate the individual's risk exposure and the precautionary measures that they are taking. It is important to analyse this relationship with other variables.

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. As expected, we find that respondents with chronic conditions tend to report a higher risk of infection (see Appendix Table 2).

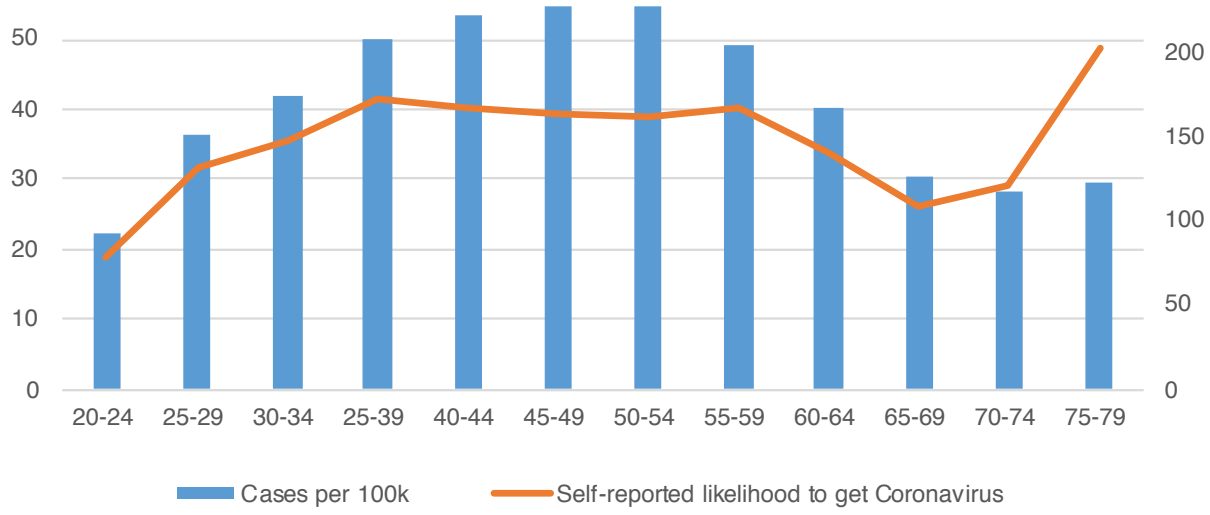
Considering the perceived infection risk by age, Figure 1 shows that the perceived likelihood of getting Coronavirus tracks per age category cases per 100 000 reasonably well. We find there is some evidence of underestimation of the likelihood of contracting COVID-19 in the 40-54 age group, and evidence of an overestimation of the likelihood of contracting COVID-19 for the 75-79 age group.

This may plausibly be due to conflating the age category's case facility rate with its infection risk.

While deaths are relatively low for this age group, they represent a higher than proportional share of COVID-19 infections because this demographic group is more likely to work and to move around, coming into contact with others. This age group's relative underestimation of their risk may just be due to lack of information or -- in line with previous work that argue that risk perceptions and decision-making have an affective or emotional dimension (e.g. Loewenstein, et al, 2001) – it may be that the risk of dying could magnify or shrink the salience and fear associated with infections.

Alternatively, it may be that the higher relative levels of infection risk amongst those in the forties and fifties may reflect more risk-taking and lower compliance with preventative measures due to the lower case fatality rate. However, our analysis 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 (see Appendix Table 2).

Figure 1: Perceived likelihood of contracting Coronavirus vs. cases per 100k



Source: NIDS-CRAM Wage 1 (2020), Mediahack website
Notes: Data are weighted.

There is an overwhelmingly strong relationship between affluence and the risk of contracting COVID-19. The caveat to bear in mind here is that the household income data is unfortunately only available for two-thirds of the sample. We find that the percentage of individuals reporting that they are likely to contract COVID-19 increases substantially from 25% for the poorest quintile (based on household income per capita) to more than twice as high at 52%.

How much is known about COVID-19 symptoms?

Knowledge of common COVID-19 symptoms is vital within the current South African COVID-19 response which has moved away from contact tracing, screening and testing. This shifts the onus of COVID-19 identification to individuals. Respondents were asked to list the signs and symptoms that someone with COVID-19 may display. The results show a worrisome trend. Although 64% of respondents listed coughing as a symptom, and 63% listed fever, only 6% of respondents were able to list all three major symptoms (coughing, fever and tiredness). Furthermore, 8% of respondents were not able to list any symptoms at all. Our results suggest that people are not in a good position to know when to seek care for COVID-19. This implies both higher individual risk and increased risk of the infection spreading.

It is furthermore concerning that there is no significant difference in the knowledge of the three most

common symptoms for high-risk individuals such as the elderly (60 years and older) and those with chronic conditions.

How has COVID-19 affected preventative behaviour?

Our main interest is, however, in how COVID-19 has affected behaviour. With all changes in behaviour, it is important to bear in mind that reported change does not specify intensity or infrequency or may thus reflect a slight or small change in frequency. We are also concerned that due to social desireabitly bias. 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 COVID-19.

Overall, we find that 91% of individuals reported engaging in some behaviour change since the onset of COVID-19.This seems to be a positive result showing that the general population is reacting to the pandemic and trying to engage in preventative behaviours. The remainder of the analysis is for the subset who did change their behaviour. We find it worrying that hand-washing appears to have gained such a high salience in the mind of the general public as the number one most important behaviour -- with 70% compliance amongst those who did change their behaviour -- when it is in fact not the primary protective behaviour recommended by health specialists. This result may be due to the mixed messaging over the course of the evolution of this pandemic, both internationally and locally. For example, at the start of the pandemic, the government informed the South African public that it was only mandatory for healthcare professionals to wear masks and the public were actively dissuaded from wearing masks. Due to the rapidly evolving pandemic, health specialists were learning about the primary pathways of transmission and best preventative practices in an ongoing fashion. The initial messaging focused on handwashing and this seems to have entered and remained in the public conscience. It suggests that simple, clear messaging regarding exactly what the highest impact preventative behaviours are, would be invaluable moving forward.

Because we now understand that surface transmission is rare, while droplet transmission is typical, the best strategies are widely acknowledged to be avoiding people (avoiding crowds and/or staying at home as much as possible), avoiding close contact (through physical distancing) and mask-wearing. More than half of those who changed their behaviour reported wearing masks (53%) and avoiding people by either staying at home or not attending large gatherings or avoiding big groups (58%), but only 25% practice physical distancing.

Cheatley et al. (2020) find that non-pharmaceutical intervention (NPI) measures designed to reduce social interaction are the most effective means to slow the spread of COVID-19. However, as previously mentioned, from a human behaviour perspective it is wise to limit the suite of interventions to two or three. In accordance with this rule of thumb, we formulate a summary measure of high-impact preventative strategies. We acknowledging that physical distancing and avoiding people are substitutes – the importance of vigilance about physical distancing depends on how often you go outside and interact with groups of people. Therefore, we formulate a definition of effective prevention strategies which requires mask-wearing and and require only that they either avoid people or apply physical distancing. Even with this more lenient definition, we find that only 35% of those who changed behaviour adopted this combination of high-impact preventative strategies.

We see little evidence of an overwhelming or dominant role for compliance cost. We do not for instance see informal settlement residents report lower 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 significantly) more likely to physically distance themselves (25% vs 22%). Surprisingly, we also 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 your workplace – where you often have contact with others – may be more crucial than access to water in your house.

It is concerning that we do not see a significantly higher level of compliance with the set of most effective strategies for high-risk groups such as those with chronic conditions and aged 60 and older. With well-targeted campaigns, we would have expected to see higher compliance amongst this at-risk group.

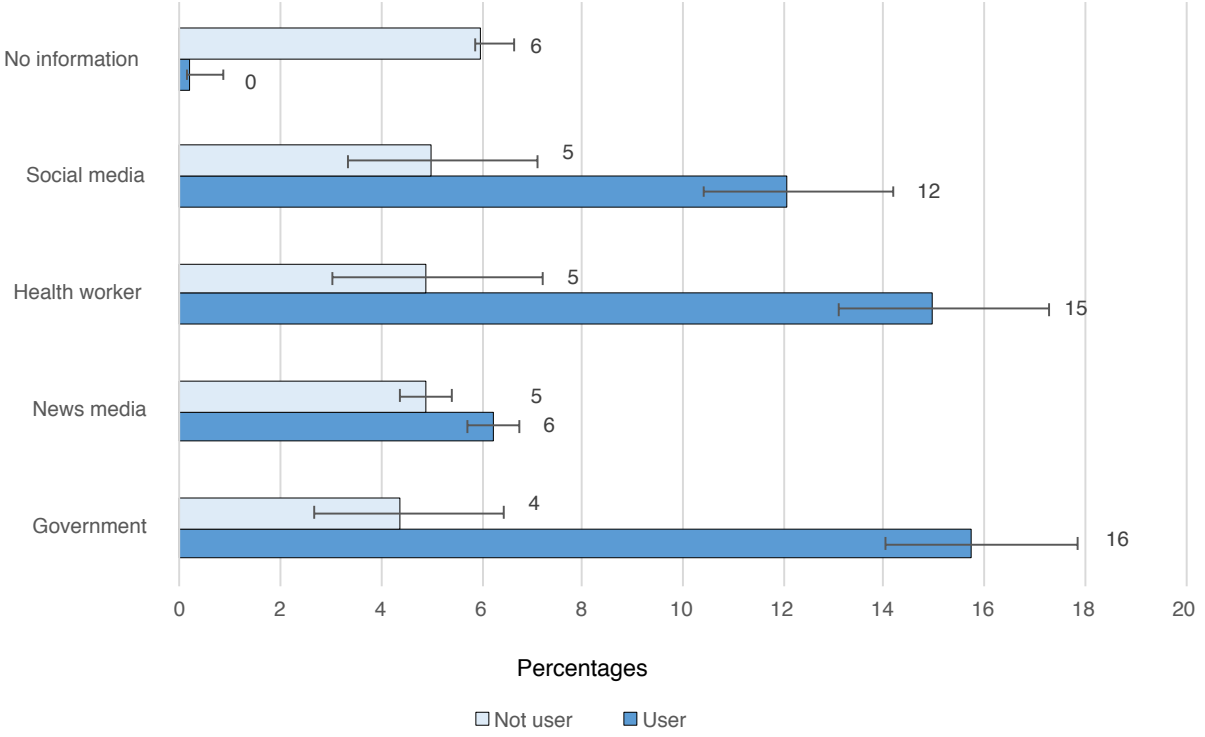
How do people learn about COVID-19?

Respondents were asked to list their most trusted sources of information about COVID-19. By far the most trusted source of information is local or international news (including radio, tv, newspapers, internet), with approximately 80% of respondents listing this source. Other trusted information sources include government (14%), social media (13%) and discussions with health workers (11%). A very low share of respondents (1%) reported no trusted information sources.

Figures 2 and 3 show that those who are reliant on health workers, social media and government sources of information have more accurate knowledge of symptoms and are more likely to follow high-impact or effective prevention strategies, compared to those reliant on the news media. For this analysis, the indicator of preventative behaviour has been redefined to include those with no behaviour change - with the latter categorised as not complying with effective or high-impact prevention strategies.

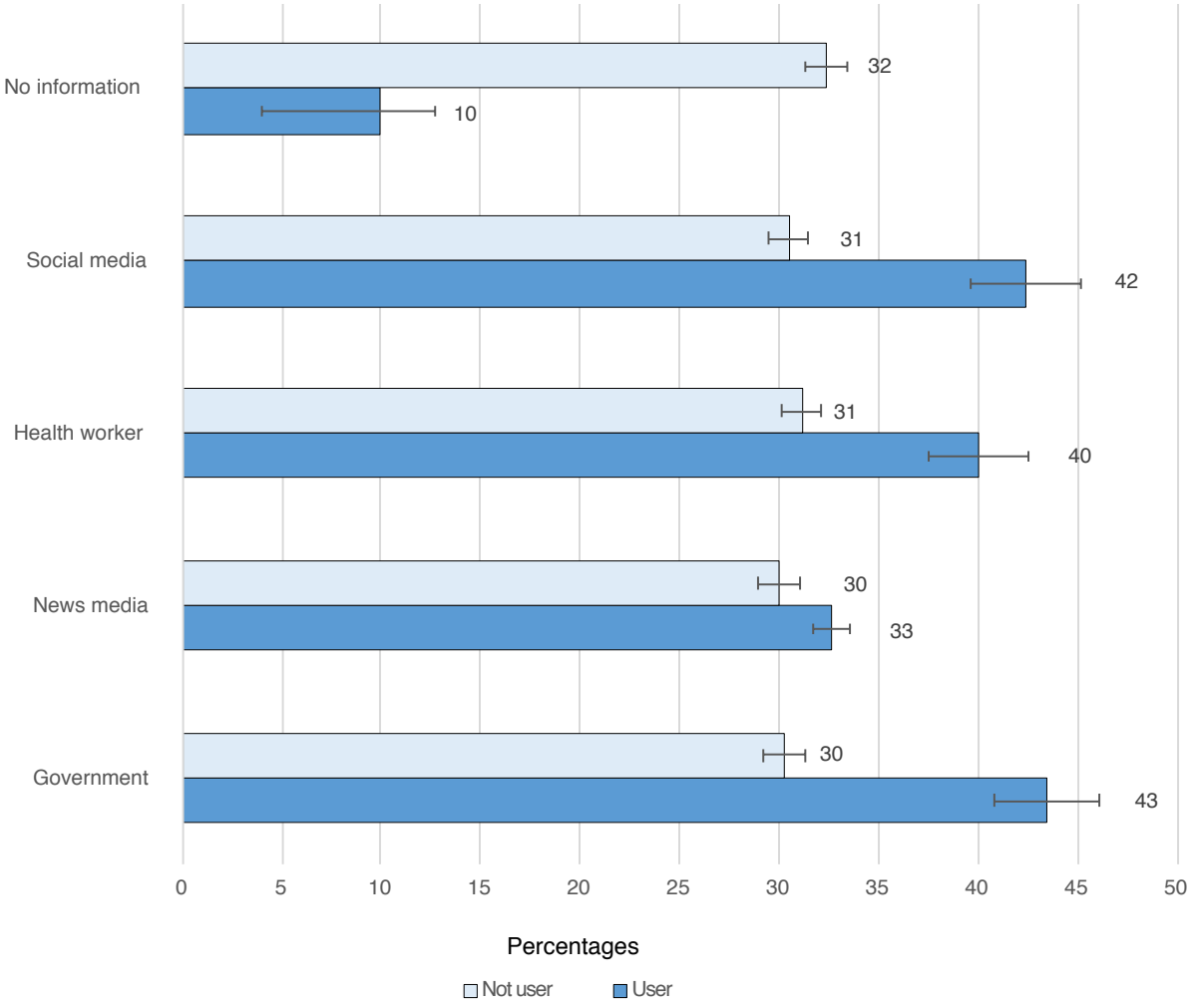
Figure 2 shows that knowledge of the three most common COVID-19 symptoms vary considerably based on the information sources that respondents accessed and trusted. Respondents who are reliant on health workers, social media and government are considerably more likely to know the three most common COVID-19 symptoms. In turn, Figure 3 shows that accessing COVID-related health information from government sources and health workers also correlates to higher-impact behaviour changes (see Appendix Table 3 and Figure 3). These relationships do not control for self-selection and it could be that part of this relationship merely reflects that more knowledgeable, discerning people who trust health workers and government more than the news media. This is not a causal relationship -- and should be interpreted as such.

Figure 2. Knowledge of three most common symptoms and trusted Coronavirus information sources



Source: NIDS-CRAM Wage 1 (2020)
Notes: Data are weighted.

Figure 3. Most effective prevention strategies and trusted Coronavirus information sources



Source: NIDS-CRAM Wage 1 (2020)
Notes: Data are weighted.

Discussion

The analysis shows that compliance with preventative measures is low. We find that few respondents had accurate knowledge of COVID-19. Only a little more than one in ten respondents mentioned weakness or tiredness as a symptom. This is very concerning because symptom recognition intermediates health-seeking behaviour, and because of the communicable nature of COVID-19, symptom awareness is crucial for the early detection and control of outbreaks in communities. This is important in the current context, where provider-initiated care pathways are unlikely due to an overburdened system where neither community screening nor contact tracing has worked well.

The overwhelming majority of people said that they have changed their behaviour in response to COVID-19, but unfortunately, in most cases, compliance with prevention strategies was insufficient to adequately protect against COVID-19 infection risk. Although the vast majority of respondents reported engaging in some behaviour change since the onset of COVID-19, low impact NPI like handwashing appears to be more prevalent than high-impact NPI like mask-wearing. This may be attributed to mixed messaging from the government which furthermore did not differentiate between high-impact and low-impact interventions as the new evidence emerged. Chapman and Loewenstein (2020) promote realistic, feasible and simple sets of preventative measures during COVID-19. Added to this recommendation, emphasis on high-impact interventions may also be useful. The CDC has already reframed their COVID-19 messaging to reflect this change (NPR Material, 2020).

The most disappointing outcome may be that we found little evidence that the elderly and those with chronic conditions are well-targeted by information campaigns. They were no less likely to engage in high-impact NPIs and did not have better knowledge of symptoms than lower-risk groups There is a worrisome trend of poor COVID-19 knowledge of symptoms, especially among older respondents. This is problematic given the latest public health response which places the emphasis on self-screening and self-isolation. The South African National Department of Health has used social media platform like WhatsApp to connect citizens to government (GovChat) and promote self-screening of COVID-19, among other services (GovChat, 2020). While this innovation may be useful for some of the population, older subgroups may struggle with this form of technology. Furthermore, mixed COVID-19 messaging may have caused confusion and increased uncertainty, all of which may negatively impact self-screening as well as the adoption of and adherence to NPIs.

News sources were considered the most trusted medium for consuming COVID-19 information in South Africa. It is therefore crucial that clear and truthful messaging be delivered via this medium. Government information sources and information from health workers appear to be more efficient channels of COVID-related information, especially to vulnerable and disadvantaged groups. There is scope to increase the reach of these channels. The decomposition of the channels through which different subgroups of the population consume information underscores that government should design a multi-modal messaging strategy, depending on which groups they choose to prioritise and target for messaging campaigns,

Policy recommendations

Clear, concise and consistent communication is required. There is a need to increase awareness in several key areas.

- *Risk assessments:* Because the risk of infection is complicated, intangible and varies over time and space, it is difficult to communicate this clearly. In particular, it is challenging to relay that one can feel fine but have the virus and spread it. 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 in their assessment of risks. It may be worthwhile to provide additional risk assessment communication training to auxiliary workers and community health workers so they understand the priority of relaying this information to at-risk patients and can communicate clearly and consistently.
- *Mask wearing and physical distancing:* The salience of these behaviours as important preventative measures must be increased. Prior inconsistencies in messaging around mask-wearing need to be countered by concise messaging, which is consistent across all stakeholders. It is important to reposition these behaviours as the social norm and leverage the fact that people respond to public opinion and what we 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.
- *Knowledge of symptoms:* Awareness of the main symptoms of COVID-19 needs to be increased, especially weakness/tiredness which was very low. This is particularly important given the failure of provider-initiated care mechanisms, such as contact tracing and community-based screening as well as delays in processing of tests in the public sector. Due to the strain of the overburdened health system, and problems with local delivery mechanisms, the responsibility for care has fallen largely on the shoulders of the individual and the community and we are concerned that many are ill-equipped for this responsibility because they are not well-informed. At-risk groups such as the elderly, as well as diabetes and hypertension patients should be prioritised in such campaigns.

News media should be used more effectively in COVID-19 communications The vast majority

of individuals are receiving information through local and international news, but we see that there is a far smaller yield on improved knowledge and high-impact prevention strategies for users of these information channels.

Enhance reliance on government and health workers as trusted source of information In addition, individuals receiving information from health workers and government appear to be more informed on symptoms and first-best or high-impact set of prevention strategies, but these channels were less frequently listed as trusted sources of information, which could reflect either low trust or lack of coverage, or a combination of these.

Provide 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. 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.

Create an enabling environment, rather than just asking people to do things. While communication efforts are important, as policymakers, funders, and programmers, 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). This is particularly relevant given the higher burden of COVID-19 falls on individuals with fewer resources.

- *Providing recommended preventive health products such as masks for free can help to ensure mass uptake:* It has been shown that uptake of preventive health products, such as vaccines, is highly sensitive to price. A large body of evidence shows that take-up 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, take-up fell from 75 percent to 18 percent (Kremer and Miguel 2007). Furthermore, preventive products distributed for free have generally been put to good use. Multiple masks should be provided per person. People need many masks - they should have easy access to free masks. Expecting people to wash their masks daily is not realistic.
- *Restructure the delivery of services to promote physical distancing:* It is important to recognise that certain behaviours are driven by basic needs and will be a higher priority than COVID-19 risk reduction. The collection of social grants or food parcels, for example, will be more important for many than reducing infection disease by avoiding large gatherings. Restructuring environments is especially important in contexts where an abstinence approach is unrealistic. Other exemplary innovations include home delivery of medication and telehealth, which have already been implemented in the Western Cape (Brey et al., 2020). The long-term benefits of such restructuring may strengthen the health system and leapfrog the public sector to community-oriented service delivery.
- *Local context and ownership are required for changing social norms* Because mask-wearing and social distancing are social norms, top-down national and provincial messages and campaigns are unlikely 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 COVOD-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 spend 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. The positive response to Cyril Ramaphosa’s strong leadership has demonstrated how the past few years of poor and weak governance and the lack of clear direction have affected South Africans. Messages based on fear will not work. Given the expected long duration of this pandemic’s threat, we need more positive and hopeful messages to motivate citizens to remain vigilant and make daily sacrifices. It is important to use language that appeals to the sense of community and frequently thank people for their cooperation.

Appendix

Table 1: NIDS-CRAM descriptive 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
Asian/Indian	79	1.1
White	325	4.6
Other/Refuse/Don’t know	10	0.1
Income Quintile		
First Quintile	912	20.7
Second Quintile	1047	23.8
Third Quintile	967	21.9
Fourth Quintile	884	20.0
Fifth Quintile	595	13.5

Education		
Grade R/No Schooling	398	5.6
Primary Education	982	13.9
Secondary Education	3877	54.8
Tertiary Education	1817	25.7
Experienced the following symptoms, sore throat, fever or cough		
Yes	615	8.7
No	6396	90.4
Don't know/Refused to answer	63	0.9
Experienced shortness of breath 4 weeks prior to the survey		
Yes	209	2.9
No	6857	96.9
Don't know/Refused to answer	8	0.11
Injuries 4 weeks prior to the survey		
Yes	205	2.9
No	6862	97.0
Don't know/Refused to answer	7	0.1
Has health needs for a chronic condition		
Yes	1613	22.8
No	5447	77.0
Don't know/Refused to answer	14	0.2
Visits a health facility		
Yes	1687	23.9
No	532	7.5
Refused to answer	5	0.1
Type of health facility visited		
Private doctor/Clinic	160	2.3
Private hospital	42	0.6
Public clinic	1224	17.3
Public hospital	197	2.8
Pharmacy	45	0.6
Traditional healer	3	0.04
Other	10	0.1
Gets advice over the phone/Internet	1	0.01

Don’t know/Refused to answer	5	0.1
Reason for not going to the clinic (If does not visit clinic)		
Afraid of the defence force/Police	4	0.1
Afraid of getting Coronavirus	30	0.4
Could postpone visit	16	0.2
Looking after children	4	0.1
No transport available	23	0.3
no transport money	13	0.2
Not ill enough to need care	191	2.7
Queues are too long	36	0.5
Too Busy	23	0.3
Other/Refused to answer	192	2.7
Has access to medication, condoms and contraception		
Yes	1919	27.1
No	5121	72.4
Don’t know/Refused to answer	34	0.5
Where Individual has access to medication, condoms or contraception(if there is access)		
Private doctor/Clinic	72	1.0
Private hospital	19	0.3
Public clinic	1322	18.7
Public hospital	179	2.5
Pharmacy	254	3.6
Other	38	0.5
Refused to answer/Don’t know	35	0.5
Confirms to have one of the following: HIV,TB lung condition, heart condition or diabetes		
Yes	1524	21.5
No	5521	78.0
Don’t know/Refused to answer	29	0,41
Has medical aid		
Yes	1111	15.7
No	5942	84.0
Don’t know/Refused to answer	21	0.3

Health needs for chronic condition By Gender	Man Count	Man %

Yes, needs medication	492	17.9
No, does not need medication	2256	81.9
Refused to answer/Don't Know	6	0.2
Total	2754	100

Visits the Clinic	Man Count	Man %
Yes	528	69.1
No	236	30.9
Total	764	100

Reason for not visiting the clinic	Man Count	Man %
Afraid of defense force/Police	3	1.3
Afraid of getting Coronavirus	9	3.8
Could postpone visit	4	1.7
Looking after children	2	0.8
No transport available	12	5.1
No transport money	4	1.7
Not ill enough to need care	86	36.4
Other/Refused to answer	84	35.6
Queues too long	15	6.4
Too busy	17	7.2
Total	236	100

Has access to medication	Man Count	Man %
Yes	665	24.1
No	2074	75.3
Don't know	10	0.4
Refused to answer	5	0.2
Total	2754	100

Table 2: Multivariate regression analysis (ordinary least squares regression) of self-assessed likelihood to contract the Coronavirus

	Model 1	Model 2	Model 3
Age	0.000006	0.000006	0.000009
	[0.000005]	[0.000005]	[0.000007]
Chronic condition	0.114***	0.112***	0.138***
	[0.0159]	[0.0159]	[0.0192]
Knows all 3 common symtoms	0.0425	0.0557*	0.0662*
	[0.0255]	[0.0251]	[0.0324]
Informal settlement resident	0.0634**	0.0623**	0.0942***
	[0.0196]	[0.0195]	[0.0228]
Convenient access to piped water	0.0789***	0.0784***	0.00696
	[0.0160]	[0.0160]	[0.0207]
Did change behaviour	0.0447***		0.00913
	[0.0130]		[0.0162]
High-impact prevention strategies		0.100***	
		[0.0217]	
Per capita household income quintiles			
2			-0.0005
			[0.0235]
3			0.0563*
			[0.0243]
4			0.162***
			[0.0236]
5			0.281***
			[0.0243]
Constant	0.227***	0.149***	0.203***
	[0.0159]	[0.0251]	[0.0248]
Observations	6055	6068	3803
R-squared	0.0160	0.0177	0.0655

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 3: Multivariate regression analysis (ordinary least squares regression) of behaviour change on information sources, controlling for vulnerability covariates.

	Wash hands more	Avoid close contact	Avoid big groups	Wear face mask	Stay home more
Local or international news (Radio, tv, newspapers, internet, etc.)	0.0767***	0.0757***	0.0818***	0.00538	0.0186
	(0.0153)	(0.0126)	(0.0112)	(0.0158)	(0.0154)
Government websites, Whatsapp line or posters	0.107***	0.137***	0.140***	-0.00923	-0.0644***
	(0.0171)	(0.0141)	(0.0126)	(0.0176)	(0.0172)
Talking to health workers	0.117***	0.113***	0.104***	0.0249	-0.0612***
	(0.0199)	(0.0165)	(0.0147)	(0.0206)	(0.0201)
Social media like Facebook, Twitter or Youtube	-0.000711	0.0900***	0.104***	-0.00646	0.00896
	(0.0173)	(0.0143)	(0.0127)	(0.0179)	(0.0175)
Female	0.0835***	-0.0349***	-0.0228***	-0.00369	0.0243**
	(0.0117)	(0.00964)	(0.00859)	(0.0121)	(0.0118)
Aged sixty and older	-0.0907***	-0.0282**	0.00442	-0.0128	0.0321*
	(0.0171)	(0.0141)	(0.0125)	(0.0176)	(0.0172)
Did not complete high school	-0.0341***	-0.0669***	-0.0215**	-0.0740***	0.00425
	(0.0120)	(0.00989)	(0.00880)	(0.0124)	(0.0121)
Repondent has a chronic condition	0.000701	0.0437***	-0.0286**	-0.00579	-0.00885
	(0.0153)	(0.0126)	(0.0112)	(0.0157)	(0.0154)
Constant	0.509***	0.152***	0.0724***	0.494***	0.365***
	(0.0175)	(0.0144)	(0.0129)	(0.0181)	(0.0176)
Observations	6,967	6,967	6,967	6,967	6,967
R-squared	0.025	0.039	0.040	0.006	0.006
Standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

References

Abdool Karim, S. S. (2020). The South African response to the pandemic. In ***New England Journal of Medicine*** (Vol. 382, Issue 24). Massachussetts Medical Society. https://doi.org/10.1056/NEJMc2014960

Adams-Prassl, A., Boneva, T., Golin, M., & Rauh, C. (2020). ***Inequality in the impact of the coronavirus shock: Evidence from real time surveys*** (CEPR Discussion Paper No. DP14665). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3594297

Andrew, A, Arman, A., Augsburg, B & Taveras, I.K. (2020), "Challenges of Adopting Coronavirus Precautions in Low-Income Countries," Blog Post, Institute of Fiscal Studies, London.

Andrews, M. A., & Bauch, C. T. (2015). Disease interventions can interfere with one another through disease-behaviour interactions. ***PLOS Computational Biology***, ***11***(6), e1004291. https://doi.org/10.1371/JOURNAL.PCBI.1004291

Ataguba, J. E. (2020). COVID-19 Pandemic, a war to be won: Understanding its economic implications for Africa. ***Applied Health Economics and Health Policy***, ***18***, 325–328. https://doi.org/10.1007/s40258-020-00580-x

Ayebare, R. R., Flick, R., Okware, S., Bodo, B., & Lamorde, M. (2020). Adoption of COVID-19 triage strategies for low-income settings. In The Lancet Respiratory Medicine (Vol. 8, Issue 4, p. e22). Lancet Publishing Group. https://doi.org/10.1016/S2213-2600(20)30114-4

Becker MH (ed): The health belief model and personal health behavior. Health Educ Monogr 2:324-508, 1974.

Bedrosian, S. R., Young, C. E., Smith, L. A., Cox, J. D., Manning, C., Pechta, L., Telfer, J. L., Gaines-McCollom, M., Harben1, K., Holmes, W., Lubell, K. M., McQuiston, J. H., Nordlund, K., O'Connor, J., Reynolds, B. S., Schindelar, J. A., Shelley, G., & Daniel, K. L. (2016). Lessons of risk communication and health promotion - West Africa and United States. ***Morbidity and Mortality Weekly Report***, ***65***, 68–74. https://www.cdc.gov/mmwr/volumes/65/su/pdfs/su6503a10.pdf

Bibby, J., Everest, G., & Abbs, I. (2020). Will COVID-19 be a watershed moment for health inequalities? ***The Health Foundation***, 1–20.

BlackDemographics. (2020). ***COVID-19: Why data shows African Americans might be affected at higher rates***. Available: https://blackdemographics.com/alarming-new-covid-19-data-shows-african-americans-might-be-affected-at-higher-rates/ [13 June 2020]

Brey, Z., Mash, R., Goliath, C., & Roman, D. (2020). Home delivery of medication during Coronavirus disease 2019, Cape Town, South Africa: Short report. African Journal of Primary Health Care & Family Medicine, 12(1), 4.

Castaneda Aguilar, R. A., Lakner, C., Prydz, E. B., Soler Lopez, J., Wu, R., & Zhao, Q. (2019). Estimating Global Poverty in Stata. In ***World Bank***. World Bank. https://doi.org/10.1596/32477

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]

Chavarría, E., Diba, F., Marcus, M. E., Reuter, A., Rogge, L., & Vollmer, S. (2020). ***Knowing versus doing: Protective health behavior against COVID-19 in Indonesia*** (No. 273).

Cheatley, J., Vuik, S., Devaux, M., Scarpetta, S., Pearson, M., Colombo, F., & Cecchini, M. (2020). The effectiveness of non-pharmaceutical interventions in containing epidemics: a rapid review of the literature and quantitative assessment. In ***medRxiv: Preprint for Health Sciences***. Cold Spring Harbor Laboratory Press. https://doi.org/10.1101/2020.04.06.20054197

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

Cowling, B. J., Ali, S. T., Ng, T. W. Y., Tsang, T. K., Li, J. C. M., Fong, M. W., Liao, Q., Kwan, M. Y., Lee, S. L., Chiu, S. S., Wu, J. T., Wu, P., & Leung, G. M. (2020). Impact assessment of non-pharmaceutical interventions against coronavirus disease 2019 and influenza in Hong Kong: an observational study. ***The Lancet Public Health***, ***5***(5), e279–e288. https://doi.org/10.1016/S2468-2667(20)30090-6

Egger, E.-M., Jones, S., Justino, P., Manhique, I., & Santos, R. (2020). ***Africa's lockdown dilemma: High poverty and low trust*** (wp-2020-76).

Emami, A., Javanmardi, F., Pirbonyeh, N., & Akbari, A. (2020). Prevalence of underlying diseases in hospitalized patients with COVID-19: A systematic review and meta-analysis. Archives of Academic Emergency Medicine, 8(1), e35. https://doi.org/10.22037/aaem.v8i1.600

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

Fuller, T. 2020. "Coronavirus Outbreak Has America's Homeless at Risk of 'Disaster.'" The New York Times, March 10.

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

GovChat. (2020). In South African National Department of Health. Available: https://www.govchat.org/ [5 July 2020]

Grantz, K. H., Rane, M. S., Salje, H., Glass, G. E., Schachterle, S. E., & Cummings, D. A. T. (2016). Disparities in influenza mortality and transmission related to sociodemographic factors within Chicago in the pandemic of 1918. ***Proceedings of the National Academy of Sciences of the United States of America***, ***113***(48), 13839–13844. https://doi.org/10.1073/pnas.1612838113

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

Guan, W., W. Liang, Y. Zhao, Y., H. Liang, Z. Chen, Y. Li, X. Liu, et al. 2020. "Comorbidity and its impact on 1,590 patients with COVID-19 in China: A Nationwide Analysis." MedRxiv, 2020.02.25.20027664. https://doi. org/10.1101/2020.02.25.20027664

Haushofer, J., Jessica, C., Metcalf, E., Björkegren, D., Chandrasekhar, A., De Quidt, J., Grenfell, B., Hussam, R., & Jayachandran, S. (2020). Combining behavioral economics and infectious disease epidemiology to mitigate the COVID-19 outbreak. In ***Unpublished Manuscript, Princeton University***.

Ingle, K., Brophy, T., & Daniels, R (2020). NIDS-CRAM Panel user manual. NIDS-CRAM Technical Document C. (Online). Available: https://cramsurvey.org/reports/ [15 July 2020]

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

Kerr, A., Ardington, C., & Burger, B (2020). NIDS-CRAM sample design and weighting. NIDS-CRAM Technical Document B. (Online). Available: https://cramsurvey.org/reports/ [15 July 2020]

Kirby, T. (2020). Evidence mounts on the disproportionate effect of COVID-19 on ethnic minorities. ***The Lancet Respiratory Medicine***, ***8***(6), 547–548. https://doi.org/10.1016/s2213-2600(20)30228-9

Kobayashi M, Beer KD, Bjork A, et al. (2015). Community knowledge, attitudes, and practices regarding Ebola virus disease—five counties, Liberia, September– October, 2014. MMWR Morb Mortal Wkly Rep 2015;64:714–8.

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

Lin, L., Jung, M., McCloud, R. F., & Viswanath, K. (2014). Media use and communication inequalities in a public health emergency: a case study of 2009-2010 pandemic influenza A virus subtype H1N1. ***Public Health Reports***, ***129 Suppl***(6_suppl4), 49–60. https://doi.org/10.1177/00333549141296S408

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

Mamelund, S.-E. (2017). ***Social inequality—a forgotten factor in pandemic influenza preparedness***. Tidsskrift for Den norske legeforening 12/13. Available: https://tidsskriftet.no/2017/05/global-helse/social-inequality-forgotten-factor-pandemic-influenza-preparedness [29 June 2020]

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

Murray, C. J., Lopez, A. D., Chin, B., Feehan, D., & Hill, K. H. (2006). Estimation of potential global pandemic influenza mortality on the basis of vital registry data from the 1918-20 pandemic: a quantitative analysis. ***Lancet***, ***368***(9554), 2211–2218. https://doi.org/10.1016/S0140-6736(06)69895-4

Nassif-Pires, L., Xavier, L. de L., Masterson, T., Nikiforos, M., & Rios-Avila, F. (2020). Pandemic of inequality. In ***Levy Economics Institute of Bard College***. Levy Economics Institute. Available: https://ideas.repec.org/p/lev/levppb/ppb_149.html [29 June 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.

NICD. (2020). ***COVID-19 testing summary: South Africa week 23 2020***. Available: https://www.nicd.ac.za/wp-content/uploads/2020/06/NICD-COVID-19-Testing-Summary_-Week-23-2020-005.pdf [17 June 2020]

Nordling, L. (2020). HIV and TB increase death risk from COVID-19, study finds—but not by much. Science, 15 June 2020.

NPR Material. (2020). CDC “clarifies” guidance on surface spread of COVID-19. Medical Brief.

Pirisi, A. (2000). Low health literacy prevents equal access to care. ***Lancet***, ***356***(9244), 1828. https://doi.org/10.1016/S0140-6736(05)73297-9

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

Ravalllion, M. (2020). On the virus and poor people in the world. Blogpost: https://economicsandpoverty.com/2020/04/02/on-the-virus-and-poor-people-in-the-world/

Rothschild, N. (2020). ***Immigrants are the hidden flaw in Sweden's anti-lockdown strategy***. https://foreignpolicy.com/2020/04/21/sweden-coronavirus-anti-lockdown-immigrants/

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

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]

Verity, R., Okell, L. C., Dorigatti, I., Winskill, P., Whittaker, C., Imai, N., Cuomo-Dannenburg, G., Thompson, H., Walker, P. G. T., Fu, H., Dighe, A., Griffin, J. T., Baguelin, M., Bhatia, S., Boonyasiri, A., Cori, A., Cucunubá, Z., FitzJohn, R., Gaythorpe, K., … Ferguson, N. M. (2020). Estimates of the severity of coronavirus disease 2019: a model-based analysis. ***The Lancet Infectious Diseases***, ***20***(6), 669–677. https://doi.org/10.1016/S1473-3099(20)30243-7

Williamson, E., Walker, A. J., Bhaskaran, K. J., Bacon, S., Bates, C., Morton, C. E., Curtis, H. J., Mehrkar, A., Evans, D., Inglesby, P., Cockburn, J., Mcdonald, H. I., MacKenna, B., Tomlinson, L., Douglas, I. J., Rentsch, C. T., Mathur, R., Wong, A., Grieve, R., … Goldacre, B. (2020). OpenSAFELY: factors associated with COVID-19-related hospital death in the linked electronic health records of 17 million adult NHS patients. ***MedRxiv***, 2020.05.06.20092999. https://doi.org/10.1101/2020.05.06.20092999

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]

World Health Organization. (2020). ***Coronavirus disease (COVID-19) advice for the public***. Available: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public [14 June 2020]

Yaya, S., Yeboah, H., Charles, C. H., Otu, A., & Labonte, R. (2020). Ethnic and racial disparities in COVID-19-related deaths: counting the trees, hiding the forest. ***BMJ Global Health***, ***5***(6), e002913. https://doi.org/10.1136/bmjgh-2020-002913

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