



LOSS OF HOUSEHOLD INCOME AND SELF- REPORTED HEALTH DURING THE COVID-19 LOCKDOWN IN SOUTH AFRICA

A Research Report submitted in partial fulfilment of the
Degree of
Master of Commerce (Economic Science)
in the School of Economics and Finance,
University of the Witwatersrand

by

Cayla Pillay
Student no: 1469745

Word count: 8679

ABSTRACT

The COVID-19 pandemic struck the world unexpectedly and caused a detrimental economic and health crisis worldwide. Globally, lockdown protocols were implemented to ease the pandemic's initial effects, and South Africa was no exception. This paper provides evidence of the relationship between loss of household income and self-reported health. This study uses a fixed-effects Linear Probability Model (LPM), and the results present a negative relationship between loss of household income and self-reported health. The changes in lockdown levels have no significant effect on loss of income. The outcomes suggest that when income is lost, the health of individuals tends to deteriorate.

Keywords: loss of household income, self-reported health, fixed-effects Linear Probability Model (LPM), lockdown levels.

INTRODUCTION

Considering the prevailing inequality in South Africa, it is unsurprising that changes to and within the economy affect the population differently. When the COVID-19 pandemic hit South African shores and the first case was reported on the 5th of March 2020, worry and panic started to creep its way in, and by the 15th of March 2020, a state of disaster was announced and life as we knew it ceased to exist (South African Government News Agency, 2020; du Plessis et al., 2022). The South African government followed suit the rest of the world and initiated a lockdown system. At midnight on the 26th of March 2020, the country went into an alert level 5 lockdown to slow the spread of the virus and prepare the healthcare system for an influx of COVID-19 cases (South African Government, 2020). The parameters of alert level 5 lockdown entailed the ceasing of all economic activity except the production and transportation of essential goods and services and the strict instruction for every person to remain in their homes, only leaving if completely necessary for essential goods and if emergency healthcare was required (Turner, 2020). With high volumes of people working and living in the informal sector and informal settlements, respectively, lockdown restrictions mean people are locked out of employment and are unable to earn a living, also adhering to COVID-19 guidelines such as social distancing and mask-wearing with a

disturbing lack of resources seems impossible, increasing the risk of infection (Mbunge, 2020; Staunton et al., 2020; Nwosu & Oyenubi, 2021).

These drastic measures resulted in many workers, and as noted previously, the more vulnerable, low- and middle-skilled workers to be laid off temporarily without pay or had their employment terminated permanently. An estimated 40% drop in active employment occurred during the alert level 5 lockdown. Half of this comprises job terminations, suggesting persistent labour market effects (Jain et al., 2020). Vulnerable groups are disproportionately affected (Jain et al., 2020). Comparing lockdown incomes of job losers to re-weighted job retainers, a recent report estimates that 20-33% of job losers fall into poverty (Jain et al., 2020). The effects of the restrictions that were put in place were widespread, but the effects on the vulnerable were detrimental. South Africa is categorised as an upper-middle-income country by the World Bank, yet it is still considered one of the most unequal countries in the world, where 10 percent of the population owns more than 80 percent of the wealth (World Bank, 2022). The high levels of unemployment and unnerving poverty rates emphasise the vulnerability of majority of the population to be affected by lockdown restrictions surrounding the COVID-19 pandemic (Joska et al., 2020; Bong et al., 2020).

Correlation and causation are important topics in economics. Correlation is a statistical measure that describes the direction and size of the relationship between two or more variables (ABS, 2021). Causation shows that one event results from the occurrence of the other event (ABS, 2021). It can be said that unemployment and, hence, loss of income are correlated with overall health. Therefore, it can be said that a relationship exists between loss of income and health. Due to the COVID-19 pandemic, many people lost their employment, resulting in a loss of income. With this sudden and potentially permanent loss of income, deterioration in overall health and well-being is expected. The stress of being unable to provide for the needs and wants of the household could lead to severe consequences. Unemployment causes stress, which eventually has long-term physiological health effects and can have negative consequences for people's mental health, including depression, anxiety and lower self-esteem (Wilson & Finch, 2021). Recent evidence shows that the fear and psychological distress associated with and the uncertainty and volatility surrounding the coronavirus are experienced across the globe. Worldwide, numerous aspects of life under forced confinement, including limited physical mobility, emotional distress, and, for

some, extreme threats to survival, are understood to pose significant risks for mental distress and illness (Brooks et al., 2020).

In the United States alone, 50% of those who participated in the Kilts Nielsen Consumer Panel surveys stated loss of income due to COVID-19. By virtue, South Africa is no exception to these effects. A 2020 study conducted in Soweto, Johannesburg, about the mental and emotional effects of COVID-19 showed that fear and distress about contracting the coronavirus are prevalent (Kim et al., 2020). Unemployment also has significant effects on the physical health of individuals. Being unemployed is a very stress-inducing situation; it may cause stress-related health issues such as headaches, high blood pressure, diabetes, heart disease, back pain and insomnia (Indeed Career Guide, 2021). These conditions mentioned, both physical and mental, require medical attention and treatment. With a loss of employment, many lose the benefits of medical aid. With the loss of income, individuals tend not to prioritise their health and spend less money on it, causing their health to worsen. When the overall income in the household decreases or is completely lost, individuals restrict expenditure and reduce their expenses on health-related goods and services like healthy nutritious food, a gym membership and leisure time for stress relief to maintain one's mental health. They focus on regaining an income to continue providing for the household.

Early research shows that, unsurprisingly, the pandemic disproportionately affected those already socially and economically disadvantaged (Arndt et al., 2020). The sudden loss in income and the potential fall into poverty can have severe effects on the mental and physical health of individuals and, more specifically, individuals who are already constantly under pressure to secure income to provide for their households. The loss of employment and income combined with pre-existing hardships such as hunger, insufficient healthcare for previous chronic diseases and viruses like diabetes and HIV and violence will negatively impact the mental and physical health of individuals (Docrat et al., 2020; Kim et al., 2020). In more current research and specifically a paper by Julius Ohrnberger (2022), the author's findings concur with previous work on the loss of income and health, showing that the lockdown-induced income shock significantly affected health. The study also reported that cash transfers through the initial increases in child support grants helped mitigate the effects of income loss for the most vulnerable groups.

This study aims to extend and add to the ideas presented in Ohrnberger (2022). Unlike Ohrnberger (2022), this paper will centre solely on the data presented in NIDS-CRAM and use additional

waves of the data from the dataset, which exclusively focuses on the lockdown period in South Africa. This study will also consider three waves of data which cover the multiple changes in lockdown levels and consistently report the findings for the chosen set of variables. The paper would like to highlight an important point: the initial shock, while significant, is not the only factor that matters. Given the virus's unpredictable nature, policy changes and lockdown levels fluctuated frequently. This constant change in lockdown levels, in turn, resulted in multiple shocks in the economy, the volatility of jobs and employment and, as such, the volatility of income and self-reported health. All the shocks over the three-wave data period will be analysed. Throughout the NIDS-CRAM data collection period, there were seven changes in the lockdown level, each presenting its economic shocks. In addition to the baseline lockdown measures that were put in place, extended policies, restrictions and aid were introduced over the lockdown period. A ban on the sale and distribution of cigarettes and alcohol was imposed in the initial lockdown; the alcohol ban was lifted and reinstated a total of 4 times. This industry took a big hit and affected the livelihoods of those employed within it. Cash transfers of increased child support grants helped mitigate the impacts of income loss in the short run (Ohrnberger, 2022). The increased amounts only lasted a limited time, until October of 2020; once that additional aid ended, changes that affected household income occurred again.

This study aims to investigate and address the themes mentioned above related to loss of household income and self-reported health during the COVID-19 lockdown in South Africa. The study aims to ascertain if a relationship exists between self-reported health and loss of household income and whether the relationship is positive or negative. Six covariates are analysed: education level, age, race (population group), gender, informal housing and residential location. The study also aims to investigate if the fluctuations of the different lockdown levels affect the loss of income and self-reported health. This analysis comprised two main steps. First are the descriptive statistics of all measures at each study round for the analysis sample using frequencies. Second, a fixed-effects Linear Probability Model (LPM) is used to examine the relationship between self-reported health and loss of household income and the impact of COVID-19 restrictions on the relationship between self-reported health and loss of household income.

LITERATURE REVIEW

The health and well-being of a person continuously fluctuate, as many factors within the individual and society can positively and negatively affect a person's mental and physical health. Six main factors of importance determine one's health: heredity, environment, lifestyle, socio-economic conditions, health services and health-related systems (Lisha, 2011). These factors are not stand-alone determinants; they are related and work hand in hand.

An individual's socio-economic status directly affects the environment in which a person interacts and lives, the lifestyle they can follow, and their access to good healthcare services. Socio-economic status affects overall human functioning, including physical and mental health (American Psychological Association, 2010). Income is one of the main contributors to determining one's socio-economic status. Therefore, losing one's income can be considered a factor that can impact an individual's health. The loss of income can be a very traumatic experience and can lead to many problems. The overall impact of losing a source or even the only source of income is quite widespread. Many factors in an individual's life will be affected.

When the primary source of income is lost, the situation's circumstances determine the response toward the loss. When the COVID-19 pandemic hit the world in 2020, it was unexpected and completely unfamiliar. Not only were jobs lost, but the entire market had crashed and could not cater to the employment needs. Unemployment increased rapidly and significantly. Globally, economies could not recover quickly due to the magnitude of the situation. By looking at the circumstances surrounding the loss of income due to the COVID-19 pandemic, an analysis is done to determine the effects on individual health. Extensive work has been done to outline the impacts of the pandemic worldwide. More so, the effects on mental health due to the COVID-19 pandemic have been substantially covered (Oyenubi & Kollamparambil, 2020; Posel et al., 2021). Across the globe, different measures were put into place to mitigate the effects of the virus. In South Africa, various lockdown levels were implemented, changing according to the severity of the virus at different periods. By looking at the effects at these periods, we deduce if they had any additional effects on individual health.

Research has been done worldwide that provides evidence that a loss of income affects people's mental and physical health. In the United Kingdom, evidence was presented showing the effects of the COVID-19 lockdown and how the loss of income and unemployment disproportionately

affected those already disadvantaged groups, especially those with young children (Barr et al., 2021). It was shown that there was a sizable increase in the costs of having children at home for extended periods without access to vital free services. Over a third of low-income families with children increased their spending in 2020, while 40% of high-income families without children reduced theirs (Barr et al., 2021). The deteriorating physical health of the low-income groups who potentially already have pre-existing medical conditions was also mentioned to emphasise the ramifications of the COVID-19 lockdown in the UK. By highlighting the existing health disparities within the UK and then showing the link to the COVID-19 economic fallout, the authors were able to emphasise how economic and health disparities are connected. Using existing research, statistical data, and specific examples like the disproportionate impact on low-income families adds depth to the analysis. The authors provide a nuanced understanding of the lasting impact of the pandemic on society. The authors also noted that now, in the UK, one in every six children and young people suffer from some form of mental illness due to the disruption in their lives, like food poverty as a result of job and income loss. While the study provides valuable contributions, it has a very limited discussion on the methodology used to make predictions and derive data. The study does well to highlight the challenges, although a more extensive discussion on solutions, policy recommendations, and interventions can be had.

In a developing country like India, which currently has the largest population in the world, the effects of the COVID-19 pandemic were experienced on a larger scale. An outline of the impact of the COVID-19 pandemic on India is given in the paper entitled "COVID-19 pandemic! Its impact on people, economy, and environment" (Debata et al., 2020). It was noted that when the national lockdown was implemented in India, large corporations and industries that employed millions of people had to either shut down or halt their productivity. Major industries like tourism, hospitality, and construction had to put off their workers. A large percentage of these workers happen to be migrant workers who were left destitute without work; these individuals also started experiencing discrimination, which further affected their mental health. The prolonged lockdown that resulted in the rapid depletion of resources and extended periods without household income led to a severe deterioration in the mental health of the people. Increases in anxiety, depression and stress were evident. The physical health of women also decreased with a rapid increase in gender-based physical and sexual violence as men were now at home due to job loss. The violence against women results in injuries and profound physical, mental, sexual, and reproductive health

problems, including sexually transmitted infections and unplanned pregnancies (Debata et al., 2020). The authors do well to comprehensively explore the multifaceted effects of the pandemic in India, specifically, individuals, health, the economy, and the environment. The paper analyses how these domains are connected and integrates insights from environmental, health science and economic studies to produce an overall understanding of the consequences of the COVID-19 pandemic. With this localised perspective of the pandemic's effects, the study becomes crucial in providing insights into India, mainly because of the country's diverse socio-economic landscape. Multiple policy measures initiated by the government are highlighted, providing a deeper understanding of the implemented interventions. The research is thorough but lacks empirical data as support. The incorporation of statistical evidence would strengthen the findings. An extended discussion on the impact on people with low socio-economic statuses could be had to delve deeper into the effects on this group.

As mentioned above and supported by the findings presented by the studies, the effects of the COVID-19 pandemic and income loss would generally affect those already disadvantaged and of a low socio-economic level. These people could also already have underlying health conditions that worsen due to the added stress and pressure of income loss. People with chronic conditions are disproportionately prone to COVID-19-related hospitalisations, intensive care admissions, and mortality compared to those without chronic conditions (Singh et al., 2021). These vulnerable people are particularly susceptible to adverse health impacts from delayed or foregone care during the pandemic; this could result from income loss and the inability to afford this care.

A team of researchers in India investigated this theory (Singh et al., 2021). In a cross-sectional study using a sequential mixed methods design, their findings indicate that the pandemic caused severe disruptions to the lives of people with chronic diseases in India, such as unhealthy diet and physical inactivity, sleep disturbances, stress, and anxiety. Access to health services was also significantly reduced as all efforts and resources were targeted at COVID-19 patients and cases. As expected, those in rural areas were disproportionately more affected. In the full multivariable-adjusted regression model, the researchers found difficulties in accessing medicine, job loss, and government financial support to be significantly associated with the worsening of diabetes or hypertension symptoms (Singh et al., 2021). This demonstrates through empirical findings that job and income loss affect individuals' mental and physical health. The use of a sequential mixed

methods design allows the study to provide a thorough analysis that is robust, incorporating multivariable regression models to identify factors associated with difficulties in accessing healthcare and worsening chronic conditions. The sample used is particularly representative, including participants from both urban and rural settings. This allows for a holistic understanding of the impact across diverse populations and becomes crucial for tailoring interventions to vulnerable groups. While the study does focus particularly on diabetes and hypertension, it could benefit from exploring the impact on individuals with other chronic conditions to provide a more comprehensive understanding.

It is important to note and acknowledge that researchers have also analysed the impact of income loss on health prior to the global COVID-19 pandemic of 2020. Catastrophes from the past, such as the 2008 financial crisis and Hurricane Katrina that occurred in 2005 had dire consequences on individuals' health due to income loss. The 2008 financial crisis was a devastating period for all economies around the world. The aftereffects were detrimental and lasted for many years after it took a long time for countries and economies to recover; some are still in that process.

One country that felt the effects of the financial crisis quite prominently within the European Union was Greece. In a 2015 paper, an analysis was done to investigate the impacts of unemployment and loss of income on self-rated health in Greece over two periods (Drykadis, 2015). The two time periods were 2008-2009, which was the initial period of the crisis, and 2010-2013, which was the period in which the effects of the crisis were felt. According to the paper, unemployment doubled in the 2010-2013 period, resulting in Greece experiencing the highest unemployment and income loss among the countries of the EU region and OECD during the financial crisis (Drykadis, 2015). The findings showed that job loss and loss of income negatively impact the health of individuals both physically and mentally. These findings are consistent with other literature showing that income loss directly affects health. The study also noted that women were more negatively affected than men and that already vulnerable individuals experienced more severe consequences of involuntary unemployment and income loss. The study's use of a six-wave longitudinal dataset allows for a comprehensive analysis of changes over time. This captures the dynamics of the relationship between loss of income or unemployment and health. The specification of involuntary unemployment addresses the reverse causality issue and adds to the reliability of the findings. The study is quite relevant to policy as it highlights the importance of social protection responses and

suggests interventions to mitigate significant risk factors, especially for the more vulnerable population groups. The study could benefit from delving into the possible impacts of reduced government spending on health services during the financial crisis and the possibility that individuals were unable to maintain healthy lifestyles during the crisis. These factors could have influenced the health outcomes. Given the COVID-19 pandemic's economic fallout, these findings from this study of the 2008 financial crisis suggest that income loss during the pandemic may adversely affect health outcomes.

In 2005, the southeastern area of the United States was struck by a Tropical cyclone that came to be known as Hurricane Katrina. In a matter of days, the lives of thousands of people had changed forever. Their livelihoods were disrupted beyond measure, and they were left destitute. The city of New Orleans and surrounding areas were hit the hardest. With over 1800 fatalities and billions of dollars in damages, people were left hopeless. Situations such as these have lasting impacts that affect for years to come, which was so in this case. In 2010, a study was published outlining the effects of Hurricane Katrina on the mental and physical health of low-income families in New Orleans (Rhodes et al., 2010). The authors recorded that the experience of the disaster, induced stressors into the lives of the survivors; these included but were not limited to PTSD, fear, financial and employment insecurity, homelessness, and loss of property. The rates of mental and physical illness rose drastically. The results show that these factors contributed significantly to the deterioration of overall health among the survivors. This study again shows and demonstrates the consistency across the board that indicates that loss of income negatively impacts one's health. The study's focus on low-income parents and specifically African-American single mothers does well to highlight the fact that certain demographic groups are more vulnerable during disasters. Including pre-Katrina resources such as social support and car ownership provides a better understanding of factors influencing the exposure to stressors. While the study highlights the need for interventions and policies such as additional economic and educational resources, it does lack in specifying policy recommendations that are suited to the vulnerabilities found in the study.

In more recent research, a 2022 study was published relating directly to the topics to be discussed in this paper (Ohrnberger, 2022). Using a difference in difference econometric method and comparison data from the NIDS and NIDS-CRAM data sets, the author investigated the effect of COVID-19 income shocks on health (Ohrnberger, 2022). The results show that the lockdown

income shock significantly reduced health, but there was no difference in effect across different wealth quartiles. The analysis also presented a mitigation to the income shocks that negatively affect the most vulnerable groups, which is cash transfer in the form of social grants. More specifically, this paper focused on child support grants. The analysis shows that a lockdown induced income shock caused adverse health outcomes; however, a pro-poor cash transfer programme protected the most economically vulnerable from these negative health effects (Ohrnberger, 2022). Using a difference-in-difference analysis, the study is able to provide a rigorous approach to isolate the causal impact of income loss on health outcomes. Using both NIDS and NIDS-CRAM data enhances the results' reliability and offers a dynamic analysis of changes over time. The study conveys the policy implications of the findings well and recommends possible social protection programmes that could combat the health impacts of income loss during crises. While the study presents a comprehensive report, including more waves of the NIDS-CRAM data would enhance the robustness of the findings. The measurement of wealth quartiles based on financial values in 2017/2018 may present limitations due to potential changes in financial assets; a more updated measure would strengthen the analysis.

METHODOLOGY

Data and sample

The data used in this paper is taken from the NIDS-CRAM dataset. The National Income Dynamics Study – Coronavirus Rapid Mobile Survey is a nationally representative panel survey of South African individuals (CRAM, 2020). The same group of people were contacted periodically throughout the duration of the study, which spanned over a year from May 2020 to May 2021, and they were asked a range of different questions relating to employment, income, household welfare, government assistance and their behaviour and knowledge about COVID-19. Five waves were conducted in the study, and the aim of the study was to have nationally representative data on the above-mentioned key concepts. The NIDS-CRAM data represents a sample of adults taken from wave 5 of the National Income Dynamics Study (NIDS) conducted in 2017. NIDS is a broadly nationally representative panel study following the lives of the same 28,000 South Africans and those they live with every two to three years since 2008 (CRAM, 2020).

This research report uses data from three waves (Wave 1, 4 and 5) of the National Income Dynamics Study- Coronavirus Rapid Mobile Survey (NIDS-CRAM) to assess the relationship between the loss of household income and self-reported health over time during the COVID-19 lockdown in South Africa. NIDS-CRAM is a rapid assessment telephone survey that was conducted to track the socio-economic effects of the COVID-19 crisis in South Africa during the first year of the pandemic and ongoing lockdown restrictions. In each wave, interviews were conducted using Computer Assisted Telephone Interviewing (CATI), which were, on average, 20 minutes long and conducted in the preferred language of the respondent. Wave 1 of this study was conducted between the 7th of May and the 27th of June 2020 (lockdown level 5) among a sample of 7 073 adults aged 18 years and older. These individuals were subsequently followed for another four waves (Wave 2 to 5) with a response rate between 70% and 80%. Wave 4 was conducted between the 2nd of February 2021 and the 10th of March 2021 when the country was on adjusted lockdown level 3, and Wave 5 was conducted between the 6th of April and the 11th of May 2021 during adjusted lockdown level 1. Since the data was collected for six reference months during the five waves of the survey, this made it possible to track how varying lockdown levels impacted outcomes. Only 3 of the 5 waves of data were used since it is where the outcome and main predictor of this analysis were measured.

Measures

Outcomes

The primary outcome of this analysis is self-reported health. Participants were asked to describe their health at present on a 5-point Likert scale: “1. *Excellent*”, 2. *Very good*, “3. *Good*”, “4. *Fair*” to “5. *Poor*”. In this analysis, the self-reported health rating was recorded as 1, representing good to excellent health and “0” for poor to fair health. The main predictor variable, loss of household income, was defined based on either a reported loss of income or a decrease in income. Since Wave 1 was conducted at the beginning of COVID-19 in 2020, participants were asked the following question: “Has the household lost its main source of income since the lockdown started on the 27th of March?” in the following waves Wave 4 and 5, the question was changed to participants and they were asked what their main household source of income was at the beginning of the year, and then a follow-up question on whether the household's main source of income changed in the past 4 weeks. The answer options for this follow-up question were: “1” increased,

"2" decreased, or "3" stayed the same. Given this, participants who reported either a loss of income or a decrease in income at any of the three waves were coded as loss of household income. The COVID-19 lockdown indicator was defined based on the lockdown level and period and how this aligns with the NIDS data collection. During the Wave 1 data collection period, the earliest data collection interview in the analytic sample was conducted on the 7th of May 2020, the month in which South Africa moved to Lockdown level 4 , while it was adjusted to lockdown level 3 at Wave 4, and adjusted lockdown level 1 at Wave 5 hence the COVID-19 indicator had three levels.

Covariates

The covariates that are used in the analysis are education level, age, race (population group), gender, informal housing and residential location. Age was divided into four age groups: 15-24, 25-54, 55-64, and 65+ years. Education level was divided into "1" no schooling, "2" primary or secondary school, "and 3" matric or vocational certificate or national certificate. Race was categorised into four groups, namely: "1" African/Black, "2" Coloured, "3" Asian/Indian, and "4" White. These covariates were informed by literature on the effects of changes in household income on health.

Statistical methods

The analysis utilises the fixed-effects Linear Probability Model (LPM), estimated using Ordinary Least Squares (OLS) as described in Frolich (2006). This model allows the inclusion of survey year fixed effects and is simple to interpret and estimate. Given the panel nature of the data, a Linear Probability Model (LPM) for a binary dependent variable y_{it} is estimated:

$$y_{it} = \emptyset_0 X_{it} + \emptyset_1 (W_{it}) + \gamma_t + e_{it} \quad (\text{Equation 1})$$

where y_{it} denotes the above-mentioned binary outcome variable self-reported health for individual i in Wave t (1-3), X_{it} is the main predictor variable (i.e. income change), W_{it} is a vector of independent variables (i.e., gender, age, education level, race and type of housing), and γ_t are survey year fixed effects, and e_{it} which is the error term. The equation above can be written as below:

$$self - reported\ health_{it} = \emptyset_0 Income\ change_{it} + \emptyset_1(W_{it}) + \gamma_t + e_{it} \quad (\text{Equation 2})$$

An interaction model specification is used below to estimate the effects of income change on self-reported health during the different lockdown levels in South Africa.

$$self - reported\ health_{it} = \emptyset_0 Income\ change_{it} * Lockdown_{level_{it}} + \emptyset_1(W_{it}) + \gamma_t + e_{it} \quad (\text{Equation 3})$$

Stata 17 was used to produce the regression results. The command “reghdfe a generalisation of areg (and xtreg,fe, xtivreg,fe) for multiple levels of fixed effects” was used to estimate fixed-effects LPM.

RESULTS

This section presents the results from the fixed-effects Linear Probability Model (LPM) used to analyse the data. Two relationships were explored, firstly the relationship between self-reported health and income loss (Table 2) and secondly what effect did the COVID-19 lockdown levels in South Africa have on the relationship between self-reported health and income loss (Table 3). A two-model approach is used to verify the robustness of the results in each case.

Table 1 provides a descriptive summary statistic of the sample, outlining the main outcome, main predictors and the covariates used in the analysis. Some noticeable sample characteristics that can be seen are that around 70% of the sample reported good health across the 3 waves of data used. Income loss considerably varied, with income loss or decrease having dropped from 42% in Wave 1 to as low as 14.6% in Wave 5. Initially, at the onset of the pandemic, over half of the sample reported a loss or decrease in income, but toward the end of the research and data collection period, i.e., waves 4 and 5, most people reported that their income did not change. Other notable characteristics of the data include that majority of the sample are between the ages of 25 – 54 years old, more than two-thirds of the sample are women, most people reported having an education level of between primary school and a national certificate and finally, over 85% of the sample identified themselves into the African/black population group.

Table 1: Descriptive statistics

Variables	Wave of Survey (Unweighted)		
	Wave = 1	Wave = 4	Wave = 5
	N=4,135	N=4,135	N=4,135
Main outcome	N (%)	N (%)	N (%)
Health rating			
0. Poor to fair health	1,256 (30%)	1,274 (31%)	1,151 (28%)
1. Good to excellent health	2,879 (70%)	2,861 (69%)	2,984 (72%)
Main predictors			
Loss of income			
0.No	2,337 (56.5%)	3,054 (73.9%)	3,334 (80.6%)
1.Yes	1,717 (41.5%)	828 (20%)	601 (14.6%)
Lockdown level			
Level 1	0 (0%)	140 (3%)	4,135 (100%)
Level 3	4,131 (100%)	0 (0%)	0 (0%)
Level 4	4 (0%)	3,995 (97%)	0 (0%)
Covariates			
Age group			
1. 15-24	595 (15%)	401 (10%)	387 (10%)
2. 25-54	2,764 (68%)	2,851 (70%)	2,854 (71%)
3. 55-64	364 (9%)	385 (10%)	387 (10%)
4. 65+	328 (8%)	410 (10%)	419 (10%)
Sex			
1. Man	1,544 (37%)	1,546 (37%)	1,546 (37%)
2. Woman	2,587 (63%)	2,589 (63%)	2,589 (63%)
Informal housing			
0. No	3,223 (78%)	3,143 (76%)	3,152 (76%)
1. Yes	869 (21%)	853 (21%)	839 (20%)
Missing	43 (1%)	139 (3%)	144 (3%)
Education level			
1. No schooling	96 (2%)	104 (3%)	104 (3%)
2. Primary OR secondary school	2,148 (52%)	2,172 (53%)	2,172 (53%)
3. Matric or Vocational or national certificate	1,868 (45%)	1,838 (45%)	1,839 (45%)
Population group			
1. African/Black	3,581 (87%)	3,581 (87%)	3,582 (87%)
2. Coloured	339 (8%)	339 (8%)	342 (8%)
3. Asian/Indian	30 (1%)	30 (1%)	30 (1%)
4. White	178 (4%)	178 (4%)	179 (4%)

**This study focused on sample estimates and did not apply survey weights for this analysis. Those coded as missing reported either as "I do not know" or refused to participate.

Table 2: Association between income change and self-reported health using a fixed-effects LP model.

Factors	Self-reported health	
	Model 1	Model 2
	β co-efficient	β co-efficient
Income loss (Reference category: No)		
1. Yes	-.0645*** (0.0104)	-0.0503*** (0.0105)
Covariates		
Age group (Reference category: 65+)		
1. 15-24		0.0562** (0.0227)
2. 25-54		0.0561*** (0.0192)
3. 55-64		0.00734 (0.0236)
Women		-0.0138 (0.0102)
Informal housing		-0.0126 (0.0121)
Education level (Reference category: No schooling)		
2. Primary OR secondary school		0.0906*** (0.0332)
3. Matric or Vocational certificate or National certificate		0.123*** (0.0339)
Population group (Reference category: White)		
1. African/Black		-0.228*** (0.0202)
2. Coloured		-0.0204 (0.0228)
3. Asian/Indian		-0.0385 (0.0482)
Constant	0.724*** (0.0083)	0.781*** (0.0389)
Year of survey (Reference category: wave 1)		
Year of survey fixed effects	Yes	Yes
No. of observations	11,871	11,257
No. of clusters	4,134	4,108

Robust standard errors clustered at household level are in parentheses.

***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively.

Table 3: Impact of COVID-19 lockdown on the association between income change and self-reported health using a fixed-effects LP model.

Factors	Self-reported health	
	Model 1 β co-efficient	Model 2 β co-efficient
Income loss (Reference category: No)		
1. Yes	-0.0504*** (0.0105)	-0.0543*** (0.0207)
Lockdown level (Reference category: Level 1)		
1. Level 3	-0.109** (0.0525)	-0.113** (0.0533)
2. Level 4	0.0220 (0.0423)	0.0232 (0.0425)
Interaction terms of (Income loss and lockdown level)		
1. Yes# Level 3		0.0112 (0.0253)
1. Yes# Level 4		-0.00437 (0.0269)
Age group (Reference category: 65+)		
1. 15-24	0.0567** (0.0227)	0.0564** (0.0227)
2. 25-54	0.0566*** (0.0192)	0.0562*** (0.0192)
3. 55-64	0.00776 (0.0236)	0.00742 (0.0236)
Women	-0.0138 (0.0102)	-0.0137 (0.0102)
Informal housing	-0.0126 (0.0121)	-0.0128 (0.0121)
Education level (Reference category: No schooling)		
2. Primary or secondary school	0.0904*** (0.0333)	0.0902*** (0.0333)
3. Matric or Vocational certificate or National certificate	0.122*** (0.0339)	0.122*** (0.0339)
Population group (Reference category: White)		
1. African/Black	-0.228*** (0.0202)	-0.228*** (0.0202)
2. Coloured	-0.0200 (0.0229)	-0.0200 (0.0229)
3. Asian/Indian	-0.0411 (0.0489)	-0.0407 (0.0488)
Constant	0.890*** (0.0613)	0.890*** (0.0618)
<i>Year of survey (Reference category: wave 1)</i>		
Year of survey fixed effects	Yes	Yes
No. of observations	11,257	11,257
No. of clusters	4,108	4,108

Robust standard errors clustered at household level are in parentheses.

***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively

In the results represented in Table 2, model 1 displays a bivariate relationship between income change and self-reported health. The results yield an interesting relationship; they show a negative relationship between income loss and self-reported health. In particular, participants who reported an income loss were associated with a 6.5% decrease in the probability of reporting better health compared to those who reported no decrease or loss of income, and these results are significant at a 5% level. When covariates are added in model 2 of Table 2, similar results are observed, but the magnitude of the change in the probability of self-reported health reduces to 5.0% and remains significant at a 5% level, indicating a negative relationship between income loss and self-reported health. The results also show that being of a younger age and having a higher education level is associated with better health, while being of the African/black population group is associated with poorer health compared to being White. It is also concluded that sex and type of housing have no significant association with health.

The results from Table 3 show how the COVID-19 lockdown levels are put into the model as an interaction. In model 1 of Table 3, without the interaction term, a decrease in income is related to poorer health; specifically, reporting a decrease or loss in income was associated with a 5.0% decrease in the probability of reporting better health compared to reporting no loss of income. The results from model 1 also indicate that level 3 lockdown conditions were associated with a 10.9% decrease in the probability of reporting better health compared to lockdown level 1 conditions. The coefficient for lockdown level 4 conditions was not significant at 5% level. In model 2 of Table 3, it was tested to see if there are any interactions between income changes and changes in lockdown levels. Once more, an income loss or decrease was related to a decrease in self-reported health. However, it was also revealed that changes in lockdown levels present no significant interactions with income loss regarding lockdown level 1. The findings from both model 1 and model 2 in Table 3 are consistent with the outcomes from Table 2 regarding the covariates. A younger age and higher education level are associated with better health. Being of the African/black population group is related to poorer health. Again, it is noted that an individual's sex and type of housing had no significant effect on an individual's health.

DISCUSSION

When the COVID-19 pandemic started in 2020, many people either lost their employment or took severe salary cuts, resulting in income losses. The result of the analysis shows that changes in income and, more specifically, a decrease in income is negatively related to self-reported health of individuals. A significant relationship is presented. The interpretation of this is that when there was loss of household income, the health of individuals also deteriorated at the time of the pandemic. The robustness of the outcome was validated by a set of covariates, which included age, sex, population group, education level and type of housing. Each interaction yielded a different result. It is common knowledge that younger people tend to have better health, and that is what the findings show as well. An interesting observation was that a higher education level was associated with better health, indicating that those who are more educated reported better health at that time period. According to research, diseases occur more often among certain groups than in the general population (Health Essentials from Cleveland Clinic, 2014). Being a part of a certain race or ethnic group can subject an individual to certain ailments and illnesses. The findings indicate that being part of the African/black population group is associated with poor health. The analysis also revealed that the sex of an individual (i.e., male or female) does not have a significant impact on self-reported health. Housing conditions can influence our physical health (de Sa, 2017). Housing also has a huge influence on our mental health and well-being (de Sa, 2017). With that being mentioned, the findings of this analysis show that housing types have no significant effect on self-reported health during the COVID-19 lockdown.

This discussion aims to contextualise and interpret the findings in relation to the existing body of literature, as outlined in the literature review. The study's insights directly apply to the current global context of the COVID-19 pandemic, emphasising the importance of targeted interventions for vulnerable populations. The convergence of the results acquired in this study with prior research provides valuable insights into the study's broader implications. The results indicate that a relationship exists between loss of household income and health, and that relationship is negative. That interpretation is that during the COVID-19 lockdown in South Africa, those who lost or had a decrease in their income reported poorer health. Notably, the investigation builds upon the foundation established by previous researchers, offering a perspective on the relationship between self-reported health and loss of household income, particularly during the COVID-19 lockdown in

South Africa. The goal of synthesising the empirical evidence with the theoretical underpinnings identified in the literature review is to contribute to the ongoing discourse surrounding health and economic interactions, specifically loss of income and health. This study, like the studies outlined in the literature review, integrates health and economic dimensions, recognising the interconnectedness of these factors influencing outcomes.

The COVID-19 pandemic was so foreign to the world that when it started, countries across the globe put in place lockdown measures to help mitigate the spread of the virus and to allow the healthcare systems to prepare for treatment. During the lockdown period in South Africa, 5 lockdown levels were introduced at different times according to the severity of the virus. Throughout the lockdown timeframe, the lockdown levels fluctuated multiple times, and with that came multiple economic shocks as the economy was so volatile. This paper investigated if these movements influenced income loss and self-reported health. The lockdown levels were put into the analysis as an interaction with reference to lockdown level 1. The results yielded that there were no significant effects with regard to the fluctuations in lockdown levels and income loss. Lastly, the findings did, however, show that lockdown level 4 was associated with poorer health. Lockdown level 4 was the second-highest lockdown level with substantial restrictions that differed very slightly from lockdown level 5 with minor adjustments. Therefore, this outcome implies that individuals' self-reported health was also significantly low during lockdown level 4 when unemployment was high, and many had still not returned to work or continued to accept salary cuts.

CONCLUSION

The objective of this paper is to examine the relationship between loss of household income and self-reported health during the COVID-19 lockdown in South Africa and to investigate if the fluctuations of the different lockdown levels affect the loss of income and self-reported health.

In conclusion, this study has examined the relationship between loss of income and health. The findings demonstrate a significant association between loss of household income and an individual's physical, mental, and social well-being. Using a fixed-effects Linear Probability Model (LPM) with data from the NIDS-CRAM data set, the study yields the following results.

Loss of household income is found to be negatively related to self-reported health. It is also shown that people with higher educational levels are associated with better health while being part of the African/black population group is associated with poorer health. The findings indicate as well that sex and type of housing have no significant impact on an individual's health. The results also revealed that the changes regarding the different lockdown level fluctuations have no considerable effect on the model. However, the results show that during lockdown level 4, self-reported health was low.

The COVID-19 pandemic has further highlighted the importance of the relationship between loss of income and health. The pandemic has resulted in widespread job losses and economic disruption, which has disproportionately impacted already marginalised and vulnerable populations.

The in-depth literature review shows that loss of income has a negative effect on physical and mental health. Research has shown that the pandemic has had a significant impact on mental health, with increased rates of depression, anxiety, and other mental health conditions reported. The loss of income and financial insecurity resulting from the pandemic have been identified as key factors contributing to this increase in mental health problems. The results generated in this study are consistent with existing literature that presents findings that prove loss of income affects an individual's health. Therefore, the null hypothesis that there is no negative relationship between loss of household income and self-reported health is not rejected.

Moreover, the pandemic has also highlighted the importance of access to healthcare and social support networks, as individuals and communities affected by COVID-19 have faced significant challenges in accessing necessary healthcare services and support. The pandemic has underscored the need for policies and interventions that address the impact of income loss on health and improve access to essential healthcare and social support systems.

Overall, the COVID-19 pandemic has highlighted the critical importance of addressing the relationship between loss of income and health and has underscored the need for effective policy responses and interventions to mitigate the negative health consequences of income loss.

Ultimately, this research report contributes to our understanding of the relationship between loss of income and health. Further research is needed to explore the complex mechanisms underlying

the relationship between income loss and health and to identify effective strategies for addressing this critical public health challenge. Although this analysis does have limitations, the overall outcome is sufficient. Future research can be done to track the progress of these individuals' income and health changes post-COVID-19.

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