Income related health inequalities associated with Covid 19 pandemic in South Africa: evidence from wave 4.

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1. Introduction and Background

Even though there have been some observable significant developments within the average level of diseases and rates of mortalities in many nations (developed and developing), health inequalities that exist within and between various nations, within social groupings and different religious groups have expanded in the last years (CSDH/WHO, 2007). Respectively, this increase in health inequalities has been a growing concern for many governments across the world. Also, civil society organisations and other organisations operating internationally have been more concerned on how they would go about reducing these inequalities (CSDH/WHO, 2007).

On this point, the World Health Organisation has noted previously that the most efficient way for health care sector to contribute to the lessening or reduction of disparities existing in health is by establishing a good systems and procedures of primary health care. The contribution of a well-established primary health care system is through the realization of various mediations in order to deal with the social determining factors, and these are social and economic conditions that are inclusive of the health care system structure that is influenced by resources, power and the distribution of money that consequently influence separate and group differences existing within the status of health (Burger & Christian, 2018). The most recent available evidence suggests that primary health care principles and values, equity in health, people centred care and subsequently a most important part for communities in health action can answer to the prospects and challenges faced by the modern-day societies (NICD, 2020).

According to the National Institute for Communicable Diseases is the national public health institute of South Africa NICD (2020), the first case of Covid-19 in South Africa was reported at the beginning of March 2020, and in response to this, towards the end of March 2020, the South African government declared the State of National Disaster on the 15 of March after 51 cases of Covid-19 were reported with zero deaths and enforced stringent national lockdown rules and interventions with the efforts to control the spread of Covid-19. Some of the interventions imposed during this period included in many other the closing down of businesses with the exceptions of essential services in what was later labelled as Alert Stage 5 which took place from the 26th of March until the 16th of April 2020 and was later extended to the 30th of April 2020 (NICD, 2020). And in turn, this resulted in the population groups that are more vulnerable (low-income earners, those that are residing in informal settlements and lastly those that are precariously employed) being more likely to be unfavourably impacted as a result of

job losses which consequently resulted in the loss of income. Nwosu & Oyenubi (2021) also note that because of this, losses in income are more likely to result in in the inability to have proper access to healthcare and diet that is nutritious, with the succeeding impact on health outcomes.

During this period, it was estimated that the South African economy would see a 3.2% reduction as a result of the Covid-19 pandemic (Fernandes, 2020). The persistence of the lockdown imposed by the South African government up to the middle of June 2020 resulted in the economy reducing by up to 6.8%, and a persistent reduction of up to 10.8% when the lockdown continued to June 2020 (Fernandes, 2020).

According to a report by Statistics South Africa (Stats SA) (2020) the "Business impact survey of the COVID-19 pandemic in South Africa" 85% of businesses surveyed on the impact of Covid-19 on the turnover of businesses reported that their turnover was below the normal range, with 46.4% showing temporary closure or paused trading activity appropriated by Covid-19, whilst 36.8% of businesses expected their workforce size to decrease. Another similar survey conducted by Stats SA 2020, "Results from Wave 2 survey on the impact of the COVID-19 pandemic on employment and income in South Africa" shows that approximately 70% of the individual respondents have indicated that before the national lockdown, they were fully in paid employment and a further 15.3% which indicated that they were in self-employment. Roughly only 89.5% of respondents that were previously employed pre-Covid-19 pandemic stayed employed during the Covid-19 pandemic, whilst 8.1% stated that they had lost their jobs or were forced to close their businesses and the remaining 1.4% became jobless.

Roughly 70% of the respondents who lost their jobs due to the Covid-19 pandemic stated that it was due to the fact that their places where they work, or their businesses had shut down or due to less customers supporting their businesses (Stats SA, 2020). Pre-Covid-19 and the national shut down, many respondents suggested that they had previously done work from non-residential buildings, whereas merely 1.4% of those that are employed did work from home. Nonetheless, the Covid-19 outbreak brought change where only 77.9% of the respondents who were working during the national shutdown did so from their home spaces as compared to the 15.1% who did their work from non-residential buildings (Stats SA, 2020).

The survey also shows that the percentage of individual respondents who reported to have no income increased up to 15.4% by the 6th week of the national shutdown from only 5.2% pre-

lockdown. Whereas the many respondents previously reported wages or salary as their only source of income before the national lockdown and after, the percentage of income recipients from wages or salaries decreased up to 66.7% by the 6th week the national shutdown from 76.6% (Stats SA, 2020).

Undoubtably, such losses in jobs and income could unfavourably impact the health outcomes of those involved. The coronavirus epidemic is more likely to reveal, feed, and aggravate inequalities in health currently existing and these in turn might have dire consequences to the poorest of the poor. Covid 19 virus could also directly affect the individuals that have already been made weak and vulnerable by systematic inequalities in health, and subsequently, these inequalities could likely increase as the spread of this virus worsens. For instance, research conducted on the impact of Covid-19 on poverty in South Africa identifies food insecurity as the facet of the impact of Covid-19 (Bekker et al., 2020). Covid-19 pandemic caused a harmful spike in the prices of food across the country, in turn disproportionately impacting those that are the poorest in South Africa (Bekker et al., 2020). Another research conducted by Vaibhav *et al.,* 2009, identifies that health inequalities present during the Covid-19 pandemic are aggravated by comorbidities and interweaving risk considerations which in turn tend to adversely magnify the burden of the disease and thus this has been portrayed as the pandemic that is synergistic and co-occurring for the communities that are underprivileged.

Additionally, during March 2020, when the whole nation went into complete lockdown, many food traders operating in the informal economy were left vulnerable and as a result unable to practice their trade (Elliot, M. 2020). Taking into consideration that the informal economy in South Africa accounts for more than 70% of food sales, this as a result delivered huge blow to the food market (Elliot, M. 2020).

Established on the above-mentioned principles, the primary health care system explores different strategies in order to accomplish a health care system that is comprehensive and that is more equitable (Fernandes, 2020). Similarly, the Commission responsible for Social Determinants of Health has previously recommended that services of health care with universal coverage and an emphasis on primary health care could possibly assist in generating interventions that are locally appropriate throughout a selection of social determining factors by encouraging participation within the community and intersectoral activities, that in turn will result in the lessening of the social caused health disparities (CSDH/WHO, 2007).

Researchers and policy makers across the whole world have been looking for ways not only to make the status of health of the lager population better and mitigate the burden of diseases, disability, and ill-health, but also to mitigate and completely remove differentials existing in health, based on race, gender, geography, socio-economic status, and ethnicity (Futshane, 2020). Whereas the coronavirus pandemic has impacted most people, one cannot not stop but wonder if such harmful outcomes have been uniform, with high possibilities of various sections within society having more likelihood of being affected than others. It can already be assumed that in South Africa, the most vulnerable people like those who are unemployed, those that do not have jobs anymore because of the coronavirus epidemic, those that are living and surrounded by poor neighbourhoods and those that are experiencing poverty generally will likely bear the burden of the pandemic more as compared to those that are well-off.

Across the whole world disparities existing in health have attracted a substantial interest from health experts (Futshane, 2020). Survey evidence in South Africa suggests that inequalities in health exist mainly in socio-economic status and in relation to primary social services access, subsequently, these are aggravated by inequalities/disparities existing in wellbeing and health (Futshane, 2020). Whereas the health systems, in conjunction with the broader social determining factors of inequalities are still in line with improving the health status and health inequalities among people, the ones that are in need of good and proper healthcare access rarely receive it. Various studies conducted in relation to the weight exerted by poor health in South Africa shows that constantly, in relation to those that are rich or wealthy, those that live in poverty experience more suffering and distress from diseases and violence (Ndugga & Artiga, 2021).

Nonetheless, these studies conducted only focus on a selected diseases and are only taking into consideration a single point in time. Studies previously conducted on income related health inequalities like that of Nwosu & Oyenubi (2021) utilise the last wave of the National Income Dynamics Study (NIDS) (Wave 5). and the first wave of the NIDS-Coronavirus Rapid Mobile Survey (NIDS-CRAM) (Wave 1) which was conducted in May/June of 2020 (corresponding with level 4 and level 3 lockdown) and the NIDS wave 5 adult sub-samples looking at higher levels of lockdown. NIDS is a panel study that has been following the lives of the same 28 000 South Africans residents and those that they reside within their households since 2008, collected biennially, with WAVE 1 (the first wave) conducted during 2008 and subsequently wave 5, the last wave gathered during 2017 (Nwosu & Oyenubi, 2021). The NIDS-CRAM is

a national representative panel survey/study of approximately 7000 South Africans, where each person is contacted telephonically on monthly basis and asked a range of questions relating to their employment and income, welfare of their household, receipt of grants, and about their knowledge and behaviour related to the COVID-19 virus (Nwosu & Oyenubi, 2021).

The current study uses a different data sets, NIDS-Coronavirus Rapid Mobile Survey (NIDS-CRAM) (Wave 4) which was conducted in Feb/March of 2021 (corresponding with level 1 and level 3 lockdown) and the NIDS wave 5 adult sub-samples looking at lower levels of lockdown and providing a clear picture on how these health inequalities have progressed or reduced so that existing policies put in place by the national government and various decisions embedded in various macro and micro studies can be revisited and therefore different approaches to be taken in order to fight against socio political issues that have permitted the Covid-19 epidemic to discriminate against individuals of the population that are disadvantaged.

The analysis used in many instances in studies relating to health inequalities is mostly cross-sectional (Kakwani *et al.*,997). And in turn these analysis mainly focuses on a given point in time and in order assess the contributions made by socio economic factors in health inequalities, one way decomposition analysis may be used (Kakwani *et al.*,1997). Furthermore, they are likely to focus more on fewer indicators of health. When the focus is on few indicators, there may be a visible restricted view of various inequalities existing in health, and this may look down on the general health inequalities (Sauerborn *et al.*, 1996). On the other side, single time valuation in health inequalities could underestimate the social effects of reforms focused on health inequalities as it does not disclose the aspects that are most important for the re valuation of efficiency of policies previously established and interventions in health that are directed at mitigating income related health inequalities (Sauerborn *et al.*, 1996).

This study will help in uncovering changes in health inequalities especially in a country like South Africa and assist in the identification of significant drivers of changes within health inequalities, and subsequently advance the allocation of resources so that there is more reduction in health inequalities. Furthermore, the areas that need to be improved or need more intervention can be underlined. This study can also be used as a tool for providing feedback through the process of reviewing policy, particularly when taking more considerations to reforms that are focused on socio economic factors frequently focused on by policy.

This paper investigates health inequalities that are income related that are linked with the Coronavirus Epidemic in South Africa. To accomplish this, this paper made a comparison between income related inequalities before the coronavirus pandemic in 2017 and during the coronavirus pandemic induced lockdown in 2021 making use of the panel data that provides a linkage between individuals over two periods (NIDS and NIDS-CRAM datasets). This paper hypothesizes that ill-health or poor health outcomes will be concentrated mostly among those that are poor and consequently that the size of disparities existing in health during the coronavirus pandemic will be more than those observed before the pandemic. To test this hypothesis further this paper makes use of the concentration curves, indices and lastly, the main analysis, a decomposition approach.

2. Literature Review

2.1 Challenges Relating to Health Inequalities Within South Africa

Previously, prior to 1994, the systems of health in existing within South Africa were divided across racial lines (Kleinert & Horton, 2009). In this instance, one health system was more resourced and those who benefited from it were the white minority, whereas the additional health systems were under-valued and under-resourced, and the majority of black people benefited from this system (Van den Heever, 2016). Particularly, the health system was exceedingly distinguished by segregation of racial groups and systematic fragmentation, which consisted of 14 different and separate departments of health (Orach & Garimoi, 2009). The hospital sector was the only focus of the health services, there was an underdevelopment of primary health care services and health services that are among black people were underfunded (Booysen, 2003).

Since 1994, substantial developments have been observed within health systems and practices in South Africa. The National Health Plan, spearheaded by the African National Congress (ANC) government during 1994 paved a new way for a health system that is systematized and coherent (Booysen, 2003). Suitable primary healthcare access was made a foundation of policy for health care, with the institution of a medical treatment that is free for women that are pregnant and children that are younger than the age of 6 between the years 1994 and 1996, and this was later extended to all users (Gilson & McIntyre, 2007).

The spread within the outcomes of health in South Africa differs largely by social factors, like ethnic origin, marital status and also the socioeconomic status (Jewkes *et al.,* 2002). For

instance, a review done by Link and Phelan (1995) indicated that there is positive correlation between socioeconomic status and life expectancy and also a negative correlation with overall perinatal and infant mortality. In another study conducted by McKinnon *et.,al* (2014) they also reported that there is a negative correlation between the socioeconomic status of households and neonatal mortality in various low income and middle income nations, through the data sets they used attainable from demographic and health surveys conducted between the years 1997 and 2012. McKinnon *et al.,* (2014) further state that social inequalities that exist within the health outcomes of the population are sustained because of social conditions that exist suck as power money knowledge and social connections that are beneficial to some, which in turn help these individuals to avoid risks that are health related and thereby causing to adopt proper protective strategies and have better access to health medical facilities and services.

According to Kabudula *et al.,* (2017), between the period of 2001 and 2013, it was reported that 10414 people died in South Africa. Information provided from verbal autopsy interviews was accessible for 93.5% of the deaths that were recorded, of which the InterVA-4 model categorised 4.5% of these deaths as being indeterminate. The other 6.5% remaining deaths from the verbal autopsy information was mostly missing due to the incapability to make contact with suitable respondents. Accordingly, the overall mortality rate steadily reduced for children under the age of 5 years over the period of study, but decreased progressively thereafter (Kabudula *et al*., 2017). Generally, the life expectancy rate at birth reduced between 2001 and 2007, and again increased from 2001 to 2013. The mortality rate in adults and the life expectancy from birth for both men and women were consistently better. With the exceptions of the height of the HIV/AIDS epidemic during 2004 to 2007 and in the earlier years prior to that, it was found that there was a relationship that is strong and inverse between the mortality rate observed in children your than 5 years old and the socioeconomic status of these various households (Shisana *et al.*, 2005).

According to Coovadia *et al.,* (2009), the constitution of South Africa binds the state to get some work done concerning or towards the continuing realisation of the right to healthcare by many South Africa citizens. Nonetheless, 15 years later, the nation is still struggling with massive inequalities in health. The are marked and observable variations within diseases and mortality rates that exist within different races in this country, and which in turn reflect on various differences existing within racial groups in the access of basic household living conditions which are basic and other health determinants (Coovadia *et al.*,2009). For instance,

the country's estimates for HIV/AIDS indicate that men and woman that are Indian and white have a very low occurrence of diseases which are estimated at 0.6% to 1.9% respectively, while the highest prevalence of these diseases is mainly found within the black population (Groenewald *e al.,* 2008). During the year 2002, the mortality rate of infants of infants differed between 7% per 1000 infants in the white population and 67% per 1000 within the black population, subsequently, the life expectancy rate for white adult female was 50%, much longer compared to that of black woman (Coovadia *et al.,*2009).

Also in South Africa, there are considerable observable health inequalities that exist within and between provinces (Coovadia *et al.,*2009). For example, during the year 2000, mortality rates in children that are under the age of 5 years fluctuated from 46% per 1000 live births given in the province of the Western Cape up to 116 per 1000 live births in the province of KwaZulu Natal (Bradshaw *et al.,* 2000). Even within the metropolitan area of Cape Town, there is roughly three-fold difference in the mortality rate of infants within the middle-class areas and informal settlements (squatter camps) (Groenewald *et al.,* 2003). The age-standardised men asthma death rate in the province of Eastern Cape was 4 times more as compared to that observed in the Western Cape province; tuberculosis age-standardised death rate was 3 times more than the one in the Gauteng province (Bradshaw *et al.,* 2000).

Evidence from the paper presented by Booysen (2003), suggests that health inequalities that are of the result on access to health care services present in urban and rural areas in South Africa continue to persist, with all these health inequalities in most instances continuing to discriminate against on those that are living in poverty compared to those that are well off. In certain instances, health inequalities are worse off compared to other areas, for instance it is found that these inequalities are worse in urban areas compared to rural areas (Booysen, 2003). Evidence also indicates that the divide existing between public and private healthcare delivery suggests that individuals residing in rural areas mostly depend on the public healthcare services than private healthcare services (Bradshaw *et al.,* 2000).

During the Covid-19 pandemic, population groups in South Africa that are mostly vulnerable like those that are identified as low-income earners mainly working in precarious and informal employment or the informal sector are the ones that have been highly impacted by the losses in jobs and the subsequent loss in income (Ngarava *et al.,* 2022). It was further found that during in 2017 and during the Covid-19 period in 2021 people living in poverty bared the higher burden of poor health (Ngarava *et al.,* 2022). The most notable finding was that income

related health inequalities during the Covid-19 period was 6 times more compared to that obtained in 2017, and in turn this was indicating the fact that income had a stronger association with health during the Covid-19 pandemic as compared to before (Nwosu & Oyenubi, 2021).

According Nwosu & Oyenubi (2021) being black or being African (in comparison to being white), household income per capita and the households that experienced hunger remarkably anticipated health inequalities that are income related during the Covid-19 period (with contributions of 130%, 46% and 9% individually to the inequalities), whereas being employed had a nontrivial but statistically insignificant contribution of 13% to health inequalities. Individuals residing under housing conditions that are inhospitable like shacks for instance were more probable to find the lockdown imposed by the government to be more intolerable.

South Africa is devoted towards providing proper access, effective and equitable health care services to all its citizens with a special focus on those that were previously disadvantaged and did not have any means or income to access such services (Zere & McIntyre, 2003). The right to proper health care is embedded in the constitution that existed in the period after apartheid in South Africa, which clearly states every citizen of South Africa possesses the right to use all the available services relating to healthcare, inclusive of reproductive/conceptive health care (Motsoaledi, 2012). Consequently, both health care services (public and private) are accessible to everyone. Nonetheless, for individuals to gain admittance to private health care services, it's largely dependent on their abilities to pay for these services (Zere & McIntyre, 2003). This can either be done by paying out from their pockets or through buying of private insurance so that their treatment may be done through private health care institutions. The health care services provided within the public institutions is mostly free, however, health care services provided within public institutions is often characterised by many difficulties, and one of them is poor quality health care as compared to that provided within private institutions and this is largely due to differentials in incomes among citizens which determine whether they get good or average health care.

Within South Africa after the apartheid regimes, improving and refining is the main priority of policy reforms in health (Bradshaw *et al.,* 2001). At the centre of these reforms and policies is the ongoing fight against differentials or inequalities existing within the health sector, unequal access and usage of proper health care facilities and the fight against the burden of infectious diseases (Bradshaw *et al.,* 2001). Even though extensive efforts are focused in addressing each of these problems, they remain a big challenge to the public health care system. The prevalence

of these inequalities in health are closely associated with income disparities and other socio-economic inequalities that characterise South Africa (Bradshaw *et al.*, 2001).

3. Description of research Methodology

3.1 Data and Key variables

The information and data that is used on this report was attained from Wave 5 the last wave of NIDS conducted during the year 2017 plus the fourth wave of NIDS-CRAM conducted in 2021.The NIDS data was gathered biennially, with WAVE 1 (the first wave) conducted during 2008 and subsequently wave 5, the last wave gathered during 2017. In a sampling or selection design, a stratified cluster (two-stage) was utilised. NIDS-CRAM is a national study that to start with targeted approximately ten thousand (10000) South Africans (comprising of approximately 7 000 interviews) primarily based totally at the wave 5 sample for adults of NIDS (Nwosu & Oyenubi, 2021). NIDS-CRAM is a high-level frequency dataset that is gathered on a monthly basis as a sequence of panel surveys based on phone calls taking place between the months of May and October of 2020 (Nwosu & Woolard, 2017). The variables covered in the survey are, household welfare, employment, recipients of grants and knowledge and behaviour relating to COVID-19.

It is crucial to take notice that for the reason that of the sample top-up that is performed in NIDS wave 5 because of attrition (ensuing in a top-up of the entire population of white people) and for the mere fact that the samples in NIDS-CRAM were created based on samples of wave 5 of NIDS (Brophy et al., 2018), an assessment that is most appropriate would be the one among NIDS wave 5 (and not the earlier NIDS waves) and the NIDS-CRAM datasets (Ingle, Brophy, & Daniels, 2020). Therefore, it is worth noting that this paper will be making use of the wave 4 survey version of the NIDS-CRAM that was conducted during February/March 2021 together with the wave 5 NIDS adult sub-sample.

The dependent variable in this paper is self-assessed health (SAH). Nevertheless, it must be noted that with regards to SAH variables, in the presence of reporting heterogeneity, the studies relating to health inequalities that use SAH are usually faced with the identification problem (Rossouw *et al.*, 2018). Rossouw et al., (2018) further states that any inequalities that are measured in SAH (self-assessed health) produces a mix in between actual associations with the status of health and heterogeneity reporting. In both surveys, participants were requested to report on their present status of health. All the answers from the respondents were captured on

a Likert scale with excellent health, very good health, good health forming a single grouping and fair health and poor health forming the other grouping. In the interest of clarity, this paper refers to these groupings as better health (excellent, very good and good) and poor health (fair and poor). Income per capita in each household was used in this paper as an index measured against health inequality.

The NIDS-CRAM datasets were made up of 7000 observations. Nonetheless, in order to intensify the comparability among the two datasets wave 5 of NIDS and wave 4 of NIDS-CRAM, the analysis was constrained to people that had observations that are not missing for the variables that are presented in the assessment or analysis made for both waves in **Table 1**. Therefore, in turn, this as a result led to an estimation sample of 3 798 total observations.

It is worth noticing that the variations in the way which other similar variables that are important were quantified in NIDS and NIDS-CRAM. The first one of these variables is the household income in the NIDS data which was based one of the two, either by combining several sources of income acquirable to all members in various households that are receiving income or by means of utilising the total income accruable in various households given by the oldest household member or by a woman who has information regarding the living and spending pattens of the various household (for those households that are unable to provide any data on individual incomes accessible within the households because they are not available) (Brophy *et al.*, 2018). Therefore, to the degree that such reports of income are accurate, the subsequent income presented by various households can be claimed to be most correct and accurate.

Nevertheless, provided that the NIDS-CRAM was a survey completed telephonically on arbitrary samples of the NIDS wave 5 data, the question related to the income of the household was a single-quick and brief question that was raised on every one of the individual respondents. A possible problem that might occur in this regard is that other respondents taking part in the survey may not be knowledgeable on whether how much each household member earns within various households (Nwosu & Oyenubi, 2021). This is a possible problem with the NIDS data, undeniably on a low scale since roughly 13% of the income in various households in the NIDS wave 5 data was attained from a response of each member representing each household (Brophy et al., 2018). Nonetheless, it must be noted that no bias is expected in household income in NIDS-CRAM result from the likelihood that the individual respondents

may not have the information needed about the household income to be systematic through household incomes allocation.

Furthermore, provided the fact per capita income of the household was used in the estimation of the measures of inequality, the size of the household played a major part in the analysis. The household size in the NIDS data was obtained by aggregating all the members of various households that are captured on the household roster. Expectedly, the household size in the NIDS-CRAM data was acquired from a one short question posed to the respondent. Whilst the former is the most desirable or most preferred, it is not hard trying to understand and imagine most of the adults would be mindful of the number of individuals that are residing in the households at each point in time. Even when reporting accurately such a number might result in a challenge, the unpredictability of the sample is persuasive enough that no systematic bias could possibly result from reducing the size of the household attained in this method.

3.2 Research Design

This report will be making usage of wave 4 edition/version of the NIDS Coronavirus Rapid Mobile Survey (NIDS-CRAM) conducted during February/March 2021 (corresponding with adjusted level 1 and 3 of the coronavirus pandemic lockdown) together with the wave 5 NIDS adult sub-sample. The outcome variable in this study is self-assessed health (SAH).

This paper proposes to measure income related health inequality in both periods to say something about the strength and direction of the inequality given the disruption of COVID-19. To achieve this, household income per capita will be used to indicate social economic status against which the inequalities in health will be measured. From such a decomposition, this paper aims at suggesting major policies that will assist in helping reduce income related health inequalities in South Africa.

3.3 Analytical Methods

3.3.1 Concentration Curves

The concentration curves are used in this paper to highlight/illustrate income-related health inequalities. A concentration curve illustrates an increasing share of the people who self-reported experiencing poor or ill-health alongside the increasing share in population categorised according to the household income per capita. In a concentration curve, a 45 degrees line represents the line of equality or fairness. Therefore, if the concentration curve

corresponds with this line, it then means that there is equal distribution of poor health through the distribution of income, meaning that there is a distribution that is proportional. Nonetheless, if poor health is concentrated more within the poor as compared to the rich, the concentration curve will sit directly above the 45-degree line. And if the concentration curve lies below the 45-degree line, ill/poor health is concentrated more within the rich people as compared to the poor (O'Donnell, van Doorslaer, Wagstaff, & Lindelow, 2008).

Whilst it is important to take note of the fact that the concentration curves are vital in representing socioeconomic inequalities at each of then points on the distribution of income for a health outcome of interest, it cannot be used as a measure of the size of such inequality (Kakwani *et al.,* 1997; Wagstaff, Van Doorslaer *et al.,* 1989). Additionally, it is not possible to establish or determine the dominance where the concentration curves cut across each other. And for these highlighted reasons, it is most important to measure the size or magnitude of socioeconomic inequality within each outcome of health of interest using a summary index; this therefore makes it necessary to estimate the concentration index.

3.3.2 Concentration Indices

Accordingly, this paper uses a different alternate measure of health inequalities that are income related, the concentration indices. Different from the Gini index usually used as a measure of inequality in health, the Concentration Index (CI) is a bivariate measure of inequality existing in the status of health which relates to the ranking of other existing variables in which in this case is the income. Normally the concentration index is situated between the interval of (-1, +1). Thus, a negative concentration index represents a distribution that is pro-poor, and a concentration index that is positive represents a distribution that is pro-rich. A concentration index with a value of 0 subsequently represents a distribution that is consistently distributed through all classed of income. The concentration indices will be derived as follows (O'Donnell *et al.,* 2008):

Equation (1) $$C_S = \frac{2}{\mu_S} \mathrm{cov}(S, r)$$

In the above equation **Cs** represents the concentration index of SAH (self-assessed health) (S); **Us** represents the mean of SAH and **r** represents the fraction rank households presented within the distribution of income.

Consequently, the concentration index in this case is described as twice as the covariance associated with health outcomes and also the fractional rank of the individuals in the distribution of income, divided up by the average or mean of outcomes of health. Provided the following, Wagstaff (2005) proposed normalizing the concentration index (CI) by dividing up $1 - u_s$. Nevertheless, Erreygers (2009a, 2009b) takes note of the fact that such normalization is ad-hoc. Wagstaff (2009) has proven that the Erreygers (2009a) normalisation (E_s) is equal to:

Equation (2) $$E_S = 4\left(\frac{\mu_S}{b-a}\right)C_S$$

In the above equation variables, and also b represent limits of the ordinal indicator of health (lower and upper limits), consequently, $\mathbf{u_s}$ and $\mathbf{c_s}$ are the same as defined earlier on.

The benefit of using a standard concentration Index is that it gives more likelihood of summarising or reviewing the size of inequality within a single measure which can be utilised in order to provide comparison between inequality levels existing over a long time period among groups of people. Nevertheless, it must be noted that the standard Concentration Index may not be a proper measure for proving comparison in inequality existing between countries over time if the indicators of health are bounded.

3.3.3 A Decomposition of inequalities that are income-related in poor/ill-health

Health inequalities that are income related existing in poor health will be decomposed making use of the Wagstaff, van Doorslaer, and Watanable (2003) method. Therefore, a poor health linear probability model will be specified as follows.

Equation (3) $$S_i = \alpha + \sum_k \beta_k z_{ki} + \varepsilon_i$$

In the above linear equation, parameters are represented by α and β, and ε represents the error term. Equation 3 was properly weighted to the population Whilst making a correction for heteroscedasticity.

4. Results

4.1 Descriptive statistics

Table 1. Descriptive Statistics

Variables	**Percentages/Mean Values**
ill-health (2021)	26.39%
Ill-health (2017)	7.32%
Average income (2021)	R 3918.739
Average income (2017)	R 10525.33
Age in years	40.69 years
Years of education	10.68
Male	38.4%
African	87.34%
Coloured	7.64%
Asian	0.73%
White	4.29%
Working and receiving income	44.35%
Formal house/dwelling	74.68%
Traditional house/dwelling	11.58
Informal dwelling (e.g., shacks)	9.78%
Household experienced hunger	19.17%
Number of observations	**3 798**

Table 1 above indicates that between 2017 and 2021, pre-COVID-19 and COVID-19 period that there has been a 21%-point increase in the prevalence of poor health among these two periods. Additionally, while taking into considerations the difficulties fundamental in making a comparison in per capita household income over the pre-COVID-19 and COVID-19 periods, nominal per capita household income indicated a decrease of 63% over time. The population had an average age of 41 (years), whilst men(males) made up 38% of the entire population. Africans made up the largest number of the population (87%), while those that are working and are earning an income made up 44% of the total population.

A majority of the people in the group or the population resided in formal structures of housing units (75%), while the other 10% resided in informal dwellings like shacks. Another 12% of the population indicated that they lived in traditional dwellings like huts. And only 19% of the population had indicated that they experienced hunger.

Table 2: Predominance of ill/poor health ordered by quintiles of per capita/Average household income.

Quintiles	**NIDS-CRAM WAVE 4 (2021)**	**NIDS WAVE 5 (2017)**
1	27.49	8.12
2	29.68	7.37
3	28.75	8.60
4	29.25	7.65
5	20.96	6.02
Population	**26.39**	**7.32**

Notes

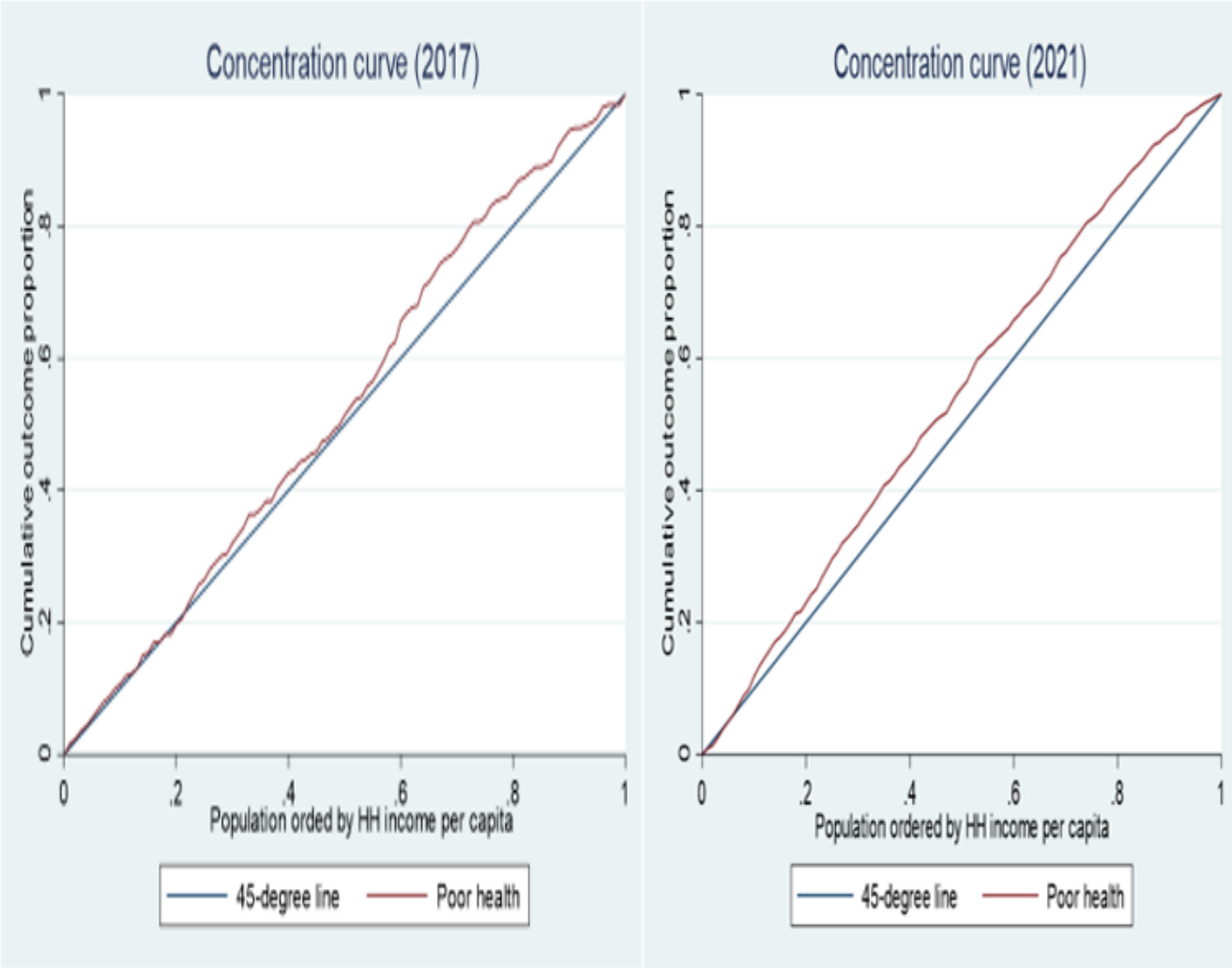
1. Sample estimation = **3 798**

Table 2 illustrates that the prevalence of poor health broadly dropped for the NIDS-CRAM population that is in higher income quintiles. While the richest quintile in NIDS wave 5 had predominance of ill/poor health that is low, the negative correlation was not as noticeable as compared to the one observed in the NIDS-CRAM population. From the aforementioned, a stronger evidence of health inequalities is expected in the course of 2021 as against 2017.

4.2 Concentration Curves Showing Periods Prior-COVID-19 and also During COVID-19.

Figure 1 represents the concentration curves for 2017 and 2021 highlighting both pre-COVID-19 and COVID-19 Periods.

Figure 1: Concentration curves Representing ill-health in (2017 and 2021)



As presented in figure 1, income related health inequalities were largely concentrated among those that are poor provided that both of the concentration curves 2017 and 2021 concentration curve lay above the 45 – degree line. Furthermore, it is suspected that the concentration index for the COVID-19 period will be more pro-poor as compared to the concentration index in the pre-COVID-19 period in 2017 provided that that the former concentration index generally lay everywhere above the equality line whilst the latter curve largely corresponded with the equality line for greater parts of the 40th poorest percentile.

4.3 Concentration Indices Prior the COVID-19 period and During the COVID-19 period.

To make a confirmation on the relative weight of health inequalities that are income related prior to the COVID-19 period and during the COVID-19 periods, table 3 below provides a report on Erreygers' concentration indices that are normalized.

Table 3: Corrected-Erreygers- concentration indices for poor/ill-health in 2017 and in 2021.

Periods	**Gender**		**Estimations**
	Female	**Male**	**Population**
NIDS Wave 5 (2017)	-0.0081 (0.0113)	-0.0162 (0.0078)	-0.0178 (0.0083)
NIDS-CRAM (2021)	-0.0628 (0.0195)	-0.0448 (0.0181)	-0.0597 (0.0144)

Notes

1. Sample estimation **= 3 798**
2. Standard Errors are in brackets
3. *** P<(1/100) = 0.01, ** P <(1/20) = 0.05, * P<(1/10) = 0.1

Estimations presented in the above information/table are all statisticall significant and since the concentration index values are negative, this further suggests a distribution that is pro-poor. Furtermore the results from the table represented above do correspond with the graphically presented results in the above figure (**Figure 1**), as they show that poor/ill-health was more concentrated on the poor in the population for both 2017 and 2021 provided that the coefficients are negative. The results in the table above show that the concentration indices of poor health for both in 2017 and 2021 were -0.0178 and -0.0597 respectively. This is therefore an indication that the concentration index in the COVID-19 period was numerically greater in comparison to the one in the pre-COVID-19 index. Moreover, **Table 3** above shows that pro-poor income related health inequalities in poor health were more noticeable amongst men as compared to women with values of -0.0448 and -0.0628 respectively. Accordingly, it is worth norticing that ill-health was more excessively concentrated on men that are poor relative to men that are well-off in relation to what is acquired amongst women.

4.4 : Decomposition Analysis: Determining factors of poor/ill-health during the COVID-19 period.

The information presented in the table below (**Table 4**) provides a representation of the results of the decomposition of health inequalities that are income-related during the COVID-19 period.

Table 4: Determining factors of Health inequalities that are income-related health during the COVID-19 period

	(C_k)CI	(´_k) Elasticity	Contributions	(%) Contributions
Age (measured in years)	0.010**	0.149	0.002	-2.47
	(0.004)	(0.110)	(0.001)	
Male	0.177**	-0.006	-0.001	1.23
	(0.014)	(0.022)	(0.004)	
African	-0.053**	0.631**	-0.034**	41.98
	(0.005)	(0.189)	(0.011)	
Coloured	0.171**	-0.040	-0.007	8.64
	(0.037)	(0.034)	(0.006)	
Indian/ Asian	0.657**	-0.000	-0.000	0.00
	(0.060)	(0.005)	(0.003)	
Working and receiving income	0.257**	0.038	-0.010	12.35
	(0.011)	(0.031)	(0.008)	
Years of schooling	0.055**	-0.194*	-0.011*	13.58
	(0.004)	(0.110)	(0.006)	
Traditional House/Dwelling	-0.294**	0.012	-0.003	3.70
	(0.024)	(0.011)	(0.003)	
Formal House(e.g. House/Flat)	0.041**	-0.011	0.000	-0.00
	(0.006)	(0.072)	(0.003)	
Log of per capita/Average income in household	0.681**	0.018**	-0.002**	2.47
	(0.030)	(0.007)	(0.001)	
Households that were subjected to/experienced hunger	-0.281**	0.040**	-0.011**	13.58
	(0.020)	(0.011)	(0.003)	
Error			-0.086**	
			(0.017)	

Notes

1. **Sample estimation = 3 798**
2. standard errors of Jackknife with 100 replications in parentheses
3. Error terms are in brackets

   *** P<(1/100) = 0.01, ** P <(1/20) = 0.05, * P<(1/10) = 0.1

Results from the decomposition in table 4 above show that race (African in relation to White), Schooling years, household or average income per capita and household that experienced hunger were contributing factors to health inequalities that are income related observed in poor health, each accounting for 42%, 13.58%, 2.47 and 13.58% respectively. Additionally, each of these variables had an effect that is proo-poor on health inequalities, suggesting that each of them subscribed to exacerbating the load of poor or ill-health on individuals that are poor or living in poverty in South Africa. Moreover, while not showing any statistically significance, Coloured people and those that are employed and earning income accounted for 8.64% and 12.65% of the overall concentration index .

Additionally, while taking note of the other variables not significantly derterming health inequalities, the decomposition results from table 4 suggest that they had a relationship that is statistitcally significant with health through their elasticities. For example, dwelling type (Traditional Dwelling/hut) was positively and significantly connected with poor health outcome.

5. Discussion

International evidence presented in Myer *et al.,* (2008); Krieger *et al.,* (2003) and Mackenbach (1992) points out that social issues, inclusive of educational status, levels of incomes, employment status, gender and ethnicity have a marked impact on how well and how healthy a person is. In all the various countries around the world, whether low, middle or high-income nations, there exist an extensive status of health inequalities in various social groups (Ray & Linden, 2018). This evidence points out that the lower a persons socio-economic status or position within a community, the greater their risk of poor health will be compared to others. In South africa, several Studies presented by Harling *et al.,*(2008); Doolan *et al.,* (2007); Myer *et al.,* (2008) and Bradshaw and Steyn (2001) have emphasised the dominance of diseases that are both communicable and non-communicable among households and individuals that are poor. These studies also show that inequalities within the distrubution of health outcomes that exist between those that are well-off and those that are poor. Health inequalities are systematic

variations within the health levels of various population groupings within a society, and subsequently, these health inequalities have major costs (social and economic) to both individuals and societies (Ataguba et al. 2011 & 2015).

This report has examined the assumption that the Coronavirus disease or COVID-19 in South Africa is largely linked with harmful health outcomes on poor people relative to those that are rich. This report contends that provided the immense disturbance triggered by the Coronavirus disease or COVID-19 pandemic and the related countrywide lockdown in South Africa as well as the likelihood that its impacts (like through the labour market, emphasised racial and past inequalities and the overall standards of living) will excessively result in a disadvantage for those that are living in poverty, health inequalities that are related to income would be observed more on the poor in the COVID-19 or Coronavirus disease era as compared to the pre-COVID-19 ara. As shown in the analysis above, this is true, with a magnitude of health inequalities that are income related being more present in the COVID-19 era nine times greater than what was obtained during 2017.

The results obtained from a decomposition analysis show that race, Schooling years and per capita household income as the variables that substantially made a contribution health inequalities that are income related during the COVID-19 era. Additionally, while not showing any statistical significance, Age, Gender, income earning employment and Dwelling type (formal dwelling) had a nontrivial contribution to increased health inequalities during the COVID-19 era.

The key findings which show that race mediates COVID-19 impact on the wellbeing of individuals substantiates previous evidence presented for South Africa. Garba (2020) notes that whilst the spread of COVID-19 serves a a threat to all segments of the society, the social crisis that is already existing in South Africa intensifies the current social differences, with the black working class and those that are poor being mostly affected. Garba (2020) further notes that High exposure to jobs that are hazardous (i.e. working as nurses, hospital cleaners and in fumigation of spaces were there were COVID-19 confirmed cases) are some of the ways in which such greater African racial gradients arise. In an article by Gawthrop (2022), it is highlighted that in nearly 984 000 cumulative deaths (presented in numbers of lost lives by racial groups) that occur in USA, Black African Americans constitute large proportions of those that are affected as compared to other racial groups. It is further stated that African Americans have the uppermost crude COVID-19 rates of mortality nationally, and this is about

2.8 times more as compared to the rate of other racial groups like Asians. Undeniably, it is clear that the relative disadvantage of the racial groups that are historically disadvantaged to the COVID-19 pandemic is well known, particularly in the current state.

Furthermore, the concentration index that is more pro-poor for Africans does not come at a surprise provided that there is an over-representation of Africans amongst South African which are poor. For example, in a report published by Statistics South Africa (2019a), the real yearly mean ependiture by households for White headed households was seven times greater as compared to that of households headed by African during 2015. As a matter of fact, according to the same report, utilizing the median expenditure of the household, racial inequality seems to be worse as the median expenditure for whites was eleven times greater as compared to that of blacks.

A more pronounced way through which race exerts an impact that is positive on poor health within South Africa is through excellent and top quality access to health care. Accordingly, Ataguba & McIntyre (2012); Benatar (2013) recognise that the deep and overwhelming inequalities existing within the healthcare system in south Africa are clearly acknowledged.

When looking into the overall perfomance for the healcare system in South africa from an equity point of view, making an evaluation of this relative to the values supporting and contributing to the financing of healthcare according to the capability of being able to pay and therefore reaping benefits from the services of healthcare according to the need, the main problem experienced within the health care system in South Africa seems to be on the side of service benefits (Ataguba & McIntyre, 2012). Particularly, the groups that are much reacher recieve much better allocation of service benefits in both private and public sectors relative in redlation to their allocation of the ill-health problem. Harling *et al.* (2008) & Ataguba *et al.* (2011) condend that it must be noted that this does not only happen in term of the status of self assesed health, but also relative to diseases that are infectious like tuberculosis and other non-communicable diseases and disability.

According to Statistics South Africa (2018) during 2018, approximately 16% South African citezens were members belonging medical aid schemes, and Africans belonging to such schemes consituted only 10% as compared to whites which constituted about 73%. Nonetheless, as the World Health Organisation previously reported, the expenditure on prdivate healthcare accounted for approximately 44% of recent expendituren on healthcare during 2007 (when almost 17% of the entire population belonged to varous medical aid

schemes). Provided the fact that Africans have lesser chances of belonging to a medical aid scheme that is private in comparison to other cultural and ethnic groups (specifically whites) – consequently, having more likelihood to be users of the public healthcare system that is overburdened, it does not come by any surprise that a positive gradient is within race and poor health (Nwosu & Oyenubi, 2021).

Nwosu & Oyenubi (2021) further note that hunger, which is an severe form of nutrition and food insecurity, disposes one to health consequences that are poor. And therefore its no surprise that hunger exacerbates health inequalities. Various studies like that of Broton *et al.*, (2018); and Weinreb *et al.*, (2002) substantiate the findings discussed in this paper of a positive correlation that exists between poor health and hunger, and also that hunger is disproprtionally carried by those that living in poverty. Accordingly, these studies that are mentioned above are raising some concerns and further highlight the importance of the need to prevent a hunger disaster that is caused by the COVID-19 pandemic, especially since there is a possibility and likelihood of job loses that might happen (Nwosu & Oyenubi, 2021). Certainly, a survey that is a national represantative performed at some point same period as the NIDS-CRAM survey discovered that prevalence of hunger in udults of about 34%, considerably greater as compared to the figure reported here (Bekker et al., 2020).

Additionally, the substantial contribution of income in exacerbating health inequalities follows another mainstream evidence existing that is looking at the affects of income inequalities in health, with a lot of evidence indicating a causal effect of income inequalities in health (Pickett & Wilkinson, 2015). Even though income earning employment turned out not to be statistically signifcant, it had a nontrivial influence to health inequalities and it was numerically higher when compared to hunger.

6. Conclusion and Policy Implications

This paper adds and enhances the knowledge in literature that is already existing in income related health inequalities within diverse groups each from various socio-economic status in the context of South Africa. Firstly, by make use of data from NIDS and NIDS-CRAM data sets with income measures that are more comparable and better, this paper gives a more reliable picture on the state of health inequalities in South Africa. Secondly, by illustrating the frequency or prevalence of poor or ill-health by quintiles of household income per capita, making use of concentration curves to represent poor health for both 2017 and 2021 and by using concentration indices in highlighting the magnitude of income related health inequalities,

this paper achieves an estimate of the magnitude of disparities in health that is more accurate. Lastly, by making use of the decomposition method in order to estimate income related health inequalities, this paper allows for the decomposition of the total that is observable in income related health inequalities into the elasticity of health and the inequality ordered by income for all the determinants of health that are included in the analysis performed in this paper.

However, such comparative analysis, has certain limitations as identified by (Rossouw *et al.*, 2018):

- With regards to SAH variables, in the presence of reporting heterogeneity, the studies relating to health inequalities that use SAH are usually faced with the identification problem.
- Any inequalities that are measured in SAH represent a mix in between actual associations with the status of health and heterogeneity reporting.
- Health inequalities and heterogeneity are mostly confounded by race. Within various racial groupings with a specific focus on among black people and to some lesser extent among white minority, heterogeneous reporting results in underestimation of health inequalities that exist between the poorest and the richest within the society.

Within the health system of South Africa, those that are socio-economically disadvantaged are the ones that are mostly discriminated against the most across the continuum of proper healthcare access. The National Health Institute (NHI) provides various means that can be used in order to improve and enhance the capability to pay for healthcare and therefore addresses the big problem of affordability, whilst inequalities that exist between perceived and actual need justifies the need for more investments within health outreach programmes. Consequently, access to the basic services of health care is an extremely appropriate goal of which every government should strive towards.

Nonetheless, the main argument of this paper is that poor health in South Africa is unequally distributed among those that are living in poverty and these income-related health disparities seem to be pronounced substantially in the COVID-19 period as compared to the pre-COVID-19 era in 2017. Nwosu & Oyenubi (2021) believe that this consequence can be ascribed to the unequal unfavourable impact of the pandemic and also related on those that are poor particularly by strengthening the income and racial inequalities and subsequently propagating a food crisis. Accordingly, massive job losses and a labour market that is depressed are mostly likely to create more problems for those that are poor having a lot of health challenges (Nwosu

& Oyenubi, 2021). Weiler *et al.* (2015) suggests that in South Africa such inequalities somewhat imply that the is an existence of health inequalities, and these inequalities are social produced.

Notably, health inequalities in South Africa have been recognised as one of the biggest challenges experienced within the public healthcare system. Findings discussed in this paper demonstrate that a number of key social aspects, including racial differences, years of schooling, per capita household income, age and gender distribution, income earning employment and Dwelling type need to be properly addressed so that the unacceptable health inequalities present in South Africa can be tackled and avoided. The evidence provided in this paper clearly supports literature and evidence that inequalities observed in health are numerous and are inter-linked. And therefore, actions taken to further address these also need to be connected and must come from several levels of interventions provided by the government.

Having a proper understanding on nature and key determining factor with regards to income related health inequalities during Covid-19 period is key in addressing and employing applicable policies that are aimed at fighting and reducing inequalities in health. Accordingly, the most important part in responding to Covid-19 and restoration of services must be in line with increasing the pace and scale within the systems of the national health in order to tackle and consequently address the existing health inequalities, so that those that are at a greatest risk can be protected (Statistics South Africa, 2020).

This paper therefore makes recommendations on policies that are clearly centred around government intervention. And consequently, it will be most important for policies designed by the government to be able to address the underlying factors of poor health, including specific attempts made in addressing various conditions that affect those that presently carry the most burden poor health (Ataguba *et al.,* 2011). Government and other stakeholders involved need to make sure that datasets are complete and timely in order to make sure that required services and resources are concentrated on those that mostly affected first. Government can also integrate health equity considerations into programs and policy and form collaborative relationships with other sectors to address health inequalities.

Whereas this note illustrates a great deal, also it directs us to a larger analytical agenda or plan, specifically if the Covid-19 pandemic continues both within international borders and domestically. We do not only address these problems relating to the pandemic to only provide or give one example, certain economic policies that should be established with the intentions

of managing the consequences that come with the Covid-19 pandemic – how to place the economies on life support, reducing the impairment done and also making the grounds for a fast when the Covid-19 pandemic falls out. Other researchers should now turn their attention to research that will try to develop long-run approaches and strategies for steering up the pandemic that will address both dimensions of health relating to containment and their economic outcomes.

Also, as various nations are starting to make a recovery from the pandemic, there are other opportunities in research that will look into the lessons learnt from Covid-19 pandemic responses and therefore capitalise on such lessons in order to speed up the drive concerning the universal health coverage (UHC) and thereby mitigating these disparities in health.

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