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A decomposition analysis of health poverty trends in South Africa

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A decomposition analysis of health poverty trends in South Africa

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Abstract: This study measures the incidence, depth, and severity of health poverty in South Africa, using ordinal self-reported data from the National Income Dynamics Study (NIDS) for 2008–17. The resultant trend is decomposed using a Shapley value-based decomposition method. The results show that 18 per cent of the South African population were health poor in 2008. The incidence decreased to eight per cent in 2017, with the depth and severity indices following this trend. The decomposition results indicate that health poverty is higher among males, the elderly, the divorced or separated, unemployed individuals, and those residing on farms. Notably, the health status of females, Africans, the low educated, and those residing in urban areas showed significant improvements during the 2008–17 period.

Key words: health poverty, ordinal self-reported health data, Shapley value-based decomposition, National Income Dynamic Study (NIDS)

JEL classification: D63, I1, I32

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1 Introduction

The relationship between poverty and ill health can be viewed from a social justice perspective, as a way of pursuing an inclusive and equitable society, and from a functional economic perspective, as a way of spurring productive development. Poverty is multifaceted; for instance, Sen's (1990) capability approach acknowledges the plurality of human conditions by extending dimensions of well-being beyond the traditional dimensions of income and consumption. The capability approach framework encompasses health, education, and longevity dimensions, among other factors in human lives. Good health confers benefits at both the individual and social levels. At the individual level, having good health confers on individuals the ability to live full and meaningful lives. Social benefits include less pressure on healthcare systems, better human capital, and increased productivity and hence economic growth (World Health Organization 2017). Accordingly, ensuring health and well-being is an overarching goal of many nations worldwide. This is reflected in Sustainable Development Goal 3: 'Ensure healthy lives and promote well-being for all at all ages' (United Nations 2015: 14).

Ensuring health and well-being for all is also one of South Africa's priorities within its transformation agenda. This follows from the country's quadruple burden of disease: non-communicable diseases; communicable diseases (especially human immunodeficiency virus (HIV) and tuberculosis); maternal, neonatal, and child morbidity and mortality; and deaths due to injury and violence (Department of Planning, Monitoring and Evaluation 2014; World Health Organization 2018). The country's disease burden is on average four times larger than that of developed countries, and in most instances almost double that of developing countries (Econex 2009: 4). Evidence from a comparison of South Africa and other countries[1] classified in the same Global Burden of Disease region shows that South Africa has the highest incidence of people per 100,000 with HIV/Aids, tuberculosis, and diarrheal disease (Institute for Health Metrics and Evaluation 2017). For instance, in 2017 South Africa had 12,678 individuals per 100,000 with HIV/Aids, which is considerably higher than the group mean of 607 individuals per 100,000. This high level of disease burden imposes economic costs due to productivity losses arising from absenteeism and early retirement. Estimates indicate that in 2015 the economic cost imposed by ill health in South Africa was 6.7 per cent of total gross domestic product (Rasmussen et al. 2017). This position threatens the country's socio-economic progress. Consequently, understanding the distribution, drivers, and trends in health status in the country is essential for policy. Such knowledge is even more pertinent with the ongoing discussion of the introduction of universal healthcare coverage (national health insurance), which is meant to benefit the poor.

Previous studies on health in South Africa (e.g., Ataguba et al. 2015; Bradshaw 2008; Omotoso and Koch 2018) have focused on health inequality and its social determinants. Omotoso and Koch (2018) investigate changes in health inequality and how changes in the social determinants of health contribute to the observed health inequality patterns. In another study, Ataguba et al. (2015) investigate health inequality trends (self-reported illness and disability) and their determinants. The key findings of these studies show that the burden of ill health and disability is more prevalent among individuals in lower socio-economic groups, and that the increasing prevalence of non-communicable diseases is being driven by individuals in lower socio-economic groups. Further, findings indicate that the growing inequalities in ill health in South Africa are explained by differences in places of residence and socio-economic status (Ataguba et al. 2015; Omotoso and Koch 2018). These studies are informative in terms of health inequality; however, they do not

[1] Albania, Brazil, Cuba, Dominica, Jamaica, Panama, Republic of Moldova, Sri Lanka, Thailand, and Tunisia.

provide evidence on health poverty, which is defined as 'the condition of being in poor health relative to what is considered to be minimally acceptable' (Clarke and Erreygers 2020: 2). While an understanding of both concepts—health inequality and health poverty—is essential for crafting public health policy, the two concepts capture distinct aspects. Health inequality measures consider the distribution of health outcomes in a population, whereas health poverty measures capture the degree of deprivation in health. If we acknowledge this important distinction, the aforementioned studies leave a dearth of knowledge about health poverty in South Africa.

Much of the literature on health poverty is based on developed countries. Studies considering developing countries are very limited, perhaps due to data constraints, and South Africa is no exception. While there is a large body of literature on poverty in South Africa, it is mainly concerned with income poverty (e.g., Posel et al. 2009; Rogan 2013; Rogan and Reynolds 2019; Seekings and Nattrass 2015). Studies that examine the issue of health in South Africa, such as Williams et al. (2008), measure the association of perceived racial and non-racial discrimination with ill health. Charasse-Pouélé and Fournier (2006) investigate the sources of the self-rated health inequalities that arise among South Africa's racial groups; their findings reveal that Africans and Coloureds report higher levels of poor health than Whites. Chirinda et al. (2018) find gender disparities in the healthy life expectancies of adults aged 50 years and older; the findings reveal that women have a higher life expectancy even though they have poorer health outcomes throughout their lives. Although these studies collectively look into poor health outcomes that lead to decreased life expectancies, as well as gender and racial disparities in health, they do not explore deprivation and the extent of health poverty among the sampled populations. Although previous studies are informative, there is a dearth of knowledge about the extent and drivers of health poverty in South Africa. This calls for more comprehensive assessments of health poverty.

This paper intends to fill the gap by measuring the magnitude of health poverty and assessing its trends and underlying factors. It seeks to answer the following research questions:

1. What is the extent of health poverty in South Africa, and how has it evolved over time?
2. What are the socio-economic and demographic factors that underpin observed changes in health poverty in South Africa between 2008 and 2017?

To answer these questions, data drawn from the 2008–17 National Income Dynamics Study (NIDS) surveys will be utilized. This paper's methodology is twofold. First, health poverty indices of the Foster, Greer, and Thorbecke (FGT) (1984) type proposed by Bennet and Hatzimasoura (2011) for ordinal data are computed to evaluate the magnitude of health poverty in South Africa. Second, the study utilizes the Shapley value-based decomposition technique suggested by Duclos and Araar (2006) to decompose changes in health poverty by demographic characteristics, education, labour market status, and location. This sheds light on the factors underpinning the observed health poverty patterns in South Africa.

2 Background: health poverty measurement and determinants, internationally and in South Africa

2.1 Health poverty measurement

Following Sen's capability approach (Sen 1990, 2001) and the subsequent work by Nussbaum (2011), bodily health is one of the core functionings which, when satisfied, allow an individual to live a full and meaningful life with the capability to flourish. According to Nussbaum's (2011: 33) characterization, bodily health is 'being able to have good health, including reproductive health; to be adequately nourished; to have adequate shelter'. This is one of the ten functionings that all human beings intrinsically share and require to live a decent life. Notably, this capability is difficult to operationalize, given its multifaceted nature. Nonetheless, previous studies have attempted to measure the degree of deprivation in health using techniques borrowed from traditional measures of poverty.

The multifaceted nature of health poverty makes it difficult to identify the minimally acceptable level of health (i.e. threshold/poverty line) and hence measurements of the level of deprivation. The problem is exacerbated by a lack of cardinal and objective health indicators in the readily available household surveys. To circumvent this, the extant literature generally uses self-reported subjective measures of health (e.g., Brezezinski 2015; Clarke and Erreygers 2020; Pascual-Sáez et al. 2019). Although limited, subjective health measures are arguably strong predictors of objective health outcomes (Jylhä 2009).

If one assumes an ordinal-scale health variable with ratio-scale properties, health poverty thresholds can be identified in two broad ways. The first adopts an arbitrary uniform threshold or one allowing for variation, i.e. for women and men. The second assumes a minimally acceptable health threshold that is contingent on the average health outcomes of an individual's specific reference group. Those who fall below the thresholds are considered to be poor in health (Clarke and Erreygers 2020). FGT poverty measures are widely used in empirical work that measures poverty. They are favoured because they are easy to construct, pose stable axiomatic and decomposable properties, and capture the depth and distribution of poverty from the threshold. However, standard FGT indices assume well-being indicators that are cardinal (e.g., income). This makes them inappropriate for use with ordinal data, which is commonly used to capture health status. To deal with this hurdle, Bennett and Hatzimasoura (2011) introduce a general method for constructing ordinal FGT indices using self-reported health data. This paper adopts this approach to measure health poverty in South Africa.

2.2 Determinants of health poverty

While the measurement of health poverty in a given population is important for policy, it is also pertinent to understand the factors underpinning observed health poverty patterns. In view of this, previous studies have been preoccupied with trying to understand factors which drive health poverty levels and trends. Factors shaping health poverty are varied. They include age, race, gender, education, employment status, rural/urban location, province, and religion.

Several international studies exist that assess the extent and nature of health poverty, e.g., Bennett and Hatzimasoura (2011) for Canada and the US, Brzezinski (2015) for the UK, Simões et al. (2015) for Portugal, and Pascual-Sáez et al. (2019) for Spain. Bennett and Hatzimasoura's (2011) empirical findings reveal that health disparities between Canada and the US are greatest among low-income groups, while Brzezinski (2015) finds cohabitation and retirement to be significant determinants of health poverty. Similarly, Simões et al. (2015) and Pascual-Sáez et al. (2019) find

gender, age, and education to be significant contributors to increasing health poverty in Portugal and Spain.

Age is an important factor in the evaluation of an individual's health outcomes. Contoyannis et al. (2004) find that young people tend to report more positive health outcomes than the elderly. The frequency and severity of health challenges faced by the old vary compared with those faced by the young. Pascual-Sáez et al. (2019) find that age has a positive marginal effect on the probability of reporting poor health. Additionally, Brzezinski's (2015) study shows that the increase in the population of retired individuals contributed to the increase in Britain's health poverty during the 1991–2008 period.

There is an extensive literature focused on the health disparities between women and men. Most studies attribute the observed findings to existing differences in biology, psychology, and the roles and responsibilities that societies assign to the different genders (Crimmins et al. 2018; Ostlin et al. 2006). The literature shows varying effects of gender on health. For instance, Lindeboom and van Doorslaer (2004) show that gender has large and persistent effects on self-reported poverty health outcomes. Pascual-Sáez et al.'s (2019) findings show that the negative impact of gender on heath poverty is to the detriment of women, while Crimmins et al. (2018) show that male life expectancy is lower than female life expectancy. An analysis of the distribution of diseases shows that a higher proportion of males report more lethal conditions (cardiovascular diseases, stroke, and diabetes), while females report more disabling chronic conditions such as arthritis and depression (Crimmins et al. 2018). Furthermore, Clarke and Erreygers's (2020) findings show a substantial but weakly persistent differential between men's and women's life expectancy.

As for education, the general finding in the literature is that it is positively correlated with positive health outcomes (DeWalt et al. 2004; Grossman 2006; Lindeboom and van Doorslaer 2004; Pascual-Sáez et al. 2019; Simões et al. 2015). Grossman (2006) shows the theoretical relationship between education and health through productive and allocative efficiency. Education may impart direct knowledge about health and health behaviours, thereby shifting the health production function; additionally, education improves individuals' health knowledge, allowing them to choose an efficient mix of inputs into their health production process. In other words, education has been found to reduce health poverty. Its influence on health outcomes runs through multiple channels. For instance, educated individuals have access to information that enables them to make informed health decisions. Also, education increases employment prospects, allowing individuals to have an opportunity to earn higher wages and thus to afford healthier lifestyles, safer living environments, and access to private healthcare (Albert and Davia 2011; Cutler and Lleras-Muney 2010).

Regarding marital status, Lindström (2009) finds significant varying health outcomes between married (or cohabiting) and single (or divorced) individuals. Married couples present better health outcomes. However, the positive health effects may also be dependent on the marital quality (Kiecolt-Glaser and Newton 2001). Additionally, Brzezinski (2015) observes that cohabiting couples have the largest overall increasing effect on Britain's health poverty. Despite specific working conditions that characterize particular jobs, the surveyed literature shows positive employment effects on good health outcomes (Brzezinski 2015; Currie and Madrian 1999; Pascual-Sáez et al. 2019).

The relationship between religion and health is multifaceted and complex in nature. There are contentious arguments regarding the exact empirical measurement of religiosity and its effects on health. As a result, much of the literature that studies this relationship is often descriptive and points towards correlations, with suggestions regarding the mechanisms that lead to the results (Mishra et al. 2015; Zimmer et al. 2016). Numerous studies propose that religiosity leads to favourable health outcomes by providing social support and reducing stress and the likelihood of

engaging in risky sexual behaviours (Koenig 2012; McCree et al. 2003; Mishra et al. 2015; Zimmer et al. 2016). For instance, religious institutions tend to provide support during times of loss and mourning, and they integrate families by providing a social network. They also tend to subscribe to prayer and meditation, which have been proved to reduce stress (Lim and Putnam 2010). Contrasting arguments suggest that the observed positive health outcomes may be equivalent to a placebo effect (Kohls et al. 2011).

The link between geographical location and health is both indirect and direct in nature. Poor people tend to reside in rural or urban informal settlements. The direct effects that contribute to poor health stem from the limited access to water, poor sanitation, lack of infrastructure, and limited access to public and private healthcare facilities in those areas (Mathee et al. 2006; Ward et al. 2014). The indirect effects stem from the lengthy referral systems that individuals who access healthcare from rural hospitals and clinics have to go through in order to get specialized care. Lastly, the limited number of specialist doctors means that patients have to incur travel costs and use time and resources to access specialist services, which tend to be offered at tertiary hospitals (Gaede and Versteeg 2011). Thus, the effect of location on health poverty depends largely on the infrastructure and living conditions in varying localities. In summary, the literature reviewed in this study suggests the relationship framework shown in Table 1.

Table 1: Summary of health poverty determinants

Variable	Relationship with health (poverty)
Age	+
Gender	+/-
Race	+
Education	-
Employment status	-
Marital status	+/-
Religion	-
Location	+/-

Source: author's compilation.

3 Methodology and data

3.1 Methodology

This paper measures health poverty in South Africa using FGT-type indices for ordinal self-reported health data, closely following the approach proposed by Bennett and Hatzimasoura (2011). The indices are computed on a sample of N individuals whose self-reported health outcome is represented by vector S, which contains the set of self-reported health categories, all ordered such that:

$$Y = (y_1, y_2, .., y_s)$$

where outcome $y_i > y_j$ if and only if health outcome i is realized to j. Using a self-selecting health poverty threshold k, health poverty indices are then determined as the weighted sum of probabilities of individuals reporting health outcomes below threshold k. The health poverty indices are given by:

$$\pi_\alpha(Y,k) = \sum_{i=1}^{k} p_j \left(\frac{k-j+1}{k}\right)^\alpha \; where\ 1 \leq j \leq k\ and\ \alpha \geq \qquad [1]$$

where p_j represents the probability that an individual selects a health self-assessment of j, and α is a parameter that accounts for the index's sensitivity to the depth and distribution of health poverty. Higher values for α assign more weight to lower valuation categories (i.e. most deprived). Equation [1] is reduced to the standard poverty headcount measure when $\propto = 0$. This study computes health poverty indices for varying values of α and health poverty thresholds k for robustness checks.

To understand the factors underpinning observed health poverty patterns, this paper relies on the attractive feature of FGT indices, i.e. the additive property that enables decomposition. If we assume that v^i and π_α represent the population and health poverty share respectively of subgroup $i \in (i,.,h)$, a population's health poverty is determined as the weighted sum of health poverty measures for varying subgroups.

Changes in total poverty over time, $\Delta\pi_\alpha$, can be expressed in terms of changes in poverty within subgroups, $\Delta\pi_\alpha^i = \pi_\alpha^i(Y_{t2}\,;k) - \pi_\alpha^i(Y_{t1}\,;k),\ i \in (i,.,h)$, and changes in population shares of subgroups, $\Delta v^i = v^i(t_2) - v^i(t_1), i \in (i,.,h)$. Consequently, the total change in health poverty between period t and $t+1$ is given by:

$$\Delta\pi_\alpha = \pi_\alpha(Y_{t+1};k) - \pi_\alpha(Y_t;k) = \sum_{i=1}^{h}\left[v^i(t+1)\pi_\alpha^i(Y_{t+1};k) - v^i(t)\pi_\alpha^i(Y_t;k)\right] \qquad [2]$$

Shorrocks (1999) shows that an exact decomposition of this nature can be performed using the Shapley value concept from cooperative game theory. Furthermore, Brzezinski (2015) proposes the poverty change decomposition provided in equation [3], which is exact and does not include residual interaction terms from changes in poverty within subgroups or changes in the population shares of subgroups. Incorporating the Shapley value decomposition concept,[2] equation [2] can be decomposed as the weighted sum of the within-subgroup effects and the subgroups' population shares as follows:

$$\Delta\pi_\alpha = \sum_{i=1}^{h}\left(W^i + P_i\right) = \sum_{i=1}^{h}\left[\frac{v^i(t_1)+v^i(t_2)}{2}\Delta\pi_\alpha^i + \frac{\pi_\alpha^i(Y_{t1};k)+\pi_\alpha^i(Y_{t2};k)}{2}\,\Delta v^i\right] \qquad [3]$$

The variables W^i and p^i denote *within-subgroup* and *between-subgroup* population effects respectively on the change in total health poverty. In equation [3], v^i captures individual characteristics, e.g., age, gender, race, education, marital status, labour market status, and location. Notably, the effect of these individual characteristics on changes in health poverty can be easily identified, since W^i is weighted by the subgroups' population shares averaged over time, whereas p^i is weighted by the subgroups' levels of health poverty over time (Brzezinski 2015).

Robustness checks

The subjective nature of self-reported health gives rise to contending views with regard to its validity. While some studies (e.g., Jylhä 2009) find that it is a strong predictor of objective health outcomes, others (e.g., Schneider et al. 2011) reveal significant reporting heterogeneity associated with demographic and socio-economic characteristics. This type of measurement error is known as state-dependent reporting bias (Kerkhofs and Lindeboom 1995). It occurs when different subgroups of the population report systematically different cut-point levels, despite having the

[2] The Shapley value decomposition is a solution concept arising from cooperative game theory. In the context of health poverty indices, it allows us to compute the mean of the marginal effects of each subgroup. The mean yields the contribution of each factor (Duclos and Araar 2006).

same levels of true health. The literature proposes methods that utilize more objective measures of 'true' health to account for possible reporting bias, e.g., hypothetical anchoring vignettes (Hernández-Quevedo et al. 2005; Kerkhofs and Lindeboom 1995; Lindeboom and van Doorslaer 2004; Vaillant and Wolff 2012).

To assess the extent of reporting bias and the consistency of the self-reported health outcomes, and to account for the limitations that arise from the use of the subjective health measure, this paper measures the degree of overlap between individuals' self-reported health outcomes and subjective ill-health indicators represented by chronic conditions. The rationale of this is to assess the extent to which poor health is under-reported within the South African context. For instance, if an individual suffers from at least one chronic condition but reports excellent health, this will give an indication of the extent to which health status is under-reported. This will inform the study if the subjective health measure in use is severely biased. The degree of overlap found in the present case is described in section 4.2.

3.2 Data

This paper uses data drawn from the 2008–17 NIDS surveys. The sampling frame includes private households and residents in workers' hostels, convents, and monasteries. The frame excludes other collective living quarters such as students' hostels, old people's homes, hospitals, prisons, and military barracks (Woolard et al. 2010). NIDS is a nationally representative survey that contains detailed information on individuals (e.g., age, race, gender, education, labour market status, health status, and location) as well as households (e.g., household composition and size). This paper employs data from Wave 1 up to and including Wave 5.[3] Wave 1 initially had 28,226 observations. Data points with missing observations and adults who refused to answer or were not available to answer the questionnaire were dropped from the data set. The remaining data set had 15,115 observations. The same process was employed for Waves 2 to 5. Although the NIDS data follows a panel structure, this paper ignores the panel dimension; it exploits only the cross-sectional dimension. The pooled data set had 88,547 observations. Design weights were incorporated to account for household non-response. To obtain appropriate estimates, standard errors, and confidence intervals, the svyset command was employed with the use of post-stratification weights. Sample district council 2011 was chosen for the strata. The strata employed represent the primary sampling unit clusters. Table A1 in the Appendix presents key variable definitions, while Table 2 presents descriptive statistics for the pooled sample for each year.

The pooled sample has 88,547 observations for the period 2008–17. Overall, 35 per cent report that their health outcome is excellent, while 29 per cent and 23 per cent report very good and good health respectively. A small share, seven per cent, report fair health, while three per cent report poor health. Over time, those who report excellent health report better health outcomes, from 32 per cent in 2008 to 35 per cent in 2017. This increase holds for those who report very good and good health. Contrariwise, those who report fair and poor health experience deteriorating health outcomes over the 2008–17 period. Eleven per cent of the population report fair health in 2008, which declines to six per cent in 2017. Similarly, six per cent report poor health in 2008, which declines to one per cent in 2017.

[3] Wave 1 represents data from 2008, Wave 2 from 2010, and Wave 3 from 2012; Waves 4 and 5 represent 2015 and 2017 respectively.

Table 2: Descriptive statistics

Variable	Overall		2008		2010		2012		2015		2017	
	Mean	Std dev.	Mean	Std dev.	Mean	Std dev.	Mean	Std dev.	Mean	Std dev.	Mean	Std dev.
Self-reported excellent	0.357	0.479	0.322	0.467	0.417	0.493	0.339	0.473	0.351	0.477	0.355	0.478
Self-reported very good	0.297	0.457	0.271	0.444	0.297	0.457	0.290	0.454	0.304	0.460	0.319	0.466
Self-reported good	0.239	0.427	0.231	0.422	0.191	0.393	0.262	0.440	0.263	0.440	0.245	0.430
Self-reported fair	0.076	0.266	0.113	0.317	0.066	0.249	0.080	0.271	0.062	0.242	0.063	0.244
Self-reported poor	0.031	0.173	0.063	0.243	0.029	0.169	0.029	0.167	0.019	0.137	0.017	0.131
Age	36	16	37	16	37	16	37	16	35	15	36	15
Female	0.535	0.499	0.562	0.496	0.540	0.498	0.542	0.498	0.513	0.500	0.522	0.500
African	0.798	0.401	0.789	0.408	0.791	0.407	0.789	0.408	0.806	0.396	0.817	0.387
Coloured	0.085	0.279	0.080	0.271	0.087	0.281	0.091	0.288	0.083	0.276	0.084	0.278
Asian/Indian	0.025	0.155	0.025	0.156	0.023	0.150	0.025	0.157	0.027	0.162	0.023	0.149
White	0.092	0.289	0.106	0.308	0.100	0.300	0.095	0.293	0.085	0.278	0.076	0.265
Unemployed	0.151	0.358	0.190	0.392	0.142	0.349	0.164	0.370	0.133	0.340	0.126	0.332
Married	0.279	0.449	0.317	0.465	0.293	0.455	0.278	0.448	0.253	0.435	0.258	0.438
No schooling	0.060	0.238	0.087	0.282	0.073	0.260	0.065	0.247	0.040	0.197	0.038	0.192
Primary education	0.159	0.366	0.196	0.397	0.184	0.388	0.170	0.376	0.134	0.340	0.114	0.318
Incomplete secondary	0.453	0.498	0.421	0.494	0.442	0.497	0.448	0.497	0.481	0.500	0.472	0.499
Matriculation	0.172	0.378	0.167	0.373	0.166	0.372	0.162	0.369	0.170	0.375	0.196	0.397
Tertiary education	0.155	0.362	0.129	0.335	0.134	0.341	0.154	0.361	0.175	0.380	0.180	0.384
Christian	0.807	0.394	0.824	0.381	0.810	0.392	0.789	0.408	0.824	0.381	0.792	0.406
Other religion	0.193	0.394	0.176	0.381	0.190	0.392	0.211	0.408	0.176	0.381	0.208	0.406

Urban	0.623	0.485	0.607	0.488	0.599	0.490	0.627	0.484	0.636	0.481	0.646	0.478
Western Cape	0.106	0.307	0.100	0.301	0.100	0.300	0.111	0.314	0.104	0.305	0.112	0.315
Eastern Cape	0.119	0.324	0.126	0.331	0.119	0.324	0.124	0.330	0.121	0.326	0.107	0.309
Northern Cape	0.023	0.150	0.023	0.151	0.023	0.149	0.022	0.145	0.020	0.142	0.027	0.161
Free State	0.054	0.225	0.057	0.233	0.056	0.230	0.056	0.229	0.047	0.213	0.052	0.221
KwaZulu-Natal	0.190	0.392	0.185	0.388	0.198	0.399	0.184	0.388	0.187	0.390	0.197	0.398
North West	0.066	0.248	0.073	0.261	0.069	0.253	0.067	0.250	0.064	0.245	0.055	0.229
Gauteng	0.262	0.440	0.249	0.432	0.253	0.435	0.265	0.441	0.278	0.448	0.262	0.440
Mpumalanga	0.079	0.270	0.078	0.269	0.079	0.270	0.072	0.259	0.078	0.268	0.090	0.286
Limpopo	0.079	0.270	0.078	0.269	0.079	0.270	0.072	0.259	0.078	0.268	0.090	0.286
N	88547		15115		15961		18327		18785		20359	

Note: matriculation refers to an examination taken at the end of secondary school in South Africa.

Source: author's calculations based on data from NIDS.

Now let us turn to other characteristics. The overall sample is composed of individuals aged 35–37 years on average, mainly female (53 per cent) and African (80 per cent). This composition pattern is consistent across the different waves. Fifteen per cent of the sample comprises unemployed individuals; 27 per cent are married individuals. In terms of education, the sample is mainly composed of individuals that have incomplete secondary education (45 per cent) and matriculation (i.e. completed secondary schooling) (17 per cent). A very small share has no schooling (six per cent), while a modest share (15 per cent) has a tertiary education. There is moderate improvement in educational attainment, with 19 per cent having completed matriculation in 2017 compared with 16 per cent in 2008, and 18 per cent having acquired a tertiary qualification in 2017 compared with 12 per cent in 2008. A large share (81 per cent) of South Africans are Christians, and this is consistent across all time periods. In terms of geographical location, 62 per cent reside in urban areas, while Gauteng (26 per cent) and KwaZulu-Natal (19 per cent) have the highest shares of individuals across South Africa's provinces. Statistics indicate that Northern Cape has the smallest share (two per cent) of individuals in the sample. The share of urbanized individuals remains relatively stable over the 2008–17 period.

4 Results

This section presents the results of the analysis in three broad sections. The first section begins with a discussion of the results on health poverty trends. The baseline results are based on a health poverty threshold of $k = 2$ (fair health). In this case, individuals who report their health as 'fair' (= 4) or 'poor' (= 5) are regarded as health poor. The section then goes on to present and discuss the results of the decomposition of changes in health poverty. All estimates are weighted by individual weights provided in the data, and robust standard errors are computed to account for heteroscedasticity. The second section presents a series of robustness checks related to the choice of health poverty line and reporting bias in the self-reported health measure. The third and final section provides a brief discussion of the results.

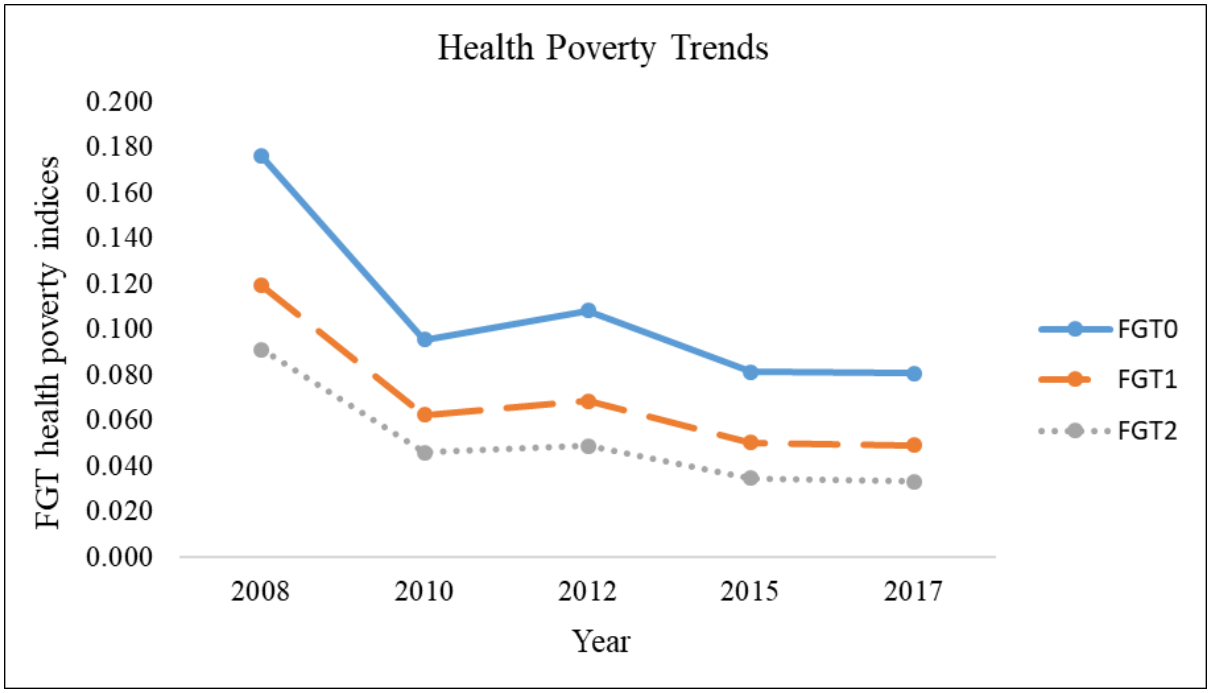
4.1 Main results

Health poverty trends

Figure 1 plots the health poverty headcount measure (FGT0), health poverty gap (FGT1), and health poverty severity (FGT2) against time to reveal health poverty trends for the period 2008–17 where $k = 2$ (fair health). FGT0 measures the incidence of health poverty (i.e. share of individuals that are health poor). This captures the proportion of individuals who are poor in health. FGT1 measures how far on average the poor are from the selected health threshold; this indicates the degree to which individuals fall below the health poverty threshold. FGT2 captures the severity of health poverty faced by individuals below the health threshold $k = 2$ by putting more weight on those who have poor health. Table 3 presents the corresponding values for the different health poverty measures, standard errors, and 95 per cent confidence intervals.

Figure 1 clearly shows a downward trend in health poverty during the 2008–17 period. The share of health poor individuals (FGT0) is 17.6 per cent in 2008; this declines to 9.5 per cent in 2010, and it further declines to 8.1 per cent in 2017. This decrease is also evident in the health poverty gap (FGT1) and health poverty severity (FGT2), which decrease by seven percentage points and 12.4 percentage points respectively between 2008 and 2017. The decline in FGT1 indicates an improvement in self-reported health outcomes, as fewer people report outcomes of fair or poor health, decreasing the number of people falling below the threshold. Similarly, the decline in FGT2 suggests that the extent of health poverty severity also improves over time.

Figure 1: Health poverty trends when health poverty threshold is set at *k = 2* (fair)



Source: author's illustration based on data from NIDS.

Table 3: FGT health poverty indices when *k = 2*

	FGT0	FGT1	FGT2
2008	0.176	0.119	0.091
	(0.006)	(0.004)	(0.004)
	[0.165, 0.188]	[0.111, 0.128]	[0.084, 0.099]
2010	0.095	0.062	0.046
	(0.005)	(0.004)	(0.003)
	[0.086, 0.105]	[0.055, 0.069]	[0.040, 0.052]
2012	0.108	0.069	0.049
	(0.005)	(0.003)	(0.003)
	[0.098, 0.119]	[0.062, 0.075]	[0.0437, 0.054]
2015	0.081	0.050	0.035
	(0.004)	(0.003)	(0.002)
	[0.073, 0.090]	[0.045, 0.056]	[0.030, 0.039]
2017	0.081	0.049	0.033
	(0.004)	(0.002)	(0.002)
	[0.073, 0.088]	[0.044, 0.054]	[0.030, 0.037]

Note: robust standard errors in round brackets; 95% confidence intervals in square brackets.

Source: author's calculations based on data from NIDS.

The changes observed between 2008 and 2017 are statistically significant across all indices. This is evidenced by the non-overlap in the 95 per cent confidence intervals for the 2008 and 2017 health poverty measures (Table 3). Thus, the overall decline in health poverty across all health poverty measures suggests improvements in the health status of the South African population, or more precisely in their perceived health status.

Decomposition results

To obtain insights into the factors that underpin the observed trends in health poverty, changes in health poverty headcount are computed between 2008 and 2017. This is then decomposed into within-group and between-group components by selected factors. The within-group component captures the effect of changes in health poverty that occur within a given group (e.g., females), while the between-group component captures the effect of changes in population share across groups (e.g., female and male). The baseline results of the decomposition are presented in Table 4, where the health poverty threshold is set at $k = 2$ (fair health). The proportion columns in the table capture the population shares of the different subgroups in each category, while the FGT0 columns represent the headcount health poverty level in each subgroup. Figure 2 presents the net effects of each variable, i.e. the within effect plus the between effect, to clearly show the factors that have the greatest and least effect on the decline in health poverty between 2008 and 2017.

As discussed earlier, the health poverty headcount index decreases from 17.6 per cent in 2008 to 8.1 per cent in 2017. The 9.5 percentage point change is decomposed first by age group. The results in Table 4 indicate that 92 per cent (i.e. 8.7 percentage points) is attributed to improvements in health poverty within age groups. A small contribution is observed from the shift in population shares between age groups. Improvements in health within the 50–59 and 30–39 age groups contribute the most to the decrease in health poverty. An assessment of the net effect (i.e. the within effect plus the between effect) of each age group shows that the 50–59 age group makes the highest contribution to the health poverty reduction, with the 70–79 age group making the least contribution (Figure 2).

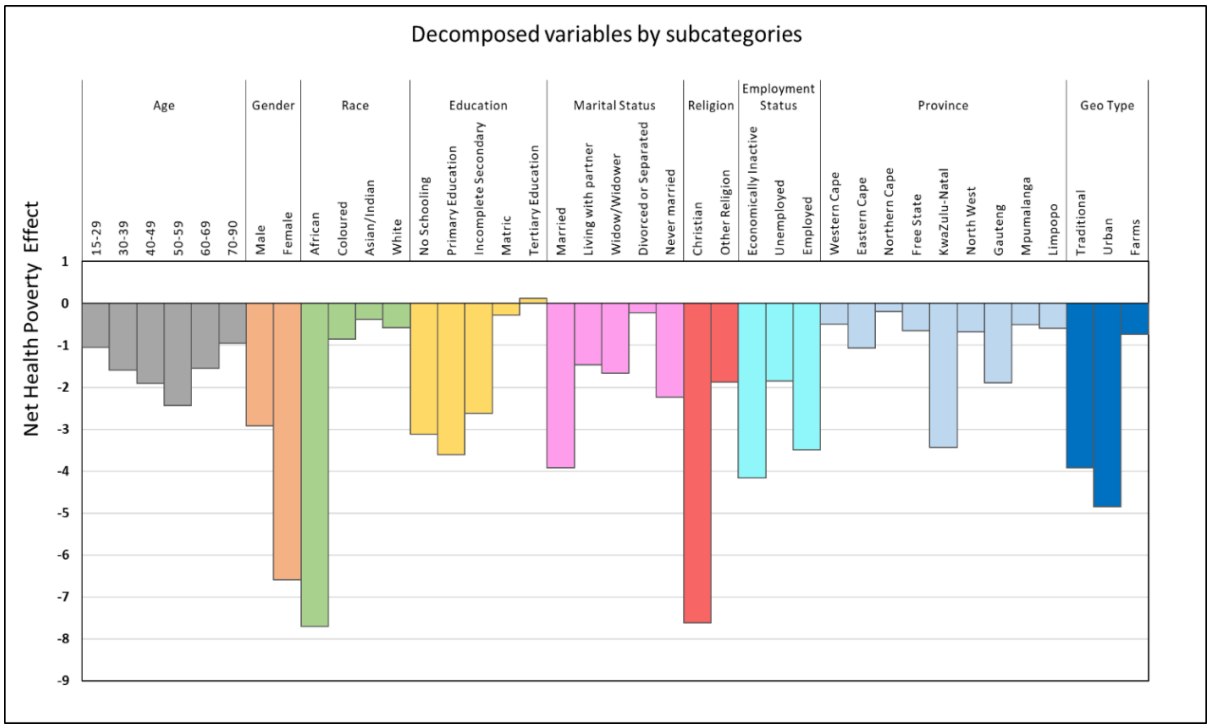
With regard to gender, the results indicate that the within-group changes in health poverty have a stronger effect than the between-group changes. Improvements in health poverty among females contribute considerably to the observed decline in health poverty. Thus, of the 9.5-percentage-point total decline in health poverty, six percentage points are attributable to health improvements among women (within effect). Turning to race, health improvements among Africans are the main driver of the health poverty changes observed between 2008 and 2017. While increases in the share of Africans have the counteracting effect of increasing health poverty, the net effect of this group on health poverty still contributes to health poverty reduction. The groups with the least effect on health poverty reduction are Asians/Indians and Whites, with net effects of -0.35 and -0.26 percentage points respectively.

Pertaining to human capital, individuals with no schooling, primary schooling, and incomplete secondary education make the highest contribution to the decrease in health poverty. This occurs mainly through the within-group improvements in health. The net effects of these groups are all negative, with the strongest effect observed among individuals with primary education. Those with tertiary education have a net effect (0.11 per cent) of increasing health poverty. Married and never-married individuals contribute the most to the decrease in health poverty. This is mainly through within-group changes. Of the total health poverty decline, -3.91 percentage points and -2.23 percentage points are attributable to the married and never-married groups respectively. Figure 2 on the net effects shows that individuals who are divorced or separated (-0.22 per cent) make the least contribution to the reduction in health poverty over the 2008–17 period.

The results for religion show that improvements in health among Christians contribute the most to the decline in health poverty. Although the between-group effect is weak, accounting for -0.4 percentage points, it also serves to reduce health poverty. Economically inactive individuals and those in employment make the largest contribution to the reduction in health poverty, while the unemployed make the least contribution. This is clearly depicted in Figure 2.

Relating to spatial factors, the results show that within-province changes account for almost all of the decrease in the province category's contribution to health poverty between 2008 and 2017. Figure 2 shows that Kwa-Zulu Natal makes the highest contribution to the reduction in health poverty, followed by Gauteng; Northern Cape makes the lowest contribution to health poverty reduction. Urban areas contribute the most to reducing the incidence of health poverty through the within effect, followed by traditional areas, and lastly farms. The decomposition results for the health poverty gap (FGT1) and health poverty severity (FGT2) are presented in Tables A2 and A3 in the Appendix. The findings for these measures are generally similar to those uncovered by using health poverty incidence (FGT0). Similarly, Figure A1 in the Appendix depicts the net effects for the health poverty headcount index when $k = 3$.

Figure 2: Decomposition of net effects of health poverty headcount index when *k* = *2*



Source: author's illustration based on data from NIDS.

Table 4: Decomposition of health poverty headcount index when *k = 2*

Variable	Group	2008		2017		Decomposition	
		Proportion	FGT0	Proportion	FGT0	Within	Between
Age	15-29	41.6	0.059	42.0	0.033	-1.074	0.019
	30-39	20.6	0.143	24.8	0.054	-1.995	0.409
	40-49	15.7	0.208	14.5	0.092	-1.739	-0.171
	50-59	11.1	0.362	9.6	0.163	-2.043	-0.399
	60-69	7.0	0.417	5.7	0.237	-1.140	-0.409
	70-90	4.0	0.514	3.4	0.322	-0.703	-0.247
	Total population	*100.0*	*0.176*	*100.0*	*0.081*	*-8.702*	*-0.798*
Gender	Male	43.8	0.138	47.8	0.065	-3.325	0.409
	Female	56.2	0.206	52.2	0.095	-5.976	-0.608
	Total population	*100.0*	*0.176*	*100.0*	*0.081*	*-9.301*	*-0.200*
Race	African	78.9	0.181	81.7	0.080	-8.066	0.371
	Coloured	8.0	0.200	8.4	0.088	-0.912	0.057
	Asian/Indian	2.5	0.210	2.3	0.062	-0.352	-0.029
	White	10.6	0.120	7.6	0.092	-0.257	-0.323
	Total population	*100.0*	*0.176*	*100.0*	*0.081*	*-9.576*	*0.076*
Education	No schooling	8.7	0.468	3.8	0.246	-1.378	-1.739
	Primary	19.6	0.291	11.4	0.181	-1.691	-1.910
	Incomplete secondary	42.1	0.136	47.2	0.065	-3.135	0.513
	Matriculation	16.7	0.077	19.6	0.052	-0.456	0.181
	Tertiary	12.9	0.067	18.0	0.055	-0.190	0.304
	Total population	*100.0*	*0.176*	*100.0*	*0.081*	*-6.850*	*-2.651*
Marital status	Married	31.7	0.202	25.8	0.096	-3.04	-0.874
	Cohabiting	8.9	0.223	5.7	0.087	-0.979	-0.485
	Widow/widower	6.8	0.460	5.8	0.247	-1.340	-0.323
	Divorced/separated	3.2	0.236	3.3	0.162	-0.238	0.019
	Never married	49.4	0.109	59.3	0.053	-3.031	0.798
	Total population	*100.0*	*0.176*	*100.0*	*0.081*	*-8.626*	*-0.874*

Religion	Christian	82.4	0.174	79.2	0.084	-7.211	-0.399
	Other religion	17.6	0.190	20.8	0.070	-2.290	0.409
	Total population	*100.0*	*0.176*	*100.0*	*0.081*	*-9.510*	*0.010*
Employment	Economically inactive	37.9	0.233	40.1	0.116	-4.541	0.380
	Unemployed	19.0	0.136	12.6	0.057	-1.245	-0.608
	Employed	43.1	0.144	47.3	0.057	-3.905	0.418
	Total population	*100.0*	*0.176*	*100.0*	*0.081*	*-9.690*	*0.190*
Province	Western Cape	10.0	0.151	11.2	0.091	-0.627	0.133
	Eastern Cape	12.6	0.164	10.7	0.092	-0.827	-0.238
	Northern Cape	2.3	0.225	2.7	0.124	-0.257	0.057
	Free State	5.7	0.198	5.2	0.094	-0.570	-0.086
	KwaZulu-Natal	18.5	0.257	19.7	0.065	-3.639	0.200
	North West	7.3	0.189	5.5	0.128	-0.390	-0.285
	Gauteng	24.9	0.148	26.2	0.068	-2.033	0.143
	Mpumalanga	7.8	0.167	9.0	0.090	-0.646	0.143
	Limpopo	10.8	0.119	9.8	0.069	-0.504	-0.095
	Total population	*100.0*	*0.176*	*100.0*	*0.081*	*-9.491*	*-0.010*
Geographical type	Traditional	33.7	0.195	31.1	0.084	-3.563	-0.352
	Urban	60.7	0.165	64.6	0.079	-5.320	0.475
	Farm	5.6	0.189	4.3	0.076	-0.561	-0.181
	Total population	*100.0*	*0.176*	*100.0*	*0.081*	*-9.443*	*-0.057*

Source: author's calculations based on data from NIDS.

4.2 Detailed analysis of the self-reported health data

Detailed analysis of the self-reported health data is necessary to ensure the accuracy of the main results. The first analysis conducted relates to the sensitivity of the results to the choice of health poverty threshold. The second pertains to assessing the extent of reporting bias in the health measure utilized.

First analysis check: sensitivity of health poverty trends to the choice of threshold

The baseline results use $k = 2$ (fair health). It is well known that health poverty measures are sensitive to the choice of health poverty threshold. To examine the sensitivity of the results, the threshold is shifted to $k = 3$ (good health), which implies that individuals with 'good' (= 3), 'fair' (= 2) and 'poor' (= 1) health are considered to be health poor. The results of the sensitivity threshold check are presented in Table 5.

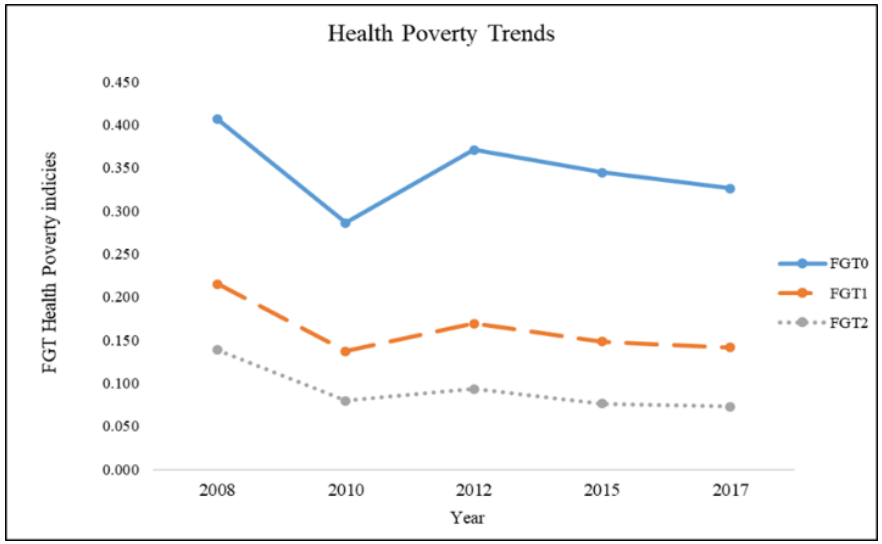
Table 5: Sensitivity check: choice of threshold

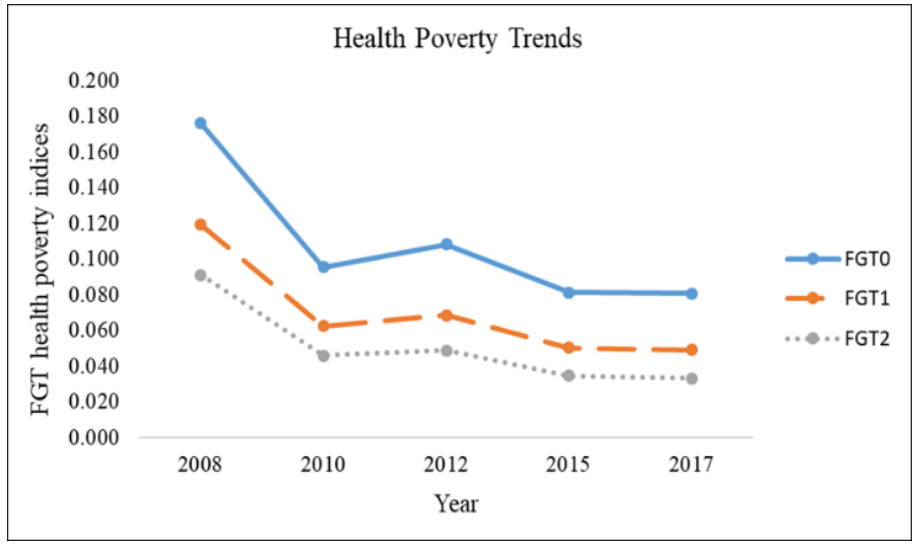
	FGT0	FGT1	FGT2
2008	0.406	0.215	0.139
	(0.010)	(0.005)	(0.004)
	[0.388, 0.428]	[0.205, 0.226]	[0.131, 0.147]
2010	0.286	0.137	0.080
	(0.010)	(0.005)	(0.004)
	[0.266, 0.306]	[0.127, 0.147]	[0.073, 0.087]
2012	0.371	0.169	0.093
	(0.011)	(0.005)	(0.003)
	[0.350, 0.391]	[0.160, 0.179]	[0.087, 0.010]
2015	0.345	0.148	0.076
	(0.009)	(0.004)	(0.003)
	[0.327, 0.363]	[0.140, 0.157]	[0.071, 0.081]
2017	0.326	0.141	0.073
	(0.009)	(0.004)	(0.003)
	[0.308, 0.344]	[0.133, 0.150]	[0.068, 0.078]

Note: robust standard errors in round brackets; 95% confidence intervals in square brackets.

Source: author's calculations based on data from NIDS.

Figure 3: Health poverty trends when health poverty threshold is set at *k = 3* (good) vs health poverty trends when health poverty threshold is set at *k = 2* (fair)





Source: author's illustrations based on data from NIDS.

Using $k = 3$ increases the health poverty incidence, gap, and severity levels; this is expected. Over time, all health poverty indices decline. FGT0, FGT1, and FGT2 decrease to 40.8 per cent, 21.6 per cent, and 13.9 per cent respectively in 2008, and to 32.6 per cent, 14.1 per cent, and 7.3 per cent in 2017. The corresponding changes in health poverty are: FGT0 -8.2 per cent; FGT1 -7.5 per cent; FGT2 -6.6 per cent. Although there is a slight increase in percentage points, the direction of the results is congruent with those obtained when $k = 2$. Figure 3 highlights the trend described above when the health poverty threshold is set at $k = 3$.

Table A4 in the Appendix presents the decomposition results for health poverty incidence when $k = 3$ (good). The results show that the 15–29 and 30–39 age groups and females contribute considerably to the decrease in health poverty over the 2008–17 period. Africans and those with education below matriculation level make the highest contribution to the reduction in health poverty. As established when $k = 2$, individuals with tertiary education contribute to increasing health poverty through the between-group effect, implying that individuals with tertiary education are more likely to report poor health outcomes compared with individuals without tertiary education. Married individuals and Christians contribute considerably to the reduction in health poverty. In terms of employment status and geographical type, almost all of the effect on health poverty is accounted for by the within-group rather than the between-group effect. The spatial outcomes indicate that individuals who stay in Eastern Cape, Free State, and North West all contribute to decreasing health poverty through within- and between-group effects. These results are consistent with those obtained when the threshold is set at $k = 2$ (fair health).

Second analysis check: under-reporting bias

The self-reported health measure used in this analysis might suffer from a reporting bias whereby individuals favour reporting better health. This limitation has been highlighted by previous studies using NIDS (e.g., Ardington and Gasealahwe 2013; Lau and Ataguba 2015; McLaren et al. 2014).

To acknowledge this limitation, this robustness check investigates the extent of reporting bias by comparing the subjective self-reported health status measure with more objective measures, i.e. chronic conditions. NIDS data has information on chronic conditions such as tuberculosis, high blood pressure, diabetes, stroke, cancer, and heart conditions. Using chronic conditions, the robustness check examines whether the trend in health poverty obtained by using the subjective measure is the same as that observed when one uses the prevalence of chronic conditions. Another check involves checking the degree of overlap between the subjective measure and chronic conditions. For instance, if a large share of individuals suffering from chronic conditions report excellent or good health, this will be indicative of a reporting bias in favour of better health status. Table 6 represents the proportions of individuals that suffer from chronic health conditions, while Table 7 presents the degree of overlap.

Overall statistics (Table 6) show that 20 per cent suffer from chronic conditions. In 2008, 22 per cent report having a chronic condition, which declines to 18 per cent in 2018. In relation to specific conditions, high blood pressure is the most widely experienced chronic condition in the sample and in 2008. Over time, the share of individuals with high blood pressure decreases from 13.5 per cent in 2008 to 11 per cent in 2017. Based on both the subjective measure of health and the prevalence of chronic conditions, the results point to the same pattern: an improvement in health status in South Africa.

Table 6: Descriptive statistics for chronic health conditions

Variable	Overall		2008		2010		2012		2015		2017	
	Mean	Std dev.	Mean	Std dev.	Mean	Std dev.	Mean	Std dev.	Mean	Std dev.	Mean	Std dev.
Tuberculosis	0.036	0.187	0.035	0.183	0.030	0.170	0.047	0.211	0.034	0.182	0.035	0.183
High blood pressure	0.125	0.330	0.135	0.341	0.113	0.316	0.161	0.367	0.104	0.305	0.110	0.313
Diabetes	0.035	0.184	0.035	0.183	0.034	0.182	0.046	0.209	0.034	0.180	0.026	0.159
Stroke	0.007	0.084	0.008	0.091	0.007	0.084	0.008	0.089	0.007	0.083	0.005	0.073
Asthma	0.032	0.175	0.034	0.181	0.035	0.184	0.040	0.196	0.026	0.159	0.024	0.153
Heart conditions	0.020	0.141	0.030	0.171	0.017	0.128	0.025	0.157	0.015	0.123	0.014	0.118
Cancer	0.009	0.092	0.007	0.084	0.006	0.079	0.006	0.079	0.012	0.107	0.011	0.106
All chronic conditions	0.203	0.402	0.219	0.414	0.182	0.386	0.248	0.432	0.181	0.385	0.180	0.384

Source: author's calculations based on data from NIDS.

Table 7: Proportion of overall chronic health conditions by self-reported health measures

Self-rated health	Proportion with chronic conditions
Excellent	0.111
Very good	0.158
Good	0.258
Fair	0.287
Poor	0.187

Source: author's calculations based on data from NIDS.

Table 7 presents the results on the overlap between reported health status and chronic conditions. The results on the overlap provide some evidence of systematic differences in reporting behaviour, revealing discrepancies between subjective health measures and chronic conditions. Of those who have at least one chronic conditions, 11 per cent report 'excellent', 15.8 per cent 'very good', and 25.8 per cent 'good' health. This implies that there is under-reporting of poor health outcomes under the subjective health measure. The implication for this analysis is that the level of health poverty reported in this paper is potentially understated and can be viewed as a lower bound.

4.3 Discussion and policy implications

The empirical results show that the incidence of health poverty decreased in South Africa from 17.6 per cent in 2008 to 8.1 per cent in 2017. The decline also extended to the health poverty gap and health poverty severity. Robustness checks suggest that the level of health poverty may be understated due to reporting bias. The decomposition results show that individuals aged 50–59 years, females, Africans, those with education below matriculation level, Christians, employed and economically inactive people, and those residing in urban areas and in KwaZulu-Natal made the highest net contributions to the reduction in health poverty. The results show that individuals aged 70–90 years, males, Asians/Indians and Whites, divorced/separated people, the unemployed, individuals with tertiary education, and those residing on farms made the least contribution to the reduction in health poverty. There is also considerable variation across provinces in contributions to health poverty reduction, with Northern Cape contributing the least to the observed trend.

The findings that highlight provincial differences suggest that South Africa should reconsider how health policies are implemented at the provincial level, with an aim to redress provincial health inequities. Similarly, the findings that show an increase in the poor health outcomes of individuals who have acquired a tertiary education suggest that there is a need to investigate the possible mechanisms that correlate higher education with poorer health outcomes. Additionally, the poor health outcomes of elderly, male, and unemployed individuals suggest that health policies targeted at those individuals can be improved. Lastly, the results indicate that health policies that benefit farm residents and divorced/separated individuals can have a significant impact in enhancing health improvements in the country.

5 Conclusion

This paper measured the magnitude of health poverty in South Africa by computing FGT poverty indices for ordinal self-reported health data. Using the NIDS data, the computed indices were further decomposed using a Shapley decomposition to determine the factors underpinning the observed trends. The computed indices showed that health poverty decreased over the 2008–17 period. The decomposition results highlighted the population subgroups that contributed to the reduction in health poverty as well as those that made the least contribution. Based on this paper's results, health policies that benefit the elderly, males, divorced/separated people, unemployed individuals, and those residing on farms can contribute to further improvements in health. Notably, the health status of females, Africans, low-educated individuals, and those residing in urban areas has improved significantly. This is commendable, thanks to various health interventions by the government. This achievement should be strengthened in future policies so as to maintain the positive momentum.

This analysis had some limitations. The paper established the possibility of reporting bias in the self-reported health measure, which is likely to downwardly bias the estimates of health poverty in South Africa. Future studies and data collection can complement subjective health measures with

the comprehensive collection and analysis of objective health measures. This paper attempted to do this, but in a limited manner. In addition, the decomposition analysis shed light on factors underpinning the observed trends; however, one cannot make clear judgements regarding the mechanisms that contributed to the results. This can be explored in future research.

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Appendix

Table A1: Key variables description

Variable	Survey question	Possible outcomes
Health	How would you describe your health at present?	Excellent (1)
		Very good (2)
		Good (3)
		Fair (4)
		Poor (5)
Chronic health conditions	Have you ever been told by a doctor, nurse, or healthcare professional that you have any of the following?	
	Tuberculosis	Yes/no
	High blood pressure	Yes/no
	Diabetes	Yes/no
	Stroke	Yes/no
	Asthma	Yes/no
	Heart problems	Yes/no
	Cancer	Yes/no
Age	What is your date of birth?	Respondent's date of birth
Gender	What is your gender?	Male
		Female
Race	What population group would you describe yourself as belonging to?	African
		Coloured
		Asian/Indian
		White
		Other
Marital status	What is your current marital status?	Married
		Living with partner
		Widowed
		Divorced/separated
		Never married

Labour market status	What is your employment status?	Regular employment
		Self-employed
		Casual work
		Subsistence work
		Not employed
Education	What is the highest level of education you have successfully completed?	No schooling
		Primary education
		Secondary education without matriculation
		Matriculation/Senior Certificate
		National Technical Certificate (levels 1, 2, & 3)
		Certificate with less than grade 12
		Diploma with less than grade 12
		Bachelor's degree
		Bachelor's degree and diploma
		Honours degree
		Higher degree (master's/ doctorate)
		Other
Province and geographical type	Derived variables	Urban
		Traditional
		Farm
		Western Cape
		Eastern Cape
		Northern Cape
		Free State
		KwaZulu-Natal
		North West
		Gauteng
		Mpumalanga
		Limpopo

Source: author's compilation based on data from NIDS.

Table A2: Decomposition of changes in health poverty gap index when *k = 2*

Variable	Group	2008		2017		Decomposition results	
		Proportion	FGT1	Proportion	FGT1	Within	Between
Age	15-29	41.6	0.039	42.0	0.020	-0.774	0.014
	30-39	20.6	0.094	24.8	0.033	-1.399	0.263
	40-49	15.7	0.141	14.5	0.056	-1.285	-0.114
	50-59	11.1	0.250	9.6	0.101	-1.548	-0.270
	60-69	7.0	0.289	5.7	0.143	-0.930	-0.277
	70-90	4.0	0.356	3.4	0.190	-0.618	-0.163
	Total population	*100.0*	*0.120*	*100.0*	*0.049*	*-6.560*	*-0.540*
Gender	Male	43.8	0.094	47.8	0.039	-2.499	0.270
	Female	56.2	0.140	52.2	0.058	-4.466	-0.405
	Total population	*100.0*	*0.120*	*100.0*	*0.049*	*-6.965*	*-0.135*
Race	African	78.9	0.124	81.7	0.048	-6.071	0.249
	Coloured	8.0	0.132	8.4	0.055	-0.639	0.043
	Asian/Indian	2.5	0.124	2.3	0.037	-0.213	-0.021
	White	10.6	0.080	7.6	0.054	-0.241	-0.206
	Total population	*100.0*	*0.120*	*100.0*	*0.049*	*-7.164*	*0.064*
Education	No schooling	8.7	0.331	3.8	0.152	-1.129	-1.193
	Primary education	19.6	0.200	11.4	0.115	-1.335	-1.292
	Incomplete secondary	42.1	0.092	47.2	0.040	-2.329	0.341
	Matriculation	16.7	0.047	19.6	0.030	-0.312	0.114
	Tertiary education	12.9	0.040	18.0	0.030	-0.142	0.178
	Total population	*100.0*	*0.120*	*100.0*	*0.049*	*-5.254*	*-1.846*
Marital status	Married	31.7	0.135	25.8	0.056	-2.279	-0.568
	Living with partner	8.9	0.151	5.7	0.050	-0.738	-0.320
	Widowed	6.8	0.321	5.8	0.156	-1.044	-0.220
	Divorced/separated	3.2	0.161	3.3	0.099	-0.199	0.014
	Never married	49.4	0.074	59.3	0.033	-2.265	0.533
	Total population	*100.0*	*0.120*	*100.0*	*0.049*	*-6.532*	*-0.568*

Religion	Christian	82.4	0.118	79.2	0.051	-5.481	-0.270
	Other religion	17.6	0.128	20.8	0.043	-1.626	0.270
	Total population	*100.0*	*0.120*	*100.0*	*0.049*	*-7.10*	*0*
Employment status	Economically inactive	37.9	0.162	40.1	0.071	-3.571	0.256
	Unemployed	19.0	0.088	12.6	0.037	-0.809	-0.398
	Employed	43.1	0.097	47.3	0.034	-2.854	0.270
	Total population	*100.0*	*0.120*	*100.0*	*0.049*	*-7.235*	*0.135*
Province	Western Cape	10.0	0.102	11.2	0.056	-0.497	0.092
	Eastern Cape	12.6	0.102	10.7	0.057	-0.525	-0.149
	Northern Cape	2.3	0.152	2.7	0.081	-0.178	0.043
	Free State	5.7	0.136	5.2	0.058	-0.426	-0.057
	KwaZulu-Natal	18.5	0.184	19.7	0.038	-2.805	0.142
	North West	7.3	0.126	5.5	0.076	-0.327	-0.185
	Gauteng	24.9	0.099	26.2	0.040	-1.498	0.092
	Mpumalanga	7.8	0.119	9.0	0.058	-0.511	0.099
	Limpopo	10.8	0.075	9.8	0.042	-0.341	-0.057
	Total population	*100.0*	*0.120*	*100.0*	*0.049*	*-7.121*	*0.021*
Geographical type	Traditional	33.7	0.134	31.1	0.051	-2.677	-0.234
	Urban	60.7	0.111	64.6	0.048	-3.962	0.312
	Farm	5.6	0.130	4.3	0.047	-0.412	-0.121
	Total population	*100.0*	*0.120*	*100.0*	*0.049*	*-7.057*	*-0.043*

Source: author's calculations based on data from NIDS.

Table A3: Decomposition of changes in squared health poverty gap index when *k = 2*

Variable	Group	2008		2017		Decomposition results	
		Proportion	FGT2	Proportion	FGT2	Within	Between
Age	15-29	41.6	0.029	42.0	0.014	-0.61	0.01
	30-39	20.6	0.070	24.8	0.022	-1.08	0.19
	40-49	15.7	0.107	14.5	0.038	-1.04	-0.08
	50-59	11.1	0.194	9.6	0.070	-1.28	-0.20
	60-69	7.0	0.224	5.7	0.096	-0.81	-0.20
	70-90	4.0	0.278	3.4	0.124	-0.56	-0.12
	Total population	*100.0*	*0.091*	*100.0*	*0.033*	*-5.39*	*-0.41*
Gender	Male	43.8	0.071	47.8	0.026	-2.05	0.20
	Female	56.2	0.107	52.2	0.039	-3.65	-0.30
	Total population	*100.0*	*0.091*	*100.0*	*0.033*	*-5.70*	*-0.10*
Race	African	78.9	0.095	81.7	0.033	-4.99	0.18
	Coloured	8.0	0.098	8.4	0.038	-0.49	0.03
	Asian/Indian	2.5	0.082	2.3	0.024	-0.14	-0.01
	White	10.6	0.060	7.6	0.035	-0.23	-0.15
	Total population	*100.0*	*0.091*	*100.0*	*0.033*	*-5.85*	*0.05*
Education	No schooling	8.7	0.262	3.8	0.104	-0.99	-0.90
	Primary education	19.6	0.155	11.4	0.081	-1.14	-0.96
	Incomplete secondary	42.1	0.070	47.2	0.027	-1.89	0.25
	Matriculation	16.7	0.032	19.6	0.019	-0.24	0.08
	Tertiary education	12.9	0.026	18.0	0.018	-0.12	0.11
	Total population	*100.0*	*0.091*	*100.0*	*0.033*	*-4.38*	*-1.42*
Marital status	Married	31.7	0.102	25.8	0.037	-1.87	-0.41
	Living with partner	8.9	0.115	5.7	0.031	-0.61	-0.23
	Widowed	6.8	0.251	5.8	0.110	-0.89	-0.17
	Divorced/separated	3.2	0.123	3.3	0.068	-0.18	0.01
	Never married	49.4	0.056	59.3	0.022	-1.85	0.39
	Total population	*100.0*	*0.091*	*100.0*	*0.033*	*-5.39*	*-0.41*
Religion	Christian	82.4	0.090	79.2	0.034	-4.54	-0.20
	Other religion	17.6	0.096	20.8	0.030	-1.27	0.20
	Total population	*100.0*	*0.091*	*100.0*	*0.033*	*-5.80*	*0.00*

Employment status	Economically inactive	37.9	0.126	40.1	0.048	-3.03	0.19
	Unemployed	19.0	0.064	12.6	0.027	-0.58	-0.28
	Employed	43.1	0.073	47.3	0.022	-2.29	0.20
	Total population	*100.0*	*0.091*	*100.0*	*0.033*	*-5.90*	*0.10*
Province	Western Cape	10.0	0.078	11.2	0.038	-0.43	0.06
	Eastern Cape	12.6	0.071	10.7	0.040	-0.37	-0.10
	Northern Cape	2.3	0.115	2.7	0.060	-0.14	0.03
	Free State	5.7	0.105	5.2	0.040	-0.35	-0.04
	KwaZulu-Natal	18.5	0.147	19.7	0.024	-2.35	0.11
	North West	7.3	0.094	5.5	0.049	-0.29	-0.13
	Gauteng	24.9	0.074	26.2	0.027	-1.21	0.07
	Mpumalanga	7.8	0.095	9.0	0.043	-0.44	0.08
	Limpopo	10.8	0.054	9.8	0.029	-0.26	-0.04
	Total population	*100.0*	*0.091*	*100.0*	*0.033*	*-5.83*	*0.03*
Geographical type	Traditional	33.7	0.103	31.1	0.035	-2.20	-0.17
	Urban	60.7	0.084	64.6	0.033	-3.22	0.23
	Farm	5.6	0.101	4.3	0.032	-0.34	-0.09
	Total population	*100.0*	*0.091*	*100.0*	*0.033*	*-5.77*	*-0.03*

Source: author's calculations based on data from NIDS.

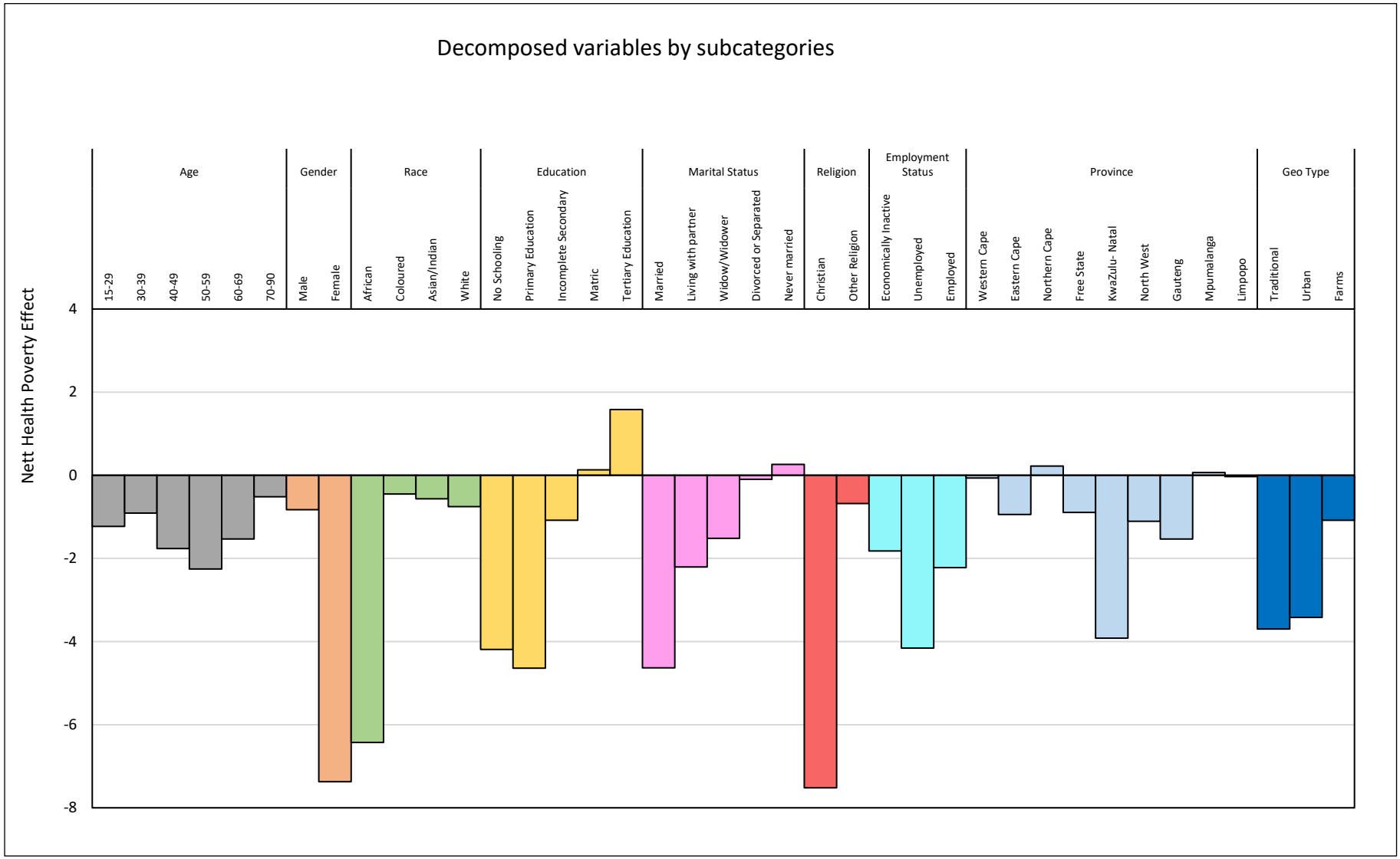
Table A4: Decomposition of changes in health poverty headcount index when *k = 3*

Group	2008		2017		Decomposition results	
	Proportion	FGT0	Proportion	FGT0	Within	Between
15-29	41.6	0.262	42.0	0.231	-1.320	0.090
30-39	20.6	0.371	24.8	0.273	-2.255	1.345
40-49	15.7	0.464	14.5	0.379	-1.279	-0.484
50-59	11.1	0.628	9.6	0.493	-1.402	-0.853
60-69	7.0	0.706	5.7	0.596	-0.705	-0.828
70-90	4.0	0.757	3.4	0.740	-0.066	-0.451
Total population	*100.0*	*0.408*	*100.0*	*0.326*	*-7.019*	*-1.181*
Male	43.8	0.347	47.8	0.300	-2.148	1.320
Female	56.2	0.455	52.2	0.350	-5.724	-1.648
Total population	*100.0*	*0.408*	*100.0*	*0.326*	*-7.872*	*-0.328*
African	78.9	0.415	81.7	0.322	-7.478	1.050
Coloured	8.0	0.408	8.4	0.333	-0.615	0.164
Asian/Indian	2.5	0.462	2.3	0.260	-0.484	-0.082
White	10.6	0.344	7.6	0.383	0.361	-1.115
Total population	*100.0*	*0.408*	*100.0*	*0.326*	*-8.216*	*0.016*
No schooling	8.7	0.750	3.8	0.620	-0.820	-3.370
Primary education	19.6	0.527	11.4	0.499	-0.443	-4.198
Incomplete secondary	42.1	0.368	47.2	0.305	-2.829	1.747
Matriculation	16.7	0.293	19.6	0.257	-0.656	0.787
Tertiary education	12.9	0.273	18.0	0.284	0.172	1.410
Total population	*100.0*	*0.408*	*100.0*	*0.326*	*-4.567*	*-3.633*

Married	31.7	0.447	25.8	0.370	-2.206	-2.427
Living with partner	8.9	0.491	5.7	0.376	-0.845	-1.361
Widowed	6.8	0.733	5.8	0.592	-0.894	-0.623
Divorced/separated	3.2	0.492	3.3	0.448	-0.139	0.041
Never married	49.4	0.317	59.3	0.269	-2.649	2.911
Total population	*100.0*	*0.408*	*100.0*	*0.326*	*-6.740*	*-1.460*
Christian	82.4	0.407	79.2	0.329	-6.355	-1.164
Other religion	17.6	0.409	20.8	0.314	-1.820	1.140
Total population	*100.0*	*0.408*	*100.0*	*0.326*	*-8.175*	*-0.025*
Economically inactive	37.9	0.451	40.1	0.381	-2.739	0.918
Unemployed	19.0	0.400	12.6	0.274	-2.009	-2.148
Employed	43.1	0.372	47.3	0.293	-3.608	1.386
Total population	*100.0*	*0.408*	*100.0*	*0.326*	*-8.356*	*0.156*
Western Cape	10.0	0.356	11.2	0.314	-0.451	0.385
Eastern Cape	12.6	0.356	10.7	0.331	-0.295	-0.648
Northern Cape	2.3	0.421	2.7	0.449	0.074	0.148
Free State	5.7	0.468	5.2	0.349	-0.656	-0.238
KwaZulu-Natal	18.5	0.495	19.7	0.265	-4.403	0.484
North West	7.3	0.447	5.5	0.393	-0.353	-0.754
Gauteng	24.9	0.384	26.2	0.306	-1.993	0.459
Mpumalanga	7.8	0.454	9.0	0.403	-0.426	0.492
Limpopo	10.8	0.327	9.8	0.356	0.303	-0.336
Total population	*100.0*	*0.408*	*100.0*	*0.326*	*-8.192*	*-0.008*
Traditional	33.7	0.419	31.1	0.335	-2.731	-0.968
Urban	60.7	0.398	64.6	0.321	-4.830	1.410
Farm	5.6	0.440	4.3	0.326	-0.566	-0.517
Total population	*100.0*	*0.408*	*100.0*	*0.326*	*-8.126*	*-0.074*

Source: author's calculations based on data from NIDS.

Figure A1: Decomposition of net effects of health poverty headcount index when *k = 3*



Source: author's illustration based on data from NIDS.