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Beyond access to basic services: perspectives on social health determinants of Mozambique

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ABSTRACT

A wide range of evidence shows systematic differences in health status among social groups, which are associated with unequal exposure to and distribution of the social determinants of health (SDH). However, the role of these SDH has not been studied extensively in low-income countries, where most studies focus on access to medical care. In this paper, we undertake a retrospective cross-sectional analysis of the SDH in Mozambique for the period 2002–2014 based on a set of household budget surveys, covering 152,259 observations. We run logistic regression models, comparing various sets of determinants of health status proxied by two measures: self-assessed overall health and number of days ill. The results, which include models stratified by sex, age and year, consistently show that neither better access to healthcare nor material conditions are related to better health. Rather, macro factors, proxied by place of residence, are the dominant predictor of health inequalities. In the stratified models, women and elders appear more vulnerable to poor health. The policy implication is that a narrow focus of health policy on selected services ignores the underlying economic and social context and their role in producing well-being or poor health. More integrated approaches are required to address the health equity gap in low-income countries.

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Introduction

In common with many low-income countries, a pillar of Mozambique's health policy over the past 20 years has been to improve access to medical care. This has principally involved expanding the network of primary health facilities (i.e., health posts) throughout the country. In many ways, this represented a practical response to the stark health challenges facing the country after prolonged armed conflict, which ended in the mid-1990s, at which point Mozambique was one of the poorest countries in the world. Consistent with the Millennium Development Goals (MDGs), expanding access to health facilities was aimed at addressing high rates of child and maternal mortality, as well as the prevalence of specific communicable diseases such as HIV/AIDS, tuberculosis, and malaria. In 1995 infant mortality was 151.2 per 1,000 live births (World Bank, 2018).

Significant gains have been achieved since the mid-1990s, both in reducing mortality from specific diseases and tackling infant mortality. Despite this, little attention has been paid to how gains in health are distributed across population sub-groups. Looking across a range of countries, Wagstaff et al. (2014) point to different rates of progress between richer and poorer households,

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 Supplemental data for this article can be accessed [here](#).

meaning that relative health inequalities have been increasing in many developing countries. Similarly, the UN (2015) argues that health inequalities are widening in sub-Saharan Africa, implying that widened access to basic services may not be sufficient to sustain improvements in health outcomes.

In Mozambique, the focus of health policy has been on curative care (World Health Organization, 2013). This is a concern since actions to treat specific diseases rarely address their root causes. Poor health is often explained with reference to a wide range of economic and social determinants. As Marmot et al. (2008) put it: '... structural determinants and conditions of daily life constitute the social determinants of health and cause much of the health inequity between and within countries' (Marmot et al., 2008, p. 1661). Consequently, both a biomedical and social view of the determinants of health are vital (CSDH, 2008).

The aim of this study is to apply the lens of the social determinants of health to the case of Mozambique. We consider progress in overall health status. We ask three main questions: (a) How has self-reported health status evolved in Mozambique over the past decade? (b) What are the differences in health status across population sub-groups? And (c) What are the key determinants of variation in health status, such as access to basic services? These questions are relevant for three reasons. First, self-reported health status provides a general and inclusive picture of life quality (health), which goes beyond the effects of specific diseases or conditions (Au & Johnston, 2014). While reductions in the latter are expected to raise overall health status, their contribution to general health may be small at the population-level. Second, the relationship between improved access to curative care and health status is generally considered to be weak. Take the example of water-borne disease – better access to treatment may lead to temporary improvements, but it does not address the source of the disease. And even though some resistance may emerge, other complications or lower-level symptoms may remain, implying overall health status does not significantly improve. Third, a fuller understanding of systematic patterns in health and how they may have changed over time can provide guidance to policymakers wishing to take an integrated approach to addressing poor health, as well as to narrow within-country health inequalities.

Social determinants of health in low-income countries

Following the neoliberal turn that gained traction in developing countries from the mid-1980s, a more selective and disease-oriented view took precedence over more intersectoral and primary care orientated approaches that had gained policy traction earlier in the century. A preference for high impact technical health interventions, aimed at treating specific conditions that are amenable to quantitative evaluations, such as the 'GOBI' (growth charts, oral rehydration, breastfeeding, immunization) approach to reduce infant mortality. More generally, the emphasis has been on access to basic services and adopting Western health technology and models of care. Unsurprisingly, therefore, the majority of social science health research in low-income countries has focused on access to services (e.g., Mezmur et al., 2017; Mtowa et al., 2017; Wabiri et al., 2016).

General medical interventions to combat diseases are of great importance. Nonetheless, a wide range of evidence shows how health outcomes are systematically related to people's social and economic positions in society. As the WHO Commission on the Social Determinants of Health (CSDH, 2008) elaborates, populations are stratified between and within countries. (Braveman & Gottlieb, 2014; Pedrana et al., 2016), giving to concrete associations between material circumstances and other intermediate factors that affect health outcomes. Put simply, there is a social gradient to poor health that reflects structural differences or inequities between population sub-groups. It follows that while access to curative health services may be a pertinent *proximate* cause of health outcomes, it is unlikely to be the *only* material determinant. Moreover, differences in access to health services tend to reflect (are symptomatic of) deeper inequalities across the population.

Research on the social determinants of health has been primarily undertaken in Western contexts (Cash-Gibson et al., 2018). In sub-Saharan Africa, studies of the social determinants of

general population health, rather than of individual diseases or of particular population groups, are scarce. Several studies point to socioeconomic gradients in health, but their scope has been in selected populations – mainly, children (Adewuyi et al., 2017; Hangoma et al., 2017; Macassa et al., 2003; Zere & McIntyre, 2003) or HIV-positive groups (Pons-Duran et al., 2016; Sia et al., 2016). Other studies link health outcomes to specific factors, such as housing conditions, access to basic services, or access to a safe water source (Batiro et al., 2017; Dos Santos et al., 2015; Herrin et al., 2013; Ntouda et al., 2013). However, with the exception of Ataguba et al. (2015) for South Africa, few studies have taken a comprehensive view of the social determinants of health outcomes. Recognising that the effect of specific determinants of health outcomes may vary from one country to another, as well as within countries (Eshetu & Woldesenbet, 2011), we address this gap for the case of Mozambique.

Methods

Context

Mozambique is a low-income country in East Africa. Since the mid-1990s, it has achieved rapid growth in real gross domestic product (GDP), averaging around 7% per year. Economic growth has brought reductions in poverty levels, but not at the same pace as in aggregate GDP – e.g., the official poverty rate fell from 68% in 1996/97 to 53% in 2002/03, but up to 2014/15 only declined to 46% (MEF, 2016). Multidimensional poverty – which, arguably, better takes into account of the provision of public goods and services – has fallen somewhat more consistently (from 77% in 1996/96 to 45% in 2014/15). At the same time, regional disparities in socio-economic conditions are large and persistent. As of 2014/15, multidimensional poverty rates were 57% for the population in the north of the country, versus 14% in the south (MEF, 2016).

Social and economic gains over recent years have been echoed in population-average health outcomes. For instance, life expectancy at birth has risen from 45 years in 1995 to 58 years in 2016 (World Bank, 2018). However, average health outcomes in present-day Mozambique rank poorly in a global perspective, reflecting low average incomes and weak provision of public services. The country still has one of the highest maternal and infant mortality rates in the world (INE, 2015) and continues to be a major recipient of health aid (IHME, 2016). Currently, communicable diseases are the leading causes of death in Mozambique: malaria (29% of all deaths), HIV/AIDS (27%), perinatal conditions (6%), diarrhoeal diseases (4%) and lower respiratory infections (4%) (World Health Organization, 2016). Large differences in mortality also exist across urban and rural locations. Malaria was the leading cause of death in rural zones and HIV/AIDS was the leading cause of death in urban zones (INE, 2015). Moreover, chronic malnutrition remains a common health condition, affecting 43% of under-fives.

Data and outcomes

To answer our research questions, we use data from the set of Household Budget Surveys (HBS) undertaken in Mozambique for the years 2002/3, 2008/9, and 2014/15. The HBSs provide consistent and homogeneous information over time of a sample of the Mozambican population, which is representative at national, regional (north, centre, and south), provincial and urban/rural levels. The surveys apply probability sampling following a three-level multistage stratified sampling technique: selection of strata (provinces), selection of enumeration areas within each strata, and selection of the households within each enumeration area. The designated person for responding to the survey in each unit was the head of the household. The final samples of households included in the analyses consist of $n = 43,869$ (HBS 2002/3), $n = 51,114$ (HBS 2008/9) and $n = 57,276$ (HBS 2014/15). While the HBS 2014/15 involved repeated visits to the participating households (once every trimester), in order

to mirror the data structure of the earlier surveys, we only draw on observations from one randomly selected trimester.

The HBS covers a wide variety of information on socioeconomic characteristics of individuals and households such as home consumption, durable assets and housing quality. It also includes information on access to a safe water source, energy, and distance to public services (e.g. distance to a health facility or primary schools).

The main outcome variable of interest is self-assessed health, which is a dichotomous variable that takes a value of 1 if somebody had a perceived health need in the prior two weeks before the survey (and zero otherwise). We refer to this as being 'unwell' hereafter. In addition, severity was assessed through the number of days reported as ill, from zero (not being unwell in any of the previous 14 days) to 4 (having been unwell for at least four of the days). Self-assessed health has been found to be a strong predictor of morbidity and mortality across different populations (Appels et al., 1996), including in Sub-Saharan Africa (SSA) (Olgati et al., 2012). Self-assessed health is a comprehensive measure of health status able to capture elements (e.g., mental health conditions) that more guided questions cannot. However, self-assessed health provides little guidance on components of health that are being affected (Au & Johnston, 2014). Days ill, which has also been tested in SSA context and found to be valid (Herrin et al., 2013), provides complementary insights into the severity of unwellness.

During the years of the study, the population reported being unwell in the past two weeks decreased from 15.9% in 2002 to 11.2% in 2014. However, systematic and persistent (relative) differences appear when analysing the different population subgroups. That is, despite the overall decreasing trend, a higher proportion of women and individuals living in rural areas report to be unwell. For example, in 2014, 12.3% of women and 10.0% of men reported being unwell in the past two weeks. The proportion reporting being unwell in the past two weeks in rural areas (12.8%) is almost twice as high as in urban areas (7.7%). Individuals aged under five and older than 45 years old also report greater unwellness on average, in 2014, 15.2% and 19.0%, respectively. The reader is referred to the Figure S1 (supplementary material) for an overview of the average unwellness in Mozambique, in total and across population sub-groups.

Explanatory variables

To understand what lies behind self-reported health, we apply a SDH lens. The motivation is to take into account a broad range of factors that may affect health status, including both immediate physical/material determinants (such as access to services) as well as broader structural factors. Inspired by the WHO's conceptual framework (CSDH, 2008; Solar & Irwin, 2010) we classify variables into four main groups: (1) access to basic services, (2) material conditions, (3) social position and (4) macro context. The first two groups capture proximate determinants of health, distinguishing between public services and private material conditions. The remaining two groups refer to deeper structural factors associated with differences in 'power, prestige and access to resources' (Solar & Irwin, 2010) and which, in turn, produce social stratification. Concretely, 'social position' captures structural differences *between* individuals and/or households in terms of such resources (e.g., driven by gender relations). The 'macro context' group of variables captures how power and resources vary more broadly over space (e.g., between geographical regions) and over time. These latter dynamics are not directly observed. However, Mozambique faces large annual variations in agricultural performance, induced by climatic variation, meaning poverty levels are known to vary significantly within locations over time. For this reason, and in order to fully capture the spatial and temporal variation associated with changes in macro-level variables, we proxy them using a 3-way combination of location (urban-rural), region, year plus the season (dry vs wet).

A detailed list of the variables we use to capture the effects in each group is found in the Table S1 (supplementary material). Note that while the outcome variables and certain characteristics vary at the individual level (i.e., within households) all members of each household share the same material conditions and per capita consumption levels. Access to medical care and education services also

varies at the household-level, as it is based on self-reported distances to relevant facilities. Safe water and access to clean energy are based on reported household conditions. Seasonal conditions refer to the main annual differences in the Mozambican climate, which is conventionally divided between a hotter wet season and a cooler dry season (Abellana et al., 2008).

The reader is referred to the Table S2 (supplementary material) for the summary statistics of the explanatory variables. As already hinted, access to services has increased substantially over time. For example, since 2002 access to medical care has doubled. In 2014, 68.3% of the population was able to access medical care in less than 30 minutes. Access to a safe water source increased from 41.4% in 2002 to 52.3% in 2014. Additionally, over the same period, an improvement in the material conditions is observed – e.g., the proportion of the population dwelling in a residence with a quality roof covering increased from 29.2% in 2002 to 42.0% in 2014. A similar pattern is observed for transportation means ownership, which increased from 34.4% in 2002 to 44.4% in 2014. Additionally, Tables S3 and S4 (supplementary material) provide information regarding the distribution of access to basic services and material conditions in the country and over the year. Large differences are shown between urban rural, the north, center and south and also along the years of study.

Statistical analysis

Under the SDH model, a working hypothesis is that proximate variables can (largely) be traced back to structural factors. The statistical implication is that the explanatory power of structural factors (groups 3 and 4) should exceed that of the proximate factors (groups 1 and 2). Put another way, the relevance (statistical significance) of the latter variables should decline when structural factors are introduced into the model.

To investigate this hypothesis, we use a logistic regression model. Here, we regress the self-assessed binary outcome of ill health on different sets of factors, considered both separately (one by one) and jointly. In addition, we also apply an ordered logistic regression model for the outcome of a number of days ill. The baseline or reference category is illiterate males, aged 1–5 located in the urban south in 2014 with: no access to health care, no access to education, no access to a safe water source, no access to clean energy, poor quality wall coverings, poor quality roof coverings, no furniture, no means of transport, no communication technology. All regression estimates apply survey weights and use robust standard errors, clustered at the level of the primary enumeration area. The models are estimated using Stata v14.1.

The aggregate regressions are run for the two outcomes (unwell and days ill), pooling the three sets of household surveys. By definition, this restricts the coefficients of interest to be the same for all groups and time periods. Later, we relax this assumption by running stratified models by age, gender and survey year. This helps provide additional insights into the extent of heterogeneity in the determinants of self-reported health. The impact of gender and age as social determinants of health is complex; gender differences in health outcomes are consistently reported in the literature (Theobald et al., 2017).

Results

Aggregate results

Tables 1 and 2 show the aggregate results from the regression models for being unwell and days ill, respectively. In columns 1 through 4, the four different groups of factors associated with different aspects of the SDH framework are introduced separately; then, in Column 5, they are introduced jointly.

Column 1 in both tables considers the relationship between health status and access to basic services. Neither column indicates any clear relation between access to medical care or access to education and health outcomes. Column 2 considers material conditions. On a standalone basis these variables appear important – e.g., being unwell is significantly less likely in those individuals living in houses with quality walls and roof coverings (OR = 0.89, $p < 0.01$ and OR = 0.78 $p < 0.001$,

Table 1. Determinants of social inequalities in self-assessed health using logistic regression and being unwell as the outcome variable, 2002–2014.

	Model 1	Model 2	Model 3	Model 4	Model 5
Access to basic services					
Access to medical care (ref.: no access to medical care)	0.97 [0.89,1.04]				1.06 [0.98,1.15]
Access to education (ref.: no access to education)	1.03 [0.95,1.12]				1.01 [0.93,1.10]
Access to safe water source (ref.: no access to safe water source)	0.89** [0.83,0.97]				0.95 [0.88,1.03]
Access to clean energy (ref.: no access to clean energy)	0.64*** [0.59,0.70]				0.90 [0.80,1.00]
Material conditions					
Quality wall coverings (ref.: poor quality wall coverings)		0.89** [0.81,0.97]			0.95 [0.86,1.05]
Quality roof coverings (ref.: poor quality roof coverings)		0.78*** [0.71,0.86]			0.91* [0.83,0.99]
Furniture possession (ref.: no furniture possession)		0.94 [0.86,1.03]			1.00 [0.92,1.10]
Owns transportation means (ref.: don't own transportation mean)		0.91** [0.85,0.97]			0.91** [0.85,0.97]
Owns communication technology (ref.: don't own communication technology)		0.85*** [0.80,0.91]			0.94 [0.87,1.01]
Social position					
Age (ref.: age 1–5)	6–20		0.36*** [0.34,0.38]		0.37*** [0.34,0.39]
	21–45		0.73*** [0.68,0.78]		0.75*** [0.70,0.80]
	>45		1.12* [1.01,1.23]		1.17** [1.05,1.29]
Female (ref.: male)			1.25*** [1.19,1.30]		1.26*** [1.20,1.32]
Literacy (ref.: illiterate)			0.91** [0.85,0.97]		1.07* [1.00,1.15]
Household size			0.95*** [0.94,0.96]		0.95*** [0.94,0.97]
Log Consumption			1.08** [1.03,1.13]		1.12*** [1.06,1.18]
Macro context					
(ref.: urban south 2014)					
Northern area					
Urban	2002			2.25*** [1.71,2.95]	1.89*** [1.36,2.63]
	2008			2.23*** [1.81,2.75]	2.05*** [1.62,2.59]
	2014			0.57*** [0.46,0.72]	0.52*** [0.41,0.66]
Rural					
	2002			2.79*** [2.31,3.37]	2.31*** [1.83,2.91]
	2008			2.97*** [2.31,3.83]	2.47*** [1.87,3.27]
	2014			1.70*** [1.42,2.02]	1.40** [1.13,1.73]
Central area					
Urban	2002			1.89*** [1.59,2.26]	1.76*** [1.45,2.13]
	2008			1.33** [1.08,1.65]	1.30* [1.03,1.64]
	2014			1.26** [1.06,1.49]	1.26* [1.06,1.50]
Rural					
	2002			2.39*** [2.07,2.76]	1.95*** [1.60,2.37]
	2008			1.44*** [1.17,1.77]	1.22 [0.96,1.55]
	2014			1.69*** [1.42,2.02]	1.42*** [1.13,1.73]

(Continued)

Table 1. (Continued).

		Model 1	Model 2	Model 3	Model 4	Model 5
					[1.45,1.98]	[1.17,1.73]
Southern area						
Urban	2002				1.43***	1.35***
					[1.24,1.65]	[1.15,1.58]
	2008				1.31**	1.27**
					[1.11,1.54]	[1.07,1.50]
Rural	2002				1.68***	1.35**
					[1.43,1.97]	[1.11,1.64]
	2008				2.38***	1.99***
					[1.75,3.24]	[1.45,2.72]
	2014				1.55***	1.37**
					[1.27,1.89]	[1.10,1.71]
Season						
Wet season					1.08*	1.07
(ref.: dry season)					[1.00,1.16]	[0.99,1.16]
n		132,185	132,185	132,185	132,185	132,185

Odds ratio and 95% confidence intervals (in brackets); P value: *p < 0.05, **p < 0.01, ***p < 0.001.

Model 1 includes only the variables for access to basic services; Model 2 includes only material conditions; Model 3 contains only the social position's variables; Model 4 includes only the macro context; and, Model 5 incorporates all the previous variables.

respectively). It is also consistent with days ill. However, the same variables become near irrelevant when they are jointly considered alongside the full set of structural factors (see Column 5). For example, quality walls are no longer statistically significant, either for unwellness or for days ill.

Consistent with existing literature (Hosseinpoor et al., 2012), Column 3 shows that gender and age are relevant factors – namely, women and the population over 45 years old are more likely to be unwell and suffer more days ill compared to men and younger age groups (Column 3). Household consumption shows a counter-intuitive relation to being unwell (Table 1); nonetheless, while wealthier populations also report more illness, its severity appears to be the same (Table 2). This result may reflect a pattern of premature deaths in less advantaged populations (for example, due to uncontrolled health conditions), as well as growing chronic conditions (diabetes, obesity-related illness, high blood pressure, and cancer) in the wealthier population that are maintained over time through access to health care. Similar results are reported in other studies (Antignac et al., 2018).

Critically, the odds ratio for the macro context factors are large in magnitude and generally highly significant (Column 4 and 5). For example, in 2014, the population living in the rural north are 1.40 times more likely of being unwell compared to the urban south where the capital city (Maputo) is located. Additionally, time is very relevant – e.g., the urban north shows large improvements between 2002 and 2014 both in being unwell and days ill. Based on the results shown in Column 5 of Table 1, Figure 1 visually plots the results for place of residence and year for being unwell, it confirms the described improvements for urban north and shows that rural zones are left behind (dashed line) compared to urban zones (dots line). The above results support our hypothesis that the relevance of the proximate factors (access to basic services and material conditions) declines when structural factors are introduced into the model.

Stratified results

Table 3 shows the models stratified by age and sex for unwellness. Consistent with previous aggregate results, the relation between access to basic services and health is weak. For women of all ages, access to medical care is not correlated with being unwell, which may relate to receiving care in under-resourced health systems (lack of infrastructure, equipment, and/or skilled health personnel). As before, we find that material conditions are almost irrelevant for the ages groups under 20 years old; however, the two sets of structural factors remain important and, in particular, we

Table 2. Determinants of social inequalities in self-assessed health using logistic regression and number of days ill as the outcome variable, 2002–2014.

	Model 1	Model 2	Model 3	Model 4	Model 5
Access to basic services					
Access to medical care (ref.: no access to medical care)	1.03 [0.96,1.10]				1.05 [0.98,1.12]
Access to education (ref.: no access to education)	0.99 [0.91,1.07]				1.00 [0.93,1.09]
Access to safe water source (ref.: no access to safe water source)	0.89** [0.83,0.96]				0.94 [0.87,1.01]
Access to clean energy (ref.: no access to clean energy)	0.76*** [0.70,0.82]				0.97 [0.88,1.07]
Material conditions					
Quality wall coverings (ref.: poor quality wall coverings)		0.92* [0.85,0.99]			0.98 [0.90,1.07]
Quality roof coverings (ref.: poor quality roof coverings)		0.82*** [0.75,0.89]			0.95 [0.87,1.03]
Furniture possession (ref.: no furniture possession)		0.98 [0.91,1.07]			1.03 [0.95,1.12]
Owns transportation means (ref.: don't own transportation mean)		0.91** [0.86,0.97]			0.92** [0.87,0.98]
Owns communication technology (ref.: don't own communication technology)		0.90** [0.84,0.96]			0.96 [0.90,1.03]
Social position					
Age (ref.: age 1–5)	6–20		0.44*** [0.41,0.47]		0.45*** [0.42,0.48]
	21–45		0.77*** [0.73,0.82]		0.79*** [0.74,0.84]
	>45		1.19*** [1.08,1.31]		1.23*** [1.11,1.35]
Female (ref.: male)			1.20*** [1.15,1.26]		1.21*** [1.16,1.26]
Literacy (ref.: illiterate)			0.92* [0.87,0.98]		1.04 [0.98,1.11]
Household size			0.96*** [0.95,0.97]		0.96*** [0.95,0.97]
Log Consumption			1.02 [0.97,1.06]		1.02 [0.98,1.07]
Macro context (ref.: urban south 2014)					
Northern area				1.51***	1.42*
Urban	2002			[1.19,1.92]	[1.07,1.88]
				1.42***	1.40**
	2008			[1.17,1.73]	[1.13,1.74]
				0.85	0.82*
	2014			[0.72,1.01]	[0.69,0.99]
				1.79***	1.67***
Rural	2002			[1.51,2.13]	[1.35,2.07]
				1.96***	1.84***
	2008			[1.51,2.54]	[1.39,2.43]
				1.33***	1.23*
	2014			[1.15,1.54]	[1.03,1.48]
				1.24*	1.25*
Central area					
Urban	2002			[1.05,1.47]	[1.04,1.50]
				0.88	0.90
	2008			[0.71,1.08]	[0.72,1.13]
				1.14	1.17*
	2014			[0.99,1.31]	[1.01,1.36]
				1.55***	1.42***
Rural	2002			[1.36,1.76]	[1.19,1.70]
				0.94	0.90
	2008			[0.77,1.14]	[0.72,1.13]
				1.33***	1.25**
	2014			[1.16,1.52]	[1.06,1.48]

(Continued)

Table 2. (Continued).

		Model 1	Model 2	Model 3	Model 4	Model 5
Southern area						
Urban	2002				0.91	0.89
					[0.80,1.04]	[0.77,1.03]
	2008				0.85*	0.83*
					[0.73,0.99]	[0.71,0.98]
Rural	2002				1.1	0.98
					[0.94,1.29]	[0.81,1.18]
	2008				1.55**	1.41*
					[1.15,2.07]	[1.04,1.91]
	2014				1.43***	1.36***
					[1.22,1.69]	[1.13,1.63]
Season						
Wet season					1.25***	1.25***
(ref.: dry season)					[1.17,1.35]	[1.17,1.35]
n		134,424	134,424	134,424	134,424	134,424

Odds ratio and 95% confidence intervals (in brackets); P value: * p < 0.05, ** p < 0.01, *** p < 0.001.

Model 1 includes only the variables for access to basic services; Model 2 includes only material conditions; Model 3 contains only social position variables; Model 4 includes only the macro context; and, Model 5 incorporates all the previous variables.

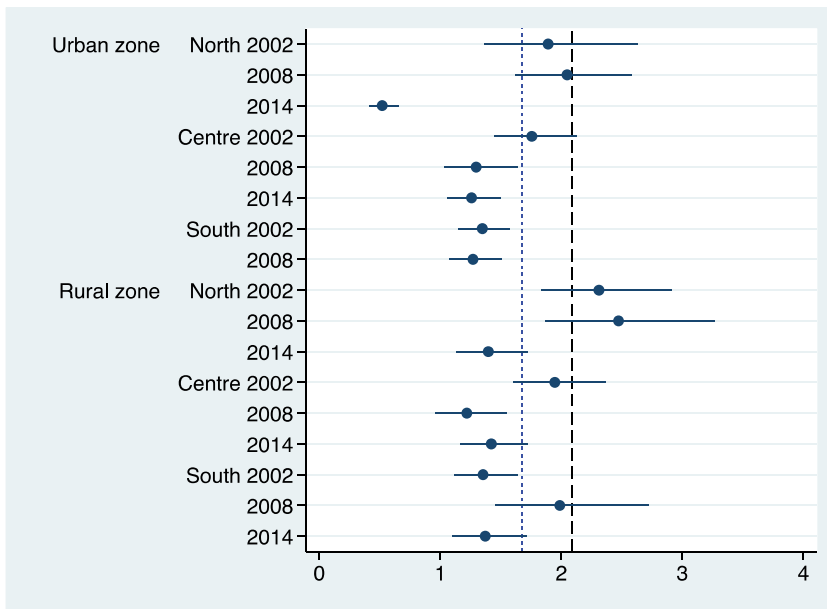


Figure 1. Odds ratio for a place of residence and year and self-assessed health as outcome variable, 2002–2014. The mean for urban areas is represented by the dots line, and for rural areas it is shown in dashed line

see that older women show a worse health status on average. As for previous models, consumption continues to be positively correlated with being unwell. Note how large the macro context factors are for all women and men in all ages.

Results stratified by year for unwellness are shown in Table 4. The first group of variables (access to basic services) shows that in 2002 access to clean energy was correlated to being less unwell but is no longer significant in the following years. We also note that access to medical care and education is positively correlated with unwellness in 2014. Material conditions are irrelevant, as in 2014. Unwellness shows a decreasing trend for the urban north while rural areas across the country show little or no improvements between 2002 and 2014.

Table 3. Determinants of social inequalities in self-assessed health stratified by sex and age and being unwell as the outcome variable, 2002–2014.

	5 years old and younger	Between 6 and 20 years old	45 years old and older	Female	Male	
Access to basic services						
Access to medical care (ref.: no access to medical care)	1.11 [0.99,1.25]	1.08 [0.95,1.22]	1.03 [0.91,1.17]	1.03 [0.94,1.12]	1.11* [1.01,1.22]	
Access to education (ref.: no access to education)	0.95 [0.84,1.08]	1.05 [0.91,1.21]	0.96 [0.82,1.12]	1.01 [0.91,1.12]	1.01 [0.91,1.12]	
Access to safe water source (ref.: no access to safe water source)	0.97 [0.87,1.09]	0.91 [0.81,1.02]	0.94 [0.82,1.07]	0.95 [0.87,1.05]	0.94 [0.86,1.04]	
Access to clean energy (ref.: no access to clean energy)	0.94 [0.80,1.11]	0.98 [0.81,1.18]	0.83 [0.67,1.03]	0.92 [0.80,1.05]	0.87* [0.76,1.00]	
Material conditions						
Quality wall coverings (ref.: poor quality wall coverings)	1.08 [0.92,1.26]	0.97 [0.83,1.13]	0.85* [0.72,0.99]	0.96 [0.85,1.07]	0.94 [0.83,1.06]	
Quality roof coverings (ref.: poor quality roof coverings)	0.77*** [0.67,0.90]	1.02 [0.87,1.21]	0.91 [0.77,1.07]	0.89* [0.80,0.99]	0.93 [0.83,1.04]	
Furniture possession (ref.: no furniture possession)	0.98 [0.86,1.12]	0.89 [0.78,1.03]	1.24** [1.08,1.41]	1.00 [0.90,1.11]	1.02 [0.91,1.14]	
Owens transportation means (ref.: don't own transportation mean)	0.93 [0.84,1.02]	0.92 [0.83,1.03]	0.85* [0.74,0.98]	0.87*** [0.80,0.94]	0.96 [0.89,1.04]	
Owens communication technology (ref.: don't own communication technology)	1.01 [0.89,1.13]	0.95 [0.83,1.09]	0.83** [0.72,0.94]	0.93 [0.86,1.01]	0.95 [0.86,1.05]	
Social position						
Age						
(ref.: age 1–5)	6–20	-	-	0.39*** [0.36,0.43]	0.34*** [0.31,0.38]	
	21–45	-	-	0.89*** [0.83,0.96]	0.59*** [0.53,0.65]	
	>45	-	-	1.41*** [1.26,1.59]	0.94 [0.82,1.07]	
Female (ref.: male)	1.01 [0.92,1.12]	1.14** [1.05,1.25]	1.45*** [1.31,1.61]	-	-	
Literacy (ref.: illiterate)	1.18** [1.06,1.31]	1.10 [0.98,1.24]	0.99 [0.88,1.12]	1.12** [1.03,1.22]	1.03 [0.94,1.13]	
Household size	0.95*** [0.93,0.96]	0.95*** [0.93,0.97]	0.97** [0.94,0.99]	0.96*** [0.94,0.97]	0.95*** [0.94,0.97]	
Log Consumption	1.11* [1.02,1.20]	1.16*** [1.06,1.25]	1.19*** [1.08,1.31]	1.10** [1.03,1.17]	1.15*** [1.08,1.22]	
Macro context						
(ref.: urban south 2014)						
Northern area						
Urban	2002	2.40*** [1.68,3.43]	2.02** [1.29,3.15]	1.35 [0.60,3.00]	1.78* [1.11,2.86]	2.10*** [1.60,2.77]
	2008	2.48*** [1.78,3.44]	1.89*** [1.35,2.65]	1.84** [1.23,2.76]	2.05*** [1.57,2.68]	2.12*** [1.63,2.75]
	2014	0.50*** [0.36,0.71]	0.45*** [0.31,0.65]	0.51*** [0.35,0.75]	0.48*** [0.38,0.61]	0.59*** [0.44,0.80]
Rural	2002	2.12*** [1.51,2.98]	2.40*** [1.67,3.47]	1.97*** [1.36,2.86]	2.20*** [1.68,2.87]	2.54*** [1.92,3.37]
	2008	2.92***	2.29***	1.63*	2.42***	2.63***

(Continued)

Table 3. (Continued).

		5 years old and younger	Between 6 and 20 years old	45 years old and older	Female	Male
Central area	2014	[2.02,4.21]	[1.50,3.51]	[1.10,2.41]	[1.77,3.30]	[1.93,3.58]
		1.47*	1.35	1.22	1.26	1.62***
		[1.08,1.99]	[0.97,1.88]	[0.87,1.71]	[0.99,1.60]	[1.26,2.09]
Urban	2002	2.06***	1.58**	1.50*	1.72***	1.86***
		[1.51,2.80]	[1.17,2.14]	[1.06,2.12]	[1.39,2.12]	[1.46,2.37]
		1.30	1.37	1.19	1.19	1.47**
Rural	2008	[0.91,1.85]	[0.96,1.94]	[0.88,1.62]	[0.94,1.51]	[1.11,1.95]
		1.24	1.19	1.21	1.14	1.45***
		[0.94,1.63]	[0.92,1.53]	[0.93,1.59]	[0.94,1.40]	[1.18,1.79]
Rural	2002	2.16***	1.85***	1.59**	1.92***	2.03***
		[1.57,2.97]	[1.35,2.53]	[1.15,2.21]	[1.52,2.44]	[1.60,2.58]
		1.13	0.97	1.91	1.19	1.29
Southern area	2008	[0.76,1.69]	[0.58,1.60]	[0.91,3.99]	[0.91,1.56]	[0.98,1.70]
		1.42*	1.24	1.25	1.39**	1.49***
		[1.06,1.90]	[0.90,1.71]	[0.93,1.68]	[1.12,1.73]	[1.17,1.89]
Urban	2002	1.38*	1.54***	1.13	1.22*	1.55***
		[1.06,1.80]	[1.20,1.97]	[0.87,1.48]	[1.02,1.46]	[1.27,1.90]
		1.35*	1.30*	1.02	1.20	1.38**
Rural	2008	[1.04,1.74]	[1.03,1.65]	[0.79,1.32]	[1.00,1.44]	[1.11,1.72]
		1.48**	1.24	1.12	1.18	1.64***
		[1.10,1.99]	[0.90,1.70]	[0.81,1.55]	[0.94,1.49]	[1.29,2.10]
Rural	2008	1.89**	1.82**	1.95**	1.78***	2.31***
		[1.27,2.80]	[1.24,2.65]	[1.30,2.92]	[1.27,2.50]	[1.64,3.25]
		1.27	1.41	1.31	1.34*	1.41*
Season	Wet season (ref.: dry season)	[0.93,1.73]	[0.99,2.01]	[0.95,1.80]	[1.05,1.69]	[1.07,1.85]
		1.03	1.01	1.21**	1.06	1.08
		[0.93,1.15]	[0.89,1.14]	[1.05,1.40]	[0.97,1.16]	[0.99,1.18]
n		26,068	51,590	16,842	69,150	63,035

Odds ratio and 95% confidence intervals (in brackets); P value: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Each model includes the variables for access to basic services, material conditions, social position (without age or sex, accordingly) and macro context.

Discussion and conclusion

This study contributes to a small but growing body of evidence on the importance of social determinants for overall population health. We analysed the case of Mozambique using data over a 12-year period. Based on a general social determinants of health conceptual model, we confirmed that the explanatory importance of structural factors exceeds that of proximate factors, including access to health services and private material conditions.

Mozambique has had an uneven spatial development over the years with large disparities between regions in terms of poverty (World Bank, 2016) and access to services (Dos Anjos & Cabral, 2016). Confirming the importance of broader macro factors, the results consistently showed that health differences between places of residence are large and persistent over time. This suggests that the root causes of poor health lie beyond the question of access to curative care. For example, there is evidence that general welfare policies have contributed to a concentration of services and assets in urban zones and a progressive underinvestment in infrastructure, access to land and agricultural technology in rural ones (Cunguara & Moder, 2011; Peters, 2013). Additionally, the World Bank's last report on poverty alleviation for Mozambique concludes that growth has benefited mostly the non-poor (World Bank, 2016), suggesting that (socio-)economic progress has not been inclusive and both vulnerability and poor living conditions remain widespread.

We recognise that fully disentangling the effects of place of residence on health is complicated. Even so, the persistent and fundamental role of spatial differences is consistent with Macassa et al. (2003) who also

Table 4. Determinants of social inequalities in self-assessed health stratified by year and being unwell as the outcome variable, 2002–2014.

		2002	2008	2014
Access to basic services				
Access to medical care		0.99	1.04	1.18**
(ref.: no access to medical care)		[0.87,1.13]	[0.87,1.24]	[1.04,1.32]
Access to education		0.95	0.91	1.14*
(ref.: no access to education)		[0.82,1.09]	[0.74,1.12]	[1.00,1.29]
Access to safe water source		0.94	0.99	0.93
(ref.: no access to safe water source)		[0.83,1.08]	[0.86,1.15]	[0.82,1.07]
Access to clean energy		0.78*	0.85	1.02
(ref.: no access to clean energy)		[0.65,0.95]	[0.71,1.02]	[0.84,1.24]
Material conditions				
Quality wall coverings		1.04	0.84*	0.95
(ref.: poor quality wall coverings)		[0.87,1.25]	[0.72,0.99]	[0.82,1.09]
Quality roof coverings		0.87	0.97	0.89
(ref.: poor quality roof coverings)		[0.74,1.01]	[0.81,1.17]	[0.79,1.01]
Furniture possession		1.01	1.05	1.00
(ref.: no furniture possession)		[0.87,1.17]	[0.87,1.27]	[0.87,1.14]
Owens transportation means		0.91	0.85*	0.95
(ref.: don't own transportation mean)		[0.82,1.01]	[0.74,0.97]	[0.86,1.04]
Owens communication technology		1.02	0.84*	0.89
(ref.: don't own communication technology)		[0.91,1.14]	[0.73,0.97]	[0.79,1.00]
Social position				
Age	6–20	0.38***	0.36***	0.37***
(ref.: age 1–5)		[0.33,0.43]	[0.32,0.40]	[0.33,0.41]
	21–45	0.74***	0.70***	0.78***
		[0.65,0.84]	[0.62,0.80]	[0.71,0.84]
	>45	1.05	1.23	1.25***
		[0.90,1.23]	[0.91,1.65]	[1.11,1.39]
Female		1.28***	1.27***	1.23***
(ref.: male)		[1.18,1.40]	[1.18,1.36]	[1.15,1.31]
Literacy		1.06	1.00	1.13*
(ref.: illiterate)		[0.95,1.19]	[0.87,1.15]	[1.02,1.25]
Household size		0.95***	0.98	0.95***
		[0.93,0.97]	[0.95,1.00]	[0.93,0.97]
Log Consumption		1.10*	1.25***	1.07
		[1.02,1.19]	[1.12,1.38]	[0.99,1.15]
Northern area	Urban	1.43*	1.54**	0.55***
(ref.: urban south)		[1.07,1.92]	[1.18,2.00]	[0.43,0.70]
	Rural	1.63***	1.77***	1.59***
		[1.28,2.07]	[1.33,2.38]	[1.22,2.07]
Central area	Urban	1.30**	0.99	1.29**
		[1.07,1.56]	[0.78,1.26]	[1.07,1.55]
	Rural	1.36**	0.92	1.60***
		[1.11,1.66]	[0.69,1.22]	[1.25,2.05]
Southern area	Rural	0.97	1.36*	1.53***
		[0.80,1.16]	[1.01,1.82]	[1.19,1.97]
Season				
Wet season		1.22**	0.87	1.06
(ref.: dry season)		[1.08,1.38]	[0.73,1.04]	[0.95,1.18]
n		43,749	33,448	54,988

Odds ratio and 95% confidence intervals (in brackets); P value: *p < 0.05, **p < 0.01, *** p < 0.001.

Each model for each year includes the variables for access to basic services, material conditions, social position (including place of residence) and season.

find no association between socioeconomic factors and child mortality in Mozambique using multivariate models controlling for place of residence. Recently, similar results are presented for Nigeria (Adewuyi et al., 2017). Other studies in Ghana and Uganda also provide evidence of the importance of place of residence over income (Atuoye & Luginaah, 2017; Herrin et al., 2013).

The present results are relevant for progression in the eradication of diseases, such as malaria. In 2016, an estimated 216 million cases of malaria occurred worldwide, however about 80% of the global malaria burden is in SSA (World Health Organization, 2017). Global efforts towards eradication

of malaria have placed the focus on specific measures directed to vector control and preventive and curative drug therapy. However, as the World Malaria Report of WHO shows, less than half of the countries with ongoing transmission are on track to reach the targets for mortality and morbidity reduction (World Health Organization, 2017). This study showed that access to basic services does not have a critical effect on overall (general) health outcomes. The point is that even though medical care is important given the high burden of disease, its contribution to the reduction of the number of people vulnerable to malaria lies to a great extent beyond the health sector, being rather due to urban planning, agriculture, transport, and mining (CSDH, 2008). Indeed, this connection was revealed by the historical experiences of European countries where broad-based socio-economic improvements such as wealth, life expectancy, and urbanization were strongly correlated with the decline and elimination of malaria in the region (Zhao et al., 2016).

Additionally, in SSA most of the attention in the health interventions has been in specific periods of life as new-borns, children, and women of childbearing age (Irwin & Scali, 2007; UN, 2015). This study showed that health inequalities worsen with age and women over 45 years old display the greatest health inequalities. Women from deprived areas, and elder population are particularly vulnerable to deprivation and exclusion, which inherently create vulnerability to poor health and negative health outcomes, which are cumulatively worse in elder adults (World Health Organization, 2015). An appropriate policy response should be to establish populational health interventions targeting those in a disadvantaged position rather than specific populations (children and women of childbearing age). The recently designed national strategy for social protection (MMAS, 2016) may be an opportunity to address health inequalities in a broader fashion.

A core strength of this paper is the use of three nationally representative surveys. A weakness is that, given the reliance on observational data, we cannot make strong inferences about causation. In the context of SDH in Sub-Saharan Africa, a second contribution of this paper is the use of a general measure of health, that is self-reported by the respondents. However, while self-reported health is a strong predictor of mortality and morbidity, caution is needed in its interpretation and cross-cultural validity. In this regard, more objective and harmonized measures of health are needed, for example, using vignettes or increasing the efforts for a cross-cultural equivalence translation of the questions (Burgard & Chen, 2014). Moreover, the use of a secondary source of data limits the range of determinants considered here. For example, it was not possible to include ethnicity, which may be a relevant axis of social inequalities. Future studies should incorporate other structural factors in order to identify relevant pathways and causal mechanisms. A further limitation is that, as in many other low-income countries, there is substantial clustering of both health inputs and outcomes at the local level, implying observed within-region variation can be small. This may partly account for the importance of the macro context factors in this study.

In sum, the identification of social determinants that significantly influence health inequalities are crucial for the design of appropriate evidence-based policy responses and actions. This study has highlighted the relevance of SDH lens for thinking about health in low-income countries. Indeed, to date, the deeper socio-economic causes of poor health, in particular those related to structural factors, have not been given sufficient attention. While disease-oriented health care programmes and policies do offer important palliative responses to extant health challenges, longer-run and integrated public health interventions are needed to address the current health equity gap in Mozambique.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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