SSM - Population Health 12 (2020) 100653

Contents lists available at ScienceDirect

SSM - Population Health

journal homepage: http://www.elsevier.com/locate/ssmph

Inequalities in morbidity in South Africa: A family perspective

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A B S T R A C T

South Africa is struggling to achieve sustainable development targets as the country faces a quadruple burden of diseases. Concerted efforts to realise good health for all people require evidence-based targeted interventions. This study aimed to investigate the relationship between living arrangements and self-reported ill-health among adults aged 15 years and older in South Africa. Analyses were based on a sample of 49,962 individuals drawn from the 2017 South African General Household Survey, using a multivariate regression technique to assess the distribution and predictors of ill-health. Composite indices of disease burdens were created using several related morbidities in each disease category. The findings confirm that health outcomes in South Africa vary by living arrangements of individuals, their socioeconomic status, and by the level of urbanisation or residence. It was found that women who are black, younger and less-educated, irrespective of their living arrangement, are particularly vulnerable to illhealth. Policy implications are discussed.

Introduction

Despite remarkable improvements in the global health landscape in the last two decades, public health challenges persist, especially in sub-Saharan Africa where governments are saddled with general macro-economic challenges. For instance, according to global statistics, in 2016, an estimated 2.4 billion years of healthy life were lost due to ill-health and premature death across the world (Roser & Ritchie, 2019). Also, in 2017 alone, communicable and non-communicable diseases cumulatively accounted for about 90% of the global total disease burden (Institute for Health Metrics and Evaluation [IHME], 2018; Roser & Ritchie, 2019).

The global disease burden varies considerably across and within regions and countries. Regionally, Africa is encumbered by a huge disease burden, with sub-Saharan Africa alone accounting for over a fifth of the world's total disease burden (Ataguba et al., 2015). For example, mortality statistics indicate that about 93% of all deaths in the sub-region are attributable to communicable and non-communicable diseases (Gouda et al., 2019).

At the national level, South Africa is battling multiple disease burdens as it is concurrently plagued by high rates of HIV/AIDS and TB and growing incidences of non-communicable diseases (Ataguba et al., 2015); in fact, communicable and non-communicable diseases combined account for over four-fifths (89%) of all deaths in South Africa (IHME, 2018).

Understanding the burden of disease in South Africa and its implications are fundamental to detecting key health challenges in the population and allow for management and targeted public health interventions. However, epidemiological data primarily focused on pathogenesis or biomedical approaches alone are insufficient in providing this vital information because the presence of diseases is a consequence of a combination of factors. Therefore, the burden of diseases cannot be completely addressed without understanding the socioeconomic determinants of health.

Worldwide, the family as a social institution provides support, care, and safety, while simultaneously being a great source of strain, pressure and conflict for its members. This is because the family institution does not exist in a vacuum but rather is a function of the larger social structure (Makiwane et al., 2017). As the most basic social unit, the family setting is where "the macro-level social and economic order affects individual physical and emotional well-being" (Ross et al., 1990, p. 1059). For instance, in the domain of health, the family plays a vital role in nurturing the health and well-being of children and adult member as the primary conduit for the transfer of health-related knowledge, attitudes and behaviour (Turagabeci et al., 2007).

Like in other societies, the family is an important part of South Africa's social structure and plays a key role in the lives of its peoples (Makiwane et al., 2017). However, historically, the trajectory of the structure and functions of the family in the society has been differentially and severely impacted for the diverse cultural groups by the race-inspired apartheid policies. These structural transformations that were inflicted upon the institution of the family in the different cultural communities by apartheid-induced policies in the past have affected the life chances of individual family members of these communities in the

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https://doi.org/10.1016/j.ssmph.2020.100653
Received 1 May 2020; Received in revised form 14 August 2020; Accepted 16 August 2020
Available online 22 August 2020

areas of health. Some scholars have observed that the family context has serious implications for population health as it is believed to have a mediating or moderating impact on health outcomes (Witt & DeLeire, 2009), a fact which indicates that the role of the family environment is equally crucial to understanding population health.

But despite the importance of the family environment in understanding population health, very few studies have incorporated the family into a health determinants framework. Moreover, the few studies that have examined associations between family structure and health are predominantly focused on developed countries. In South Africa, like in other developing contexts, there is a general dearth of empirical evidence of the family perspective on population health.

The theoretical side-lining of the family angle in the social determinant of health (SDOH) discourse is lamentable for several reasons. First, as a result of the family transformations engendered by apartheid policies, South Africa has witnessed a proliferation of non-traditional families or households[1] as evidenced by the increasing diversity in living arrangements (Makiwane et al., 2017). Secondly, black African and white South Africans are culturally linked with the extended and nuclear family systems respectively (Amoateng & Kalule-Sabiti, 2008).[2]

However, even though black Africans have historically been compelled to live in single-person households, the fact remains that socioeconomically their living conditions are not qualitatively different from their kin who live in extended family households in the countryside. Racial discrimination in general, especially in the housing market, has meant that living arrangements in South Africa are largely confounded with socio-economic conditions for the different population groups. For instance, study of extended household living in South Africa confirmed a negative relationship between the incidence of extended households and household expenditure; the tendency for people to live in extended households decreases with household expenditure. All of these have bearings on the way families function to ensure the wellbeing of members.

The aim of the present study, therefore, is to contribute to the existing body of knowledge on population health by addressing this gap by examining disease burdens in South Africa as a family phenomenon. Specifically, this study examines the effect of family structure on communicable and non-communicable diseases, while controlling for individual socio-demographic characteristics such as age, sex, population group, education, employment, wealth, and residence location.

Theoretical framework: social determinants of health

Different living conditions such as those experienced at the household-level also determine health status (Turagabeci et al., 2007). The family context is a crucial but often overlooked social environment that interacts with the physical environment (Vedanthan et al., 2016). As a shared environment, the home can be a linchpin for studies on population health. This is because, at the micro-level, household members reciprocally interact and influence each other and as such individual health can affect that of other members; the home environment can simultaneously impact individual health outcomes (Vedanthan et al., 2016). The family or household environment does affect individual members' health through promoting healthy behaviours, preventing or reducing risk exposures among members and vice versa. Through this process, the family becomes a key link between health outcomes and health determinants (Witt & DeLeire, 2009).

Besides the fact that as a social institution the family context impacts individuals' access to societal resources, there are variations in how individual family members make use of the opportunities and challenges offered by the family. In other words, the conditions in which people are born, grow, live and work – loosely termed "social determinants of health" (SDOH) – have significant bearings on their well-being and health outcomes (Commission on Social Determinants of Health [CSDH], 2008). The World Health Organisation has recognised that one's environment, i.e. where people live, impacts on health (CSDH, 2008). However, environmental determinants of health are often taken to refer narrowly to physical environments (i.e. neighbourhoods and communities). In South Africa, discussions of determinants of health heavily revolve around issues of poverty, socioeconomic position, or some other indicator of social disadvantage. Thus, there is a general dearth of empirical evidence of the family perspective on population health generally and on SDOH specifically.

It is against this background of the how the family context interacts with individual socioeconomic characteristics that we examine the impact of family structure/living arrangements on the health outcomes of individual South Africans, and that we undertake in the present study. Specifically, we examine the impact of single-person, single-parent headed, two-parent headed and extended households on communicable and non-communicable diseases, while we control for the effects of selected socio-demographic characteristics.

Review of the empirical literature

Studies that have examined the impact of the family context on health outcomes have employed varied explanatory mechanisms to provide insights into the relationship between family and health. These family theories have ranged from genomics, systems theory, family structure, family socioeconomics, family processes, to family culture. Moreover, the family-health link has been empirically explored in diverse populations, despite difficulties with comparisons because of different measures and conceptualisation. For instance, some studies have examined the association between health and family cohesion and communication, focusing largely on parenting style and/or parent-child relationship (e.g. see Cuffe et al., 2005), while others have been concerned with multigenerational composition effects on health (see Ferrer et al., 2005; Takeda et al., 2004).

Similarly, Agrawal's (2012) examination of the effect of living arrangement on the elderly shows that the living arrangements of the elderly were strongly associated with adverse health outcomes, independent of age, sex, education and living standard. Further, the elderly who were living alone were more likely to suffer from ill-health than those living with their family. The basic presumption is that the health or ill-health has contextual determinants, beyond individual characteristics. Thus, the disease burden of people in the same household is likely to be similar since they share many characteristics.

Besides the empirical evidence of the family-health relationship, anecdotal evidence, drawn from a few studies conducted in other contexts, shows how different family structures and composition affect health. For instance, Turagabeci and colleagues' (2007) study of adults aged 20–60 years in Japan found an association between large family structures and better health outcomes. Specifically, people living alone or in nuclear families were significantly more likely to be in ill-health compared to those in extended families.

At the individual level, a growing body of research shows that demographic and socioeconomic factors influence individual health. For instance, there are large disparities in health and disease burden by sex and gender globally. Even as men and women suffer from different types of diseases at different ages (IHME, 2018), women across the world are disproportionately burdened by ill-health than men of similar socioeconomic conditions (Buvinić et al., 2006).

[1] In this paper, we use the terms family and household interchangeably consistent with scholars that have argued that the household is the residential dimension of the family (see e.g. De Vos, 1995).

[2] It is significant to note that the single-person household is a variant of the nuclear family system. While black-Africans and white South Africans were culturally identified with the extended and nuclear family systems respectively, such apartheid-induced policies as Influx Control and Group Areas Acts have resulted in black-Africans increasingly living in single-person households in the cities and towns contrary to their cultural preference of living with their kin.

Likewise, socioeconomic status (SES); including wealth, income, education and employment; has widely been studied concerning health outcomes or disease burden. The consensus in the social determinants of health literature is that there is a distinct socioeconomic gradient in health in favour of advantaged groups, regardless of how it is measured (Marquez & Farrington, 2012; Metzler, 2007). Education is a good predictor of health status; better-educated people are healthier and/or suffer fewer disease burdens, whilst lower education level is associated with poor health or increased disease burden (Low et al., 2005; Metzler, 2007). Similarly, employment is also a strong predictor of health, with employed people being healthier (Ataguba et al., 2015). The poor have a double burden of both infectious and chronic diseases (Marquez & Farrington, 2012).

In South Africa, studies have identified socioeconomic variations in health, where having higher income or belonging to a higher wealth index is linked to better health (Khaoya et al., 2015). Thus, those at the lower end of the socioeconomic ladder, suffer much more diseases and premature death than the affluent. Wealth, whether measured at the individual or household level, is a powerful determinant of health, as poverty increases the incidence of diseases in vulnerable populations.

In short, an increase in any of the measures of SES has a protective effect against poor health in a population because the effects of the SES indicators on health are synergistic (Low et al., 2005). Since families are also economic units, family socioeconomics equally have health implications for members. Thus, socioeconomic inequality between and within households and family structure shape health outcomes.

The risk of morbidity is likely to differ by age, regardless of a shared environment. The breakdown of the global disease burden by age shows that non-communicable diseases are lower among younger people, particularly children and adolescents below age 15 years, while the burden from communicable diseases is higher for this group (Roser & Ritchie, 2019). Moreover, research has explored racial differences in health outcomes in South Africa, with poor health prominent among black Africans (see Omotoso & Koch, 2018). Since family compositions and household are racially patterned in South Africa, racial differentials in disease burdens are likely to reflect in the different living arrangements. Finally, empirical links have been established between residential location and ill-health in South Africa, showing geographical variations in health in favour of urban and affluent communities (see e.g. McIntyre et al., 2002; Omotoso & Koch, 2018).

Materials and methods

Data and design

The study used data from the 2017 South African General Household Survey which is based on the 2013 Master Sample which is representative at the provincial level (Statistics South Africa [Stats SA], 2018). A two-stage sampling technique was used in selecting respondents. First, a stratified design with probability proportional to size sampling (PPS) was employed in selecting the primary sampling units (PSUs) from the enumeration areas. Secondly, systematic sampling was employed to select the dwelling units in the second stage (Stats SA, 2018). The Master Sample consisted of a total of 3324 PSUs, containing a sample of approximately 33,000 dwelling units.

The analyses presented in this paper are based on self-reported information from adults aged 15 and older who completed the adult health module; this translates into a sample of roughly 49,962 respondents. Given the changing dynamics, composition and structure of households, the analyses for the present study were disaggregated by individuals' living arrangements to assess how different family arrangements influence health outcomes. It specifically examined this in the context of the burden of communicable and non-communicable diseases using a nationally representative sample of adults in South Africa, while controlling for the effects of important sociodemographic factors.

Measures

The main predictor variable of interest in this study is household composition. However, recognising the diversity of household composition in South Africa, the more inclusive term 'living arrangements' is used instead. It was constructed using information about members living in a household, conventionally defined or constructed by the relationship to the head of the household. It was further divided into three response categories: 'one-person household', 'nuclear household', and 'extended household'.

Accordingly, a person is considered to be a 'one-person household' if s/he lives alone without a spouse, other kin and/or non-relatives. A nuclear household refers to the conventional household of parent(s) and child (ren), could be either biological or stepparent. Although the sample contained moderate numbers of respondents who lived in single-parent and two-parent households, these two groups were combined into the more generic "nuclear household" because preliminary explorations showed that the separate sample sizes were prohibitively small for more detailed analyses. Finally, a person is considered to be living in an 'extended-household' if s/he lives with at least one kin, including spouse, children, and other relatives and non-relatives.

The disease burden was measured using two broad disease classifications: communicable and non-communicable diseases. First, self-reported health status was collected by asking individuals if they had been diagnosed by a health practitioner as having any infectious or chronic conditions, including HIV and AIDS, tuberculosis, cancers, cardiovascular diseases, chronic respiratory diseases, and diabetes These chronic health conditions are known to be major contributors to mortality and morbidity in South Africa (Ndinda et al., 2018). The binary answers were collated into composite measures of *communicable* (HIV/AIDs and tuberculosis) and *non-communicable diseases* (i.e. cancers, diabetes, asthma, mental illness, and cardiovascular diseases like stroke, hypertension and heart attack).

The control variables included basic demographic variables (age, sex and population group) and socioeconomic variables (educational level, employment status and household wealth index category) chosen for their theoretical importance. However, because of small sample sizes, and to avoid skewed distributions and reliability issues in the analyses, some variables were recoded. For instance, population group was restricted to "1=Black African", "2=Others". Likewise, education level was recoded into "1=below secondary", "2=secondary", "3=tertiary". However, household wealth was generated by the data collection agency and was available in the dataset. Households were categorised into categories as follows: richer, middle and poorer. All variables were categorised (see Table 1).

Statistical analysis

Data analyses were conducted at three levels, namely univariate, bivariate and multivariate. In the first level of analyses, descriptive analysis, frequencies and percentages, was used to show the distribution of the sampled population as well as identify the reported prevalence of disease burdens among the sampled population. In the second level, Chi-square tests was used to measure the association between the demographic and socioeconomic factors and disease burdens, as well as a bivariate logistic regression technique was used in predicting the burden of diseases in relation to living arrangement.

In the final stage of the analyses, multivariate logistic regression techniques were used to examine and show the joint contribution of the selected sociodemographic factors significant at the bivariate level to predict disease burdens. The model used an exhaustive search of the entire model space in conjunction with model validation and specification tests (for similar modelling strategies, see Henley et al., 2020). Additionally, several two-way interaction effects were explored based on their theoretical importance. Results are presented in using odds ratios (ORs), with a variable considered a predictor of chronic ill-health

Table 1
Sociodemographic characteristics of sampled population.

Predictor Variables	One-person household		Nuclear household		Extended household		Total	
Age Group								
15–24 years	489	3.9%	3795	30.3%	8228	65.8%	12512	25.1%
25–34 years	1404	12.0%	4088	35.1%	6163	52.9%	11655	23.3%
35–49 years	1641	12.9%	6075	47.7%	5030	39.4%	12746	25.5%
50+	1523	11.7%	4294	32.9%	7232	55.4%	13049	26.1%
Gender								
Male	3434	14.9%	8685	37.8%	10862	47.3%	22981	46.0%
Female	1623	6.0%	9567	35.5%	15791	58.5%	26981	54.0%
Population Group								
Black African	4489	11.0%	13139	32.3%	23056	56.7%	40684	81.4%
Others	568	6.1%	5113	55.1%	3597	38.8%	9278	18.6%
Place of Residence								
Urban	3333	10.4%	13685	42.7%	15019	46.9%	32037	64.1%
Rural	1724	9.6%	4567	25.5%	11634	64.9%	17925	35.9%
Education Level								
Below Secondary	1229	10.9%	3036	27.0%	6972	62.1%	11237	22.5%
Secondary	3064	9.3%	12100	37.0%	17572	53.7%	32736	65.5%
Tertiary	764	12.8%	3116	52.0%	2109	35.2%	5989	12.0%
Employment Status								
Employed	3367	16.5%	9163	44.8%	7911	38.7%	20441	40.9%
Not Employed	1690	5.7%	9089	30.8%	18742	63.5%	29521	59.1%
Household Wealth Index								
Poorer	104	2.5%	2254	54.3%	1792	43.2%	4150	8.3%
Middle	1852	4.9%	12571	33.4%	23178	61.7%	37601	75.3%
Richer	3101	37.8%	3427	41.7%	1683	20.5%	8211	16.4%
Total	**5057**	**10.1%**	**18252**	**36.5%**	**26653**	**53.4%**	**49962**	**100.0%**

if the p-value associated with the OR is less than 0.05. All analyses were done using SPSS software version 25.

Results

Background characteristics

Table 1 presents the distribution of the sample characteristics by type of living arrangement. More than half (53.4%) of the respondents reported living in extended households. Over one-third (36.5%) of them lived in nuclear households, while one-tenth (10.1%) reported living alone. Over half (54%) of the respondents were female and 46% were male; relatively more females (58.5%) and males (47.3%) were found in extended households compared to nuclear or solitary households.

Slightly over a quarter of the respondents belonged to each of the 50^{+} (26%), 35–49 (25.5%) and 15–24 (25.1%) age groups respectively, while slightly less than a quarter (23.3%) belonged to the 25–34 age group. Substantially more 35-49-year olds (47.7%) lived in nuclear households compared to other age groups. The majority (81.4%) of the respondents belonged to the black African population group, whilst the rest (18.6%) belonged to other population groups; compared to other population groups who lived predominantly in nuclear households, more black Africans (56.7%) lived in extended households.

Two-thirds (65.5%) of the respondents had a secondary-level education, slightly more than one-fifth (22.5%) had below secondary education, while 12% of them had tertiary education. Among the tertiary-educated, the majority (52%) lived in nuclear households; most of those with secondary education or lower lived in extended households. Slightly less than three-fifths (59.1%) of them were not employed, while 40.9% were employed. The majority of the non-employed (63.5%) lived in extended households, whilst more of the employed (44.8%) lived in nuclear households.

Three-quarters (75.3%) of the respondents reported belonging to the middle wealth index category, reflecting a substantial proportion (61.7%) of extended households; 16.4% were in the rich wealth index category, mostly in nuclear (41.7%) and solitary (37.8%) households; 8.3% were in the poor wealth index category and most in nuclear households (54.3%). Finally, just under two-thirds (64.1%) of the respondents lived in urban areas and 35.9% lived in rural areas; substantially more of the extended households (64.9%) were in the rural areas.

Prevalence of burden of diseases among South African adults

Tables 2 and 3 show the results of the bivariate analyses in the examination of the association between disease burdens and sociodemographic factors across living arrangements. Overall, 18.7% of the sampled respondents reported ill-health. Among those who reported ill-health, breakdown by cause-specific diseases indicates that non-communicable diseases accounted for over three-quarters (76.7%) of the reported total disease burden; communicable diseases accounted for about a fifth (20.2%), and a small proportion (3.1%) of the respondents reported having (had) multiple or both disease burdens (Fig. 1). Moreover, breakdown by living arrangements shows that both disease burdens were more common among respondents living in extended households and least common among those living alone.

Detailed analyses of the different disease-risk indicators show that respondents in the 35–49 age group, black Africans and those who had secondary-level education more frequently reported incidences of communicable diseases, irrespective of living arrangements. Further, female and unemployed respondents, as well as those who belonged to households in the middle wealth index living in nuclear and extended households, were overrepresented among those who reported incidences of communicable diseases. Likewise, male, urban and employed respondents living alone, as well as their counterparts from richer households more frequently reported incidences of communicable diseases. Urban residents from nuclear households as well as rural respondents from extended households were overrepresented among those who reported incidences of communicable diseases.

Additionally, the results show that, regardless of living arrangements, non-communicable diseases were more frequently reported by female, black, urban and unemployed respondents as well as respondents aged 50 years and older and those from households in the middle wealth index. Further, respondents with less than secondary education living alone or in extended households, as well as those with secondary-level education in nuclear households were overrepresented among those who reported incidences of non-communicable diseases.

Finally, the results of the bivariate analyses using Chi-square tests in

Table 2
Bivariate analyses of the burden of communicable diseases by living arrangement and selected sociodemographic factors (n = 2108).

Predictor Variables	One-person household			Nuclear household			Extended household		
	Number	% of CD		Number	% of CD		Number	% of CD	
Age Group			<.001			<.001			<.001
15–24 years	7	2.4%		33	4.4%		101	9.5%	
25–34 years	62	21.0%		162	21.7%		256	24.0%	
35–49 years	131	44.4%		418	56.2%		406	38.0%	
50+	95	32.2%		132	17.7%		305	28.5%	
Gender			0.001			<.001			<.001
Male	174	59.0%		259	34.8%		298	27.9%	
Female	121	41.0%		486	65.2%		770	72.1%	
Population Group			<.001			<.001			<.001
Black African	285	96.6%		705	94.6%		1025	96.0%	
Others	10	3.4%		40	5.4%		43	4.0%	
Place of Residence			<.001			<.001			<.001
Urban	166	56.3%		463	62.1%		502	47.0%	
Rural	129	43.7%		282	37.9%		566	53.0%	
Education Level			<.001			<.001			<.001
Below Secondary	130	44.1%		249	33.4%		430	40.3%	
Secondary	156	52.9%		465	62.4%		609	57.0%	
Tertiary	9	3.1%		31	4.2%		29	2.7%	
Employment Status			0.003			<.001			0.024
Employed	173	58.6%		319	42.8%		284	26.6%	
Not employed	122	41.4%		426	57.2%		784	73.4%	
Household Wealth Index			0.014			<.001			<.001
Poorer	9	3.1%		109	14.6%		81	7.6%	
Middle	128	43.4%		567	76.1%		952	89.1%	
Richer	158	53.5%		69	9.3%		35	3.3%	
Total	**295**	**14.0%**		**745**	**35.3%**		**1068**	**50.7%**	

Table 3
Bivariate analyses of the burden of non-communicable diseases by living arrangement and selected sociodemographic factors (n = 7211).

Predictor Variables	One-person household			Nuclear household			Extended household		
	Number	% of NCD		Number	% of NCD		Number	% of NCD	
Age Group			<.001			<.001			<.001
15–24 years	3	0.4%		26	1.0%		35	0.9%	
25–34 years	31	4.2%		115	4.6%		103	2.6%	
35–49 years	128	17.5%		626	25.0%		588	14.8%	
50+	571	77.9%		1739	69.4%		3246	81.7%	
Gender			<.001			<.001			<.001
Male	331	45.2%		1052	42.0%		943	23.7%	
Female	402	54.8%		1454	58.0%		3029	76.3%	
Population Group			<.001			<.001			<.001
Black African	560	76.4%		1468	58.6%		3215	80.9%	
Others	173	23.6%		1038	41.4%		757	19.1%	
Place of Residence			0.023			<.001			<.001
Urban	510	69.6%		1971	78.7%		2415	60.8%	
Rural	223	30.4%		535	21.3%		1557	39.2%	
Level of Education			<.001			<.001			<.001
Below Secondary	322	43.9%		713	28.5%		2067	52.0%	
Secondary	309	42.2%		1369	54.6%		1655	41.7%	
Tertiary	102	13.9%		424	16.9%		250	6.3%	
Employment Status			<.001			<.001			<.001
Employed	307	41.9%		1065	42.5%		977	24.6%	
Not employed	426	58.1%		1441	57.5%		2995	75.4%	
Household Wealth Index			<.001			<.001			0.002
Poorer	8	1.1%		180	7.2%		223	5.6%	
Middle	431	58.8%		1894	75.6%		3522	88.7%	
Richer	294	40.1%		432	17.2%		227	5.7%	
Total	**733**	**10.2%**		**2506**	**34.8%**		**3972**	**55.0%**	

the examination of the association between living arrangements and disease burdens show that age, sex, population group, education level, and place of residence were significantly associated with communicable diseases across all living arrangements (Table 2). Whereas employment status was associated with communicable diseases only for those who lived in nuclear households, wealth index was associated with communicable diseases only for those who lived in nuclear and extended households (Table 2).

Lastly, age, sex, population group, education level and employment status were significantly associated with non-communicable diseases across all living arrangements (Table 3). However, household wealth index was associated with non-communicable diseases only for those who lived alone or in extended households; places of residence was associated with non-communicable diseases for those who lived in nuclear and extended households only.

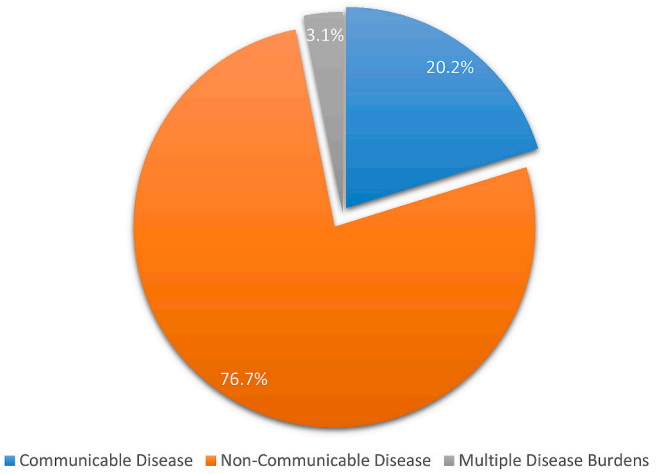

Fig. 1. Prevalence breakdown of reported disease burdens among individuals aged 15 and older in South Africa, 2017 (n = 8954).

Effects of living arrangement and control variables on the burden of diseases

The results of the bivariate logistic regression show that, compared with extended households, sole-living significantly predicted the risk of communicable diseases (OR = 1.48, CI = 1.30–1.69), while living in nuclear households significantly protected (OR = 0.91, CI = 0.86–0.96) against the risk of non-communicable diseases (Table 4). Further, Tables 5 and 6 present the main effects as well as interaction effects of living arrangements and selected socio-demographic characteristics on disease burdens.

Table 5 shows that respondents' age, sex, population group, education level, employment status, household wealth index, and residential location generally predicted disease burdens, with varied effects depending on disease category and respondents' living arrangements. The effect of age in predicting the odds of communicable disease was significant only for individuals who lived alone; respondents aged 25–34 years living alone (OR = 0.14, CI = 0.2–0.94) had a lower risk of communicable diseases compared to those aged 50 years and older. However, females aged 25–34 years old had greater odds of reporting communicable diseases regardless of the type of living arrangement compared to their male counterparts over 50 years old. But, as Table 6 shows, the odds of non-communicable diseases were significantly lower for all respondents younger than 50 years, irrespective of living arrangement; the relationship was particularly stronger for those in the 15–24 age group (OR = 0.01).

Moreover, females, particularly those who lived in nuclear (OR = 0.53, CI = 0.40–0.71) and extended (OR = 0.52, CI = 0.33–0.83) households, had significantly lower risk of non-communicable diseases compared to males. However, sex interacted with age to increase the risk of non-communicable diseases for younger females, particularly those aged 15–34 living nuclear households and 35–49 living in extended households. Compared to males, females who lived in nuclear (OR = 0.35, CI = 0.13–0.91) or extended (OR = 0.30, CI = 0.11–0.82) households had significantly lower odds of communicable diseases.

Table 4
Bivariate logistic regression model showing odds ratios predicting the burden of communicable and non-communicable diseases by living arrangement.

Living Arrangement	Communicable Disease		Non-Communicable Disease	
	Odds Ratio	CI	Odds Ratio	CI
One person	1.48[b]	1.30–1.69	0.97	0.89–1.05
Nuclear family	1.02	0.93–1.12	0.91[a]	0.86–0.96
Extended family	1.00		1.00	

[a] Significant at 0.01 level.
[b] Significant at 0.001 level and 1.00 is reference category.

Black Africans who lived in nuclear (OR = 3.70, CI = 2.16–6.32) and extended (OR = 6.29, CI = 2.88–13.74) households were at greater risk of communicable diseases compared to other population groups. Moreover, black Africans, particularly those living in nuclear households (OR = 1.33, CI = 0.99–1.79), were at greater risk of non-communicable diseases compared to other population groups (Table 6), especially black African females who live alone were more than five times more likely to report communicable diseases compared to males (OR = 5.81, CI = 1.13–12.9) or in nuclear (OR = 2.16, CI = 1.11–4.21) households (Table 5), while black African females in nuclear households (OR = 1.44, CI = 1.16–1.78) were at a significantly higher risk of non-communicable diseases.

Table 5 shows that regarding the SES measures, education significantly predicted communicable diseases only for individuals who lived in nuclear households. Specifically, individuals who had below secondary education and lived in nuclear households (OR = 2.37, CI = 1.05–5.37) had higher odds of communicable diseases compared to those with tertiary education. Further, education moderated the relationships with age and sex to increase the odds of communicable diseases for some groups. First, education interacted with age to increase the risk of communicable diseases significantly for individuals aged 25–49 who had below secondary-level education and lived alone, as well as those aged 35–49 with below secondary education and lived alone. For sex, females who had less than tertiary-level education and lived in extended households were at greater risk of communicable diseases.

Moreover, as Table 6 shows, lower education was a risk factor for non-communicable diseases, with the odds significant for individuals who had secondary-level education and lived in extended households (OR = 1.55, CI = 1.04–2.29). However, education combined with sex and population group to produce interesting conditional indirect effects. First, lower education (secondary and below) increased the risk for females, particularly those who lived in nuclear and extended households. Secondly, the interaction of education and population group reduced the risk of non-communicable diseases for all black Africans with less than tertiary-level education, living arrangement notwithstanding.

Table 5 shows that individuals who had no employment and living in extended households (OR = 3.30, CI = 1.57–6.95) had significantly greater odds of communicable diseases compared to the employed, except for black Africans, among whom those who were not employed and lived in extended households (OR = 0.42, CI = 0.20–0.89) had significantly reduced odds of communicable diseases. Moreover, as Table 6 shows, the lack of employment increased the odds of non-communicable diseases for all respondents, regardless of living arrangement; the relationship was distinctly stronger for those who lived alone (OR = 5.88, CI = 2.29–15.09).

Individuals who lived in poorer households, either nuclear (OR = 1.43, CI = 1.04–1.97) or extended (OR = 1.50, CI = 1.00–2.27), had a significantly higher risk of communicable diseases (Table 5), individuals who lived in nuclear households in the middle wealth index (OR = 1.47, CI = 1.17–1.85) had significantly higher odds of non-communicable diseases; conversely, those who lived in extended households in the middle wealth index (OR = 0.63, CI = 0.44–0.92) had lower odds.

Moreover, household wealth interacted with sex and population group to produce variabilities for some social groups. When combined with sex, females from poorer and middle wealth households, particularly if nuclear or extended, had increased likelihood of non-communicable diseases. However, when combined with population group, black Africans from poorer and middle wealth households, particularly if they lived alone or in nuclear settings, had reduced odds of non-communicable diseases.

Finally, Table 5 shows that compared to rural residents, urban dwellers who lived in extended households (OR = 0.86, CI = 0.75–0.98) were at a significantly lower risk of communicable diseases, while according to Table 6, urban residence was a significant risk factor for all

Table 5
Multivariate logistic regression model showing odd ratios predicting the burden of communicable diseases by living arrangement.

Predictor Variables	One-person household		Nuclear household		Extended household	
	Odd Ratio	Confidence Interval	Odd Ratio	Confidence Interval	Odd Ratio	Confidence Interval
Age Group						
15–24 years	0.186	0.01–2.86	0.86	0.65–2.26	0.65	0.41–1.05
25–34 years	0.14[a]	0.02–0.94	0.423	0.14–1.26	0.392	0.13–1.15
35–49 years	0.415	0.08–2.16	0.928	0.38–2.26	1.223	0.45–3.32
50+ years	1.00		1.00		1.00	
Gender						
Male	1.00		1.00		1.00	
Female	0.184	0.02–1.39	0.35[a]	0.13–0.91	0.30[a]	0.11–0.82
Population Group						
Black African	1.366	0.56–3.31	3.70[c]	2.16–6.32	6.29[c]	2.88–13.74
Others	1.00		1.00		1.00	
Place of Residence						
Urban	0.897	0.69–1.16	0.890	0.76–1.05	0.86[a]	0.75–0.98
Rural	1.00		1.00		1.00	
Education Level						
Below Secondary	2.638	0.68–10.29	2.37[a]	1.05–5.37	1.474	0.60–3.63
Secondary	2.050	0.52–8.06	1.858	0.82–4.19	1.316	0.53–3.27
Tertiary	1.00		1.00		1.00	
Employment Status						
Employed	1.00		1.00		1.00	
Not Employed	1.624	0.34–7.73	1.808	0.95–3.44	3.30[b]	1.57–6.95
Household Wealth Index						
Poorer	1.751	0.85–3.59	1.43[a]	1.04–1.97	1.50[a]	1.00–2.27
Middle	0.690	0.30–1.60	1.175	0.89–1.55	1.313	0.92–1.87
Richer	1.00		1.00		1.00	
Age Group * Education Level						
15–24 years * Below Secondary	0.48	0.20–2.13	0.800	0.34–1.87	0.510	0.31–0.86
15–24 years * Secondary	0.525	0.04–6.64	0.350	0.15–0.55	0.220	0.17–0.87
25–34 years * Below Secondary	9.05[a]	1.23–6.69	2.155	0.68–6.74	1.977	0.65–5.97
25–34 years * Secondary	3.525	0.52–24.33	1.408	0.47–4.24	1.056	0.36–3.11
35–49 years * Below Secondary	6.23[a]	1.16–13.33	3.05*	1.21–7.68	1.671	0.61–4.60
35–49 years *Secondary	2.952	0.55–5.89	1.799	0.72–4.51	1.169	0.42–3.24
50+ years * Tertiary	1.00		1.00		1.00	
Pop. Group * Employment						
Black African* Not Employed	1.442	0.37–5.55	0.911	0.47–1.75	0.42[a]	0.20–0.89
Others * Employed	1.00		1.00		1.00	
Gender * Education Level						
Female * Below Secondary	1.043	0.24–4.54	1.342	0.61–2.96	2.91[b]	1.30–6.52
Female * Secondary	1.022	0.24–4.33	1.199	0.56–2.58	2.60[a]	1.18–5.74
Male * Tertiary	1.00		1.00		1.00	
Age Group * Gender						
15–24 years * Female	5.62[a]	0.96–12.75	3.09[b]	1.34–7.14	2.33[b]	1.41–3.84
25–34 years * Female	4.68[c]	2.17–10.08	2.65[c]	1.56–4.51	4.03[c]	2.63–6.18
35–49 years * Female	1.586	0.85–2.96	1.53[a]	1.00–2.34	1.99[c]	1.40–2.83
50+ years * Male	1.00		1.00		1.00	
Gender * Population Group						
Female * Black African	5.81[a]	1.13–12.9	2.16[a]	1.11–4.21	1.104	0.57–2.14
Male * Others	1.00		1.00		1.00	

[a] Significant at 0.05 level.
[b] Significant at 0.01 level.
[c] Significant at 0.001 level and 1.00 is reference category.

respondents, irrespective of living arrangement; the risk was particularly stronger for those who lived alone.

Discussion

Historically, the single most significant external force that has engendered transformation in the social structures of most sub-Saharan societies was the inception and establishment of the colonial project. The colonial project, through influences such as Western formal education, wage labour, growth of modern techniques of production and their concomitant growth of cities and towns, had the net effect of altering the region's social institutions such as the family, kinship, and the mainly agrarian and subsistence economies which in turn have induced changes in other domains of social, economic and political life in these societies.

While modernising influences like education, wage labour, urbanisation and new forms of wealth have been the main pathways of change in sub-Saharan Africa. In South Africa, these influences were socially engineered through the racially-inspired hierarchical system of apartheid to ensure differential access to the benefits of modernisation. Specifically, apartheid-induced policies such as land expropriation from the majority black Africans, controlled urbanisation, the Group Areas act, discrimination in the housing market etc., impacted the African system of extended family through a rural-urban migratory system which was not only selective of mainly young male members of the family, but also exploited them economically and socially by confining them to single-sex hostels in poorer sections of the cities and towns they had flocked to (Seekings, 2003).

This is the family and socioeconomic context of the present study. The study sought to examine the relationship between poor health and its determinants from a family perspective. Specifically, it focused on the impact of living arrangement on health outcomes in South Africa. In particular, we examined the effect of one-person, nuclear and extended household living on the burden of communicable and non-

Table 6
Multivariate logistic regression model showing odd ratios predicting the burden of non-communicable diseases by living arrangement.

Predictor Variables	One-person household		Nuclear household		Extended household	
	Odd Ratio	Confidence Interval	Odd Ratio	Confidence Interval	Odd Ratio	Confidence Interval
Age Group						
15–24 years	0.01[c]	0.00–0.03	0.01[c]	0.00–0.01	0.01[c]	0.00–0.01
25–34 years	0.05[c]	0.03–0.08	0.03[c]	0.02–0.04	0.02[c]	0.01–0.03
35–49 years	0.21[c]	0.16–0.29	0.17[c]	0.15–0.21	0.11[c]	0.09–0.13
50+ years	1.00		1.00		1.00	
Gender						
Male	1.00		1.00		1.00	
Female	0.801	0.43–1.48	0.53[c]	0.40–0.71	0.52[b]	0.33–0.83
Population Group						
Black African	1.605	0.90–2.87	1.33[a]	0.99–1.79	1.553	0.97–2.49
Others	1.00		1.00		1.00	
Place of Residence						
Urban	1.88[c]	1.51–2.33	1.33[c]	1.18–1.51	1.57[c]	1.43–1.72
Rural	1.00		1.00		1.00	
Education Level						
Below Secondary	2.001	0.94–4.25	1.210	0.88–1.67	1.251	0.82–1.90
Secondary	1.321	0.74–2.34	1.171	0.94–1.46	1.55[a]	1.04–2.29
Tertiary	1.00		1.00		1.00	
Employment Status						
Employed	1.00		1.00		1.00	
Not Employed	5.88[c]	2.29–15.09	1.57[c]	1.40–1.76	1.55[c]	1.40–1.71
Household Wealth Index						
Poorer	0.734	0.10–5.30	1.179	0.79–1.77	0.737	0.40–1.35
Middle	0.409	0.14–1.18	1.47[b]	1.17–1.85	0.63[a]	0.44–0.92
Richer	1.00		1.00		1.00	
Pop. Group * Education Level						
Black African * Below Secondary	0.34[b]	0.16–0.73	0.70[a]	0.49–0.99	0.54[b]	0.36–0.82
Black African * Secondary	0.42[b]	0.23–0.76	0.66[b]	0.51–0.87	0.49[c]	0.33–0.72
Others * Tertiary	1.00		1.00		1.00	
Pop. Group * Household Wealth						
Black African * Poorer	0.723	0.09–5.73	0.47[c]	0.30–0.71	0.750	0.41–1.36
Black African * Middle	0.61[a]	0.37–1.01	0.55[c]	0.42–0.71	0.909	0.63–1.31
Others * Richer	1.00		1.00		1.00	
Gender * Education Level						
Female * Below Secondary	1.709	0.93–3.15	2.27[c]	1.65–3.14	1.81[b]	1.25–2.61
Female * Secondary	1.443	0.83–2.51	1.69[c]	1.29–2.21	1.43[a]	1.00–2.04
Male * Tertiary	1.00		1.00		1.00	
Gender * Household Wealth Index						
Female * Poorer	1.334	0.26–6.81	1.63[a]	1.08–2.46	2.00[b]	1.19–3.35
Female * Middle	1.241	0.83–1.86	1.108	0.86–1.44	2.12[c]	1.48–3.05
Male * Richer	1.00		1.00		1.00	
Age Group* Gender						
15–24 years * Female	2.460	1.45–4.64	2.35[a]	0.97–5.66	1.294	0.61–2.73
25–34 years * Female	1.386	0.63–3.05	2.09[b]	1.31–3.36	1.047	0.67–1.64
35–49 years * Female	0.872	0.53–1.43	1.219	0.97–1.53	2.01[c]	1.56–2.58
50+ years * Male	1.00		1.00		1.00	
Gender * Population Group						
Female * Black African	1.627	0.96–2.74	1.44[b]	1.16–1.78	1.144	0.91–1.44
Male * Others	1.00		1.00		1.00	

[a] Significant at 0.05 level.
[b] Significant at 0.01 level.
[c] Significant at 0.001 level and 1.00 is reference category.

communicable diseases among adults aged 15 years and older in South Africa, while controlling for selected socio-demographic factors.

The findings of the study have generally confirmed the empirical evidence that health outcomes vary by living arrangements of individuals, their socioeconomic status, and by the level of urbanisation or residence. On the whole, the study found that incidences of poor health were more common among individuals residing in extended households. In other words, individuals who lived in extended households were more likely than those who lived in nuclear or one-person households to report a greater disease burden. It is a fact that black Africans, in general, are culturally predisposed to a communalist ethos and thus traditionally live in extended households of several related persons, while the nuclear household is culturally identified with descendants of Europeans or whites. Historically, the extended household or family has been functional for individual members of these extended households due to the pooling of resources for mutual support of members, especially in times of adversity. This mutuality of support that characterises extended households explains the finding by the present study that unemployed individuals in extended households generally have a higher risk of communicable diseases except amongst black Africans.

However, within the context of South Africa, the historical role and viability of the extended family which is identified with the majority black African population have been negatively impacted by the social engineering of the apartheid system. For instance, apartheid-induced policies such as Influx Control and the Group Areas Acts ensured that black Africans not only lived in single-sex hostels in cities and towns against their cultural preference of living and pooling resources with other kin, but were confined to poorer sections or townships on the outskirts of these cities and towns. Coupled with general discrimination in the housing market, education and employment, black Africans who are now “free” to live anywhere and with their kin, are relatively deprived of the social and economic resources that are required to ward

off diseases.

The net result of the social engineering of the extended family which was historically and culturally identified with the majority of the country's population (Amoateng, Heaton, & Kalule-Sabiti, 2007), is that this type of living arrangement in the society has been selective of all the negative effects of social relations: overcrowding, physical, emotional and economic stress and strains.

Conversely, the majority of individuals whose cultural preference is the nuclear family have historically been empowered through resources such as education, wage employment and urban living to be able to largely ward off diseases. This fact is evidenced by the present study's finding that individuals, especially those aged 15–34 years old who live alone had a lower risk of communicable diseases, while persons who live in nuclear households generally were less likely to report communicable and non-communicable diseases.

The present study found that over and above the impact of living arrangement or household type, individual socioeconomic factors such as education, participation in the labour force and household wealth also predict health outcomes for individuals. Specifically, less education, lower household wealth and the lack of employment endangered individual health, irrespective of living arrangement. This corroborates previous findings and assertion that low socioeconomic status is associated with higher morbidity and mortality rates (Ataguba et al., 2015; Omotoso & Koch, 2018).

However, even within the same household, some are more vulnerable than others. As the findings revealed, young, black and less-educated females as a group are the most at risk of disease burdens in South Africa. The increasing vulnerability of the female gender to disease burden in South Africa cannot be divorced from the insidious inequality and discriminations embedded in the society, both historically and contemporaneously. Much of the health problems females, particularly black women, contend with can be attributed to their subordination in society.

Apartheid's rigid social hierarchy ensured that white people, particularly white men were at the very top of the ladder in all aspects, including in the determination of resource allocations to health care (Coovadia et al., 2009). This, and the general impoverishment of the black population during apartheid, ensured that black women are doubly disadvantaged as they were socially ranked lower than both white women and black men. Thus, the power imbalance between the sexes places women at a disadvantage culturally, socially and economically, affecting their health outcomes. More importantly, "gender and race remain the key markers of vulnerability to poor health outcomes in South Africa" (Rispel et al., 2011, p.S1), with the two constructs having synergetic effects on health.

Lastly, residential disparities in the distribution of disease burdens are largely a corollary of historical design. The Group Areas Act and other related legislation during apartheid racially segregated living spaces, particularly urban areas, with reservation of land mostly for white people and black Africans relegated to impoverished townships (black urban areas) or Bantustans (homelands in rural areas) (Coovadia et al., 2009). Like with most social goods, government expenditures on health care and related services in Black areas were systematically lower compared to white areas. Thus, contemporary urban-rural differences in the distribution of disease burdens are not by accident. Our finding of urban residence being a risk factor for the burden of non-communicable diseases but not communicable diseases reaffirms assumptions about the growing burden of non-communicable diseases being a consequence of urbanisation.

Conclusions

The conditions in which people are born, grow, work, and live do affect their health. It is often erroneously assumed that individuals have the freedom to make healthy choices without much regard for people's lived experiences. As this study has underscored, it is important to contextualise risks. Our findings have shown that females, particularly younger, black and less-educated females, are the most-at-risk populations in South Africa as far as disease burdens are concerned. Accordingly, the underlying social characteristics of these groups give them less opportunity to be healthy than their more advantaged counterparts. In conclusion, the present study has demonstrated that families and households exist in social, economic, cultural, and political contexts and their observed structures and patterns with observed outcomes like health largely reflect the prevailing conditions in a society at any particular time.

In terms of policy, the findings of this study underscore the need for national broad-based (rather than selective) interventions to prevent and treat the major health problems of communicable and non-communicable diseases. Health promotion programmes could effectively target identified most-at-risk populations in South Africa. Additionally, there is a need to strengthen resource distribution efforts to improve the social conditions of marginalised groups and vulnerable households to better their health and quality of life. Lastly, more and multidisciplinary empirical research is needed to assess critically how the family context determines differences in the health of a population.

Limitation of the study

This is one of the few studies assessing risk factors associated with poor health from the family perspective in South Africa. To this effect, this study has sought to contribute to the emerging literature in this field shedding more light on the social and demographic contexts of health outcomes in society. Although the study findings revealed some interesting observations, it is important to note that this study is cross-sectional and, therefore, the conclusions about causality cannot be drawn. Moreover, this study relies heavily on self-reported information about health status, due to the sensitivity of the issue, there may be under-reporting of such information and the possibility of recall bias on the part of the respondents.

Financial disclosures

None to declare.

Ethical statement

The dataset generated and/or analysed during the current study is publicly available in the online DataFirst repository, [https://doi.org/10.25828/6bvj-n342]. Permission from the DataFirst is required to access the data.

All ethical considerations were met by the primary investigators, Statistics South Africa. Consent of study subjects can be reasonably presumed once permission was obtained to use the data.

CRediT authorship contribution statement

Elizabeth Biney: Conceptualization, Investigation, Writing - original draft. **Acheampong Yaw Amoateng:** Writing - review & editing, Supervision. **Olusegun Sunday Ewemooje:** Methodology, Formal analysis.

Declaration of competing interest

The authors declare that they have no competing interests.

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