

The Meaning of Health in Rural South Africa: Gender, the Life Course, and the Socioepidemiological Context

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This article examines the meaning of health among middle-aged and older adults in a rural South African setting, where 72 percent of adults aged 40 and over are living with a major chronic condition, and 81 percent report good or very good health. We draw on a unique mixed-methods dataset that includes a population-based survey with disease biomarkers (hypertension, diabetes, HIV), self-assessments of health including self-rated health, functional ability and medication use, as well as nested qualitative life history interviews with survey participants including questions about lived experiences of health. We conduct survey trend analysis and ordinal logistic regression, as well as inductive and deductive coding of qualitative interviews, and triangulate findings across data sources. Overall, we find that self-rated health and functional ability are not associated with biometric disease indicators; however, we find that gendered familial expectations, life course stage, and the socioepidemiological context work together to regulate the salience of illness as people age. The study highlights the utility of research with multiple measures of health in illuminating the challenges of aging amidst the complex epidemiological transitions that increasingly characterize low- and middle-income countries.

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Introduction

The African continent is undergoing a complex epidemiological transition. Even before the global COVID-19 pandemic, African populations have had an ongoing high burden of infectious diseases at young and middle ages, alongside a growing burden of chronic diseases at middle and older ages (World Health Organization 2008; Young et al. 2009; Gouda et al. 2019). This is creating a unique socioepidemiological context across the continent in which the individual and communal burden and experience of poor health are now extending across greater proportions of the life course. This is likely to affect how people in such settings assess their health. South Africa is a particularly important country in which to examine this question. It has the world's largest number of people living with HIV (almost 8 million) as well as exceptionally high levels of noncommunicable disease among older adults (Human Services Research Council 2018; Mayosi et al. 2009; Westaway 2010). This article examines the meaning of health in rural Mpumalanga Province, South Africa, a context that has experienced a severe HIV/AIDS epidemic, and in which most middle-aged and older adults are aging with a major chronic condition. We examine how people make sense of their health, as well as the role of gender, the life course, and the socioepidemiological context, in explaining variation in their health assessments.

We draw on a unique mixed-methods dataset with biometric measures of disease (hypertension, diabetes, HIV) from a population-based sample, survey responses from the same individuals on self-rated health (SRH), functional ability (FA), and medication use, as well as nested qualitative life history interviews with survey respondents which included questions about lived experiences of health. We first examine survey trends in biometric disease indicators as well as SRH, observing whether and how they vary by age group and gender. Next, we conduct ordinal logistic regression to examine SRH correlates with morbidity and other sociodemographic variables. We conduct robustness checks including examining the relationship between FA and biometric disease indicators, as well as medication use and SRH. We then analyze life history interviews linked to respondents' biometric outcomes to investigate whether and how living with a chronic condition affects health assessments, whether this varies by gender and across middle and older ages, and the role of the socioepidemiological context in shaping these assessments.

Background

The World Health Organization (WHO 1948) defines health as reflecting "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Illness and health are assessed in a range

of ways, including through biometric measures such as blood tests and glucometers that establish the presence of disease (e.g. Shay et al. 2012; Clark et al. 2015; Gómez-Olivé et al. 2013a; Tran et al. 2018), through qualitative studies that examine lived experiences of health and illness (e.g. Jylhä 1994; Prieto-Flores et al. 2010; Schatz and Gilbert 2012; Lopes Ibanez-Gonzalez and Tollman 2015), as well as through survey questions that ask respondents to rate their health (e.g. Idler and Benyamini 1997; Miilunpalo et al. 1997; Schnittker 2005; Gómez-Olivé et al. 2013b; Duboz et al. 2017).

Perhaps the most widely used measure of self-assessed health is the SRH survey question which asks respondents to assess their overall health (Idler and Benyamini 1997). It is an appealing survey measure for a number of reasons. First, it closely approximates the WHO's holistic definition by enabling respondents to connect subjective and objective health together, including assessments of physical health and functioning, health risk behaviors, social roles and relationships, and psychosocial well-being in their self-ratings of health (Idler and Benyamini 1997; Jylhä 2009; Duboz et al. 2017). Second, responses to the single survey question are more reliable as predictors of future mortality than biometric health measures or physician assessments (Benyamini and Idler 1999; Mossey and Shapiro 1982; Idler and Benyamini 1997; Miilunpalo et al. 1997; Jylhä 2009; Lorem et al. 2020). Third, its relationship to health outcomes is robust to variations in survey question phrasings (e.g., questions asking about health in general, or health at the present time/today, or health compared to others their same age, etc.) and item choice differences (ranging from three to seven choices for health ratings) (Idler and Benyamini 1997; Eriksson, Undén, and Elofsson 2001). Finally, its predictive relationship to mortality and its utility as a health measure has been established across different ethnic groups and multiple countries (Appels et al. 1996; Miilunpalo et al. 1997; Idler and Benyamini 1997; Chandola and Jenkinson 2000; Lorem et al. 2020), including on the African continent (Debpuur et al. 2010; Onadja et al. 2013; Gómez-Olivé et al. 2013b; 2014; Cau, Falcão, and Arnaldo 2016; Duboz et al. 2017; Fonta et al. 2017).

While each method of assessment provides important information about health and illness, in this study, we build on work by Jylhä (1994, 2009) and Idler, Hudson, and Leventhal (1999) who call for more studies examining relationships between biophysiological and self-assessed health and more research on the various factors that people draw on when asked to assess their health. We advance the literature by combining and triangulating among biometric, survey, and qualitative measures of illness from the same individuals to examine the meaning of health. This both enables identification of discrepancies among measures of health, for example, people with major disease conditions who rate their health as excellent, as well as, importantly, why those discrepancies occur. To guide our analysis of

what might explain variation in the meaning of health, we focus on three factors—gender, the life course, and the socioepidemiological context.

Gender and the life course

The experience of illness is gendered and varies over the life course. In nearly all countries, including South Africa, while men have a higher mortality rate, women report worse SRH, and this is mirrored in more reports of illness, life-threatening conditions, and FA limitations (Verbrugge 1985, 1989; Idler 2003; Rieker and Bird 2005; Case and Paxson 2005; Read and Gorman 2010; Debpuur et al. 2010; Gómez-Olivé et al. 2010, 2013a; Onadja et al. 2013; Duboz et al. 2017; Cau, Falcão, and Arnaldo 2016; Fonta et al. 2017). In addition, research suggests that gender differences in health vary across the life course; in the United States, while at younger ages women report worse SRH than men, the gender gap narrows at older ages and disappears after age 75 (Gorman and Read 2006; McCullough and Laurenceau 2004; Zajacova, Huzurbazar, and Todd 2017).

While there are underlying biological drivers of sex and aging that lead to morbidity, this process is exacerbated by their social construction, as captured by gender and life course stage (Ross and Bird 1994; Moen 2001; Rieker and Bird 2005; Schnittker 2005). A social constructivist approach thus necessarily situates health and well-being within the larger context of people's lives. In theorizing the concept of "the gendered life course," Moen (2001, 188) noted that "gender differences in health and psychological well-being in later adulthood reflect both (a) women's and men's differential roles, relationships, and resources and (b) the gendered context in which they are experienced." Gender is pervasive; it organizes identities, self-concepts and beliefs, interactions with others, and the way individuals experience and are treated by institutions such as the workplace, the household, and health care systems (Acker 1990; Dovel et al. 2015; Ridgeway and Correll 2004; West and Zimmerman 1987; Williams 1992). This has profound health implications. In contrast to femininity, masculinity is associated with engagement in dangerous occupations, risky practices, and limited health engagement which are, in turn, associated with preventable morbidity and premature mortality due to low health risk assessment or a sense of invincibility (Courtenay 2000; Skovdal et al. 2011). Inability to meet expectations of masculinity also has an impact on health assessments. Springer (2010) found that men who were economically dependent on their partners reported worse health than those who were not, and this effect was stronger for higher income men who earned less than their wives.

A key site in which the gendered life course and its shaping of health assessments play out is within unions. Over the life course, middle-aged and older adults are likely to be exposed to a variety of living arrangements, including marriage, cohabitation, and singlehood (e.g., due

to widowhood, separation, divorce or never being in a union), with positive and negative gendered consequences for health outcomes and experiences (Reniers 2008; Reniers and Watkins 2010; Waite 1995; Williams and Umberson 2004). In sum, the gendered life course is a key lens through which health assessments are filtered due to social expectations of gendered tasks and roles that shift with age. Our study extends the literature by triangulating among multiple assessments of health to identify the differential role of gender and the life course in shaping the meaning of health among men and women at different points of the life course.

The socioepidemiological context

An understudied but arguably major driver of variation in health assessments across countries and settings is the socioepidemiological context. This context is characterized by interactions between the overall disease burden, the distribution of disease across the population, real and perceived disease etiologies, as well as the social meanings attached to various diseases. A high disease burden, concentrated at older ages, is a feature of many high-income countries and is a function of increased life expectancy due to medical technologies and developments, among other things (Anderson and Horvath 2004; Buttorff, Ruder, and Bauman 2017; Raghupathi and Raghupathi 2018; Boissonneault and Rios 2021). In the United States, high morbidity among older adults may explain the weakening gender differences in SRH as people age (Gorman and Read 2006; McCullough and Laurenceau 2004; Zajacova, Huzurbazar, and Todd 2017), as well as the weakening association between SRH and chronic conditions, and concomitant strengthening association between SRH and mental health as people age (Schnittker 2005).

In many African countries, a high disease burden has been arrived at in more complex ways, creating a unique socioepidemiological context. In addition to ongoing high rates of childhood illnesses (Adedokun and Yaya 2020), the HIV/AIDS pandemic introduced dramatic increases in child and young adult morbidity and mortality (UNAIDS 2016). However, the introduction of widespread antiretroviral therapy (ART) has played a major role in prolonging the lives of those who would have otherwise died from AIDS (Reniers et al. 2014; Slaymaker et al. 2014), transforming HIV into a long-term chronic illness. At the same time, more Africans are surviving to older ages and acquiring noncommunicable chronic diseases characteristic of aging (Mayosi et al. 2009; Young et al. 2009; WHO 2008). Further, people with HIV are subject to an earlier and faster onset of chronic diseases (Deeks, Lewin, and Havlir 2013), increasing the proportions of people aging with comorbidities. The overall effect has been to stretch the experience of morbidity across the life course. This means that compared to high-income countries, different or shifting reference points for what constitutes good health

(McMullen and Luborsky 2006; Wood, Taylor, and Lichtman 1985) may arise at earlier points in the life course. As growing proportions of Africans spend increasing amounts of time managing illness and/or taking care of someone who is ill, we might thus expect more variation in the relationship between biometric and self-rated health.

Across the subcontinent, there is also likely to be wide variation in socioepidemiological contexts. African countries have different proportions of middle-aged and older adults, different burdens of infectious and chronic diseases, and differential experiences with infant and child mortality; they have also been differently impacted by the HIV/AIDS pandemic (Gouda et al. 2019). South Africa, our country of study, has a distinctive socioepidemiological context. It has relatively high proportions of older adults, some of the highest rates of chronic disease on the subcontinent, the most severe HIV/AIDS epidemic globally, the world's largest ART program, as well as a significant mortality shock from AIDS and other disease-related mortality (Hosegood and Timaeus 2006; Statistics South Africa 2009, 2014; Mayosi et al. 2009; Westaway 2010; Human Services Research Council 2018). South Africa's position in relation to subcontinental and global trends makes it an important context in which to examine the meaning of health as well as the drivers of variation in health assessments as people age. Additionally, our use of life-history interviews, along with biometric and self-assessed health measures allows us to examine the differential role of individual, familial, and wider communal experiences of illness in shaping health assessments.

The case of rural Mpumalanga Province, South Africa

A number of factors have shaped the gendered life course and socioepidemiological context for middle-aged and older adults in our study setting in rural South Africa, in ways that are likely to affect their health assessments. During the apartheid era, mass relocation of Blacks to "homeland" areas, and coerced migration of men to work in farms, mines, and cities, instituted a gendered circular labor migration pattern (Collinson 2010). In the postapartheid era, high unemployment and disinvestment in former homelands have resulted in the persistence of these patterns: 60 percent of men and 20 percent of women migrate for work (Blalock 2014; Clark et al. 2007). Many women remain at home engaging in itinerant work, alongside being primary caretakers of their families, reliant on remittances from migrating partners or government child support when they have dependent children (Collinson 2010; Twine et al. 2007). By age 60, adults are eligible for means-tested noncontributory government pensions, which enable stability of income in a setting where many are poor (Case and Menendez 2007; Schatz et al. 2012). In addition to retirement, disability and illness bring men back to their rural homes (Clark et al. 2007; Blalock 2014).

The HIV/AIDS epidemic has significantly affected everyday life (Posel, Kahn, and Walker 2007). Its effects were structured by, and in turn structured, the gendered life course. Circular labor migration has been linked to high HIV acquisition in men's workplaces, subsequently bringing them home to die (Clark et al. 2007; Mojola et al. 2015). High morbidity and subsequent AIDS-related death led to a significant population-level mortality shock reflected by plummeting life expectancy prior to the rollout of ART (Kabudula et al. 2017a), which was only widespread as of the 2010s (Mee et al. 2014). Between 1994 and 2004, life expectancy dropped from 72.7 to 59.4 years for women and from 68.2 to 53.3 years for men (Kahn et al. 2012). Higher morbidity and mortality among men led to overburdened hospitals and resulted in many women leading multigenerational households, and serving as primary caretakers of grandchildren as well as the sick and dying (Schatz 2007; Schatz and Seeley 2015; Schatz et al. 2018; Mojola and Angotti 2019). Many women were left widowed; among those aged 60 and above, 59 percent of women and only 14 percent of men were widowed (Houle et al. 2018). In sum, the intertwined nature of the gendered life course and socioepidemiological context are likely to inform how middle-aged and older adults make sense of the meaning of health as they age.

Data

This study draws on multiple nested data sources collected within the Agincourt Health and SocioDemographic Surveillance System (HDSS, hereafter "Agincourt") run by the South African Medical Research Council (MRC)/the University of Witwatersrand (Wits) Rural Health and Health Transitions Research Unit (Agincourt) in Mpumalanga Province, South Africa. At the time of our study, the system covered over 90,000 people from 27 villages (see Kahn et al. 2012 for further system details; see Schatz 2012 for nesting procedures and rationales). Study protocols for each data source were approved by their respective investigators' institutions as well as the Mpumalanga Provincial Research and Ethics Committee.

Survey data and measures

The *Ha Nakekela* study (HIV/NCD survey) conducted in 2010–2011 is a population-based cross-sectional survey that drew from a random sample of the 2009 Agincourt census surveillance update round (see Gómez-Olivé et al. 2013a; Clark et al. 2015 and Houle et al. 2018 for survey details). The survey interviewed 5,080 people drawn from 21 villages and included biometric measures (including dried blood spots for HIV and measures for diabetes and hypertension), as well as survey questions on sexual and chronic disease behavioral risk, SRH, and sociodemographic measures. Our analytic

sample focuses on the 2,107 survey respondents who were aged 40-plus. The following measures were examined:

Health. To capture multiple dimensions of respondents' health, we draw on three biometric measures of chronic conditions—HIV, hypertension, and diabetes—as well as three measures of self-assessed health available in the survey—SRH, our main measure, as well as functional ability, and medication use, our alternative measures.

HIV Status: This measure was based on a screening assay of blood spots (Vironostika Uniform 11—Biomerieux, France) and a confirmatory assay of positive tests (SD Bioline HIV ELISA test—Standard Diagnostics Inc, Korea). Following WHO criteria, if there was a discrepancy between the screening and confirmatory assays, a third assay was conducted to determine the final outcome (see also Gómez-Olivé et al. 2013a). The measure is coded 0 for HIV negative and 1 for HIV positive.

Hypertension: This indicator was based on three measurements of blood pressure conducted with a Boso blood pressure instrument (BOSCH+SOHN, Jungingen, Germany). Measurements were taken three minutes apart. Following national guidance, we use an average of the last two measures. Respondents were considered hypertensive ($= 1$) if their systolic blood pressure was greater than or equal to 140 mmHg, their diastolic blood pressure was greater than or equal to 90 mmHg, or they reported using antihypertensive medication in the past two weeks. (See also Clark et al. 2015; Houle et al 2021).

Diabetes: This indicator was based on measurements of random blood glucose levels, which were conducted using a Caresens POP point of care glucometer (i-Sens, Nowon-gu, Seoul, Korea). Respondents were determined to have “probable diabetes” ($= 1$) based on whether they had blood glucose levels greater than or equal to 11.1 mmol/L (see Ho et al. 2012 for diabetes classifications; see also Clark et al. 2015).

Any Disease: Respondents were coded as 1 if they had at least one major chronic condition (HIV, hypertension, or diabetes).

Self-Rated Health (SRH): Respondents were asked: “How would you rate your health today?” (*Xana rihanyu ra wena hi ku angarela namuntlha u ti twa jani?* in XiTsonga/Shangaan). The survey question is based on the WHO-SAGE survey measure on SRH (Kowal et al. 2010; Phaswana-Mafuya et al. 2013). Respondents were offered four options: “very good, good, bad, very bad.” The variable is reverse coded so that increasing values indicate better health.

Functional Ability (FA): Respondents were asked: “Overall in the last 30 days, how much difficulty did you have with work or household activities?” (*Hi ku katsakanya ka masiku ya makume-narhu lama nga hundza, i ku tikeriwa ka njhani loku u nga va na kona hi ntirho kumbe hi mintirho yi n'wana ya laha kaya?* in XiTsonga/Shangaan). The survey question is based on the WHO-SAGE

survey measure on FA (WHO-SAGE 2006).¹ Respondents were offered four options: “none, mild, severe, extreme.” The variable is reverse coded so that increasing values indicate better FA.²

Medication Use: Respondents were separately asked if they had taken medication for high blood pressure or diabetes in the past two weeks to capture recent use, and whether they were taking antiretroviral treatment for HIV.

Socioeconomic status (SES). We used three indicators to capture SES — employment, education, and wealth. (We merged the HIV survey with the 2009 Agincourt census to derive these measures). Using multiple measures is important because health may be shaped by different dimensions of SES (Adler and Newman 2002). While education may capture health knowledge and self-efficacy, wealth might better reflect a respondent’s living conditions and durable assets to buffer the effects of chronic illness. Employment, in turn, may be more reflective of access to cash income to cover day-to-day living expenses such as food as well as health-related expenses such as paying for transport to go to the health facility (see Bloom and Canning 2000; Adler and Newman 2002; Bingenheimer 2007; Hadley, Maxfield, and Hruschka 2019).

Education: This measure has four categories: no formal education, 1–5 years, 6–11 years, or 12 or more years of education (high school graduate or higher).

Wealth: This measure is an asset-based index of ownership of modern assets, livestock, availability of power supply, water and sanitation, and dwelling structure. These categories were summed and normalized, producing an index ranging from 0 to 5. Higher scores indicated wealthier households (Kabudula et al. 2017b).

Employment: Respondents were coded 1 if they reported currently working, and 0 if not working.

Sociodemographic measures.

Age group: Respondents were categorized into age groups: 40–49, 50–59, 60–69, and 70+. This coding schema matches the age categorization employed in the qualitative analysis.

Gender: This measure was coded as 1 if the respondent is a man and 0 if a woman.

In union: This measure was coded 1 if a respondent is currently in a formal or informal union and 0 if not (e.g., single, widowed, separated/divorced). We combined formal and informal unions because additional analyses indicate that there was no significant difference between these categories in their relation to SRH.

Weighting and multiple imputation. In all models and supplemental analyses, following Schatz et al (2019), we used inverse probability sampling weights to adjust for nonresponse and sample selection. We also used village dummies to adjust for village clustering of results. From our analytic sample of 2107, 144 (6.8 percent) respondents were missing a measure of work status or biomarker measures. We thus used multiple imputations to include these respondents while addressing their missing characteristics (Allison 2000; Sterne et al. 2009). To calculate the number of required imputations, we used von Hippel's (2020) two-stage procedure on all the models; it suggested that the required imputations range from two to five. We imputed five datasets using Markov chain Monte Carlo procedures and assuming a multivariate normal distribution. In our descriptive statistics (Table 1) and supplemental analysis which drew on specific disease biomarkers (HIV, hypertension, and diabetes—Supplement Table A2), we imputed responses for an additional 70 (3.3 percent) respondents. These respondents had at least one positive biomarker measure, so we could assign them a value for "any disease"; however, we had to impute specific missing disease biomarkers. We assessed the differences between the full imputed ($n = 214$) and nonimputed ($n = 1893$) sample (see Supplement Table A1). The imputed sample had better SRH, was younger, and was more likely to have 12+ years of education.

Life history interview data and measures

In 2013, the *Izindaba Za Badala* study conducted 60 life history interviews (LHIs) with a random stratified sample of respondents aged 40–84 who participated in the *Ha Nakekela* survey (see Mojola et al. 2021 for study details including stratified random sampling procedures). The sample was stratified by gender (30 men/30 women), HIV serostatus (30 living with and 30 without HIV), and age group (20 people each in their 40s, 50s, and 60s or over). Randomly sampling from the survey avoided convenience sampling and ensured even distribution across study villages. Five experienced local interviewers conducted audio-recorded interviews in the local language (XiTsonga/Shangaan). They later translated and transcribed the interviews into English. Quality checks on transcripts were performed by the study leaders. Interviews included questions on childhood and current family life, household composition, livelihood strategies, and general health (including comorbidities and medications) as well as questions specific to HIV and ART. Interviewers were only aware of health conditions disclosed in interviews. In the health module, respondents were asked: *How is your health these days? [Any] current health concerns or issues? In the last year? If so, did you/ where do you seek treatment? Is there anything that keeps you from seeking treatment when you are sick? Who from your family takes care of you when you are*

TABLE 1 Sample description of adults aged 40-plus in Agincourt, South Africa

	Total propor- tion	[95% CI]	Men (propor- tion)	[95% CI]	Women (propor- tion)	[95% CI]
At least one disease (HIV, hypertension, diabetes)	0.72	[0.70, 0.74]	0.71	[0.67, 0.74]	0.72	[0.70, 0.75]
HIV positive	0.22	[0.20, 0.24]	0.23	[0.20, 0.27]	0.22	[0.19, 0.24]
Hypertensive	0.60	[0.58, 0.62]	0.58	[0.54, 0.61]	0.61	[0.58, 0.64]
Probable diabetes	0.04	[0.03, 0.05]	0.04	[0.03, 0.05]	0.04	[0.03, 0.06]
Self-rated health						
Very bad	0.01	[0.01, 0.02]	0.01	[0.00, 0.02]	0.01	[0.01, 0.02]
Bad	0.18	[0.16, 0.19]	0.14	[0.12, 0.16]	0.19	[0.17, 0.21]
Good	0.30	[0.28, 0.32]	0.26	[0.23, 0.30]	0.32	[0.29, 0.34]
Very good	0.51	[0.49, 0.53]	0.58	[0.55, 0.62]	0.48	[0.45, 0.51]
Age category						
Age 40–49	0.34	[0.32, 0.36]	0.35	[0.31, 0.38]	0.34	[0.31, 0.37]
Age 50–59	0.23	[0.21, 0.25]	0.22	[0.19, 0.25]	0.24	[0.21, 0.26]
Age 60–69	0.19	[0.17, 0.20]	0.19	[0.17, 0.22]	0.19	[0.17, 0.21]
Age 70+	0.24	[0.22, 0.25]	0.24	[0.21, 0.26]	0.24	[0.21, 0.26]
Formal education						
None	0.48	[0.46, 0.50]	0.38	[0.35, 0.41]	0.52	[0.5, 0.55]
1–5 years	0.18	[0.17, 0.20]	0.21	[0.18, 0.24]	0.17	[0.15, 0.20]
6–11 years	0.24	[0.22, 0.26]	0.29	[0.26, 0.32]	0.22	[0.19, 0.24]
12+ years	0.10	[0.08, 0.11]	0.12	[0.10, 0.15]	0.09	[0.07, 0.10]
Currently working	0.27	[0.25, 0.29]	0.35	[0.31, 0.38]	0.24	[0.22, 0.27]
Wealth tertile						
Low	0.34	[0.32, 0.36]	0.33	[0.29, 0.36]	0.35	[0.32, 0.37]
Medium	0.32	[0.30, 0.34]	0.32	[0.28, 0.35]	0.32	[0.30, 0.35]
High	0.34	[0.32, 0.36]	0.36	[0.32, 0.39]	0.33	[0.30, 0.36]

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TABLE 1 (Continued)

	Total propor- tion	[95% CI]	Men (propor- tion)	[95% CI]	Women (propor- tion)	[95% CI]
In union	0.46	[0.44, 0.49]	0.65	[0.62, 0.69]	0.38	[0.36, 0.41]
N	2,107		820		1,287	

sick? Are you on any Western/alternative medication? Is getting/taking your medication a problem? As you get older, what do you think your major health concerns will be?

Methods and analytic approach

The nested nature of our dataset, with biometric, survey, and life history interview data drawn from the same individuals, enabled us to conduct mixed-methods analyses for this paper. These analyses were useful not only in allowing us to examine similarities and discrepancies across health measures but also to address limitations associated with each data source (Creswell et al. 2011). Importantly, because of the time gap between biometric/SRH (2010-11) and LHI (2013) data collection, we focused our comparisons on biometric and self-rated health, and biometric and LHI health assessments, rather than SRH and LHI comparisons. This was because chronic disease is less likely to be variable over time. Our analyses proceeded in three stages.

Stage 1: Quantitative Analyses. We first examined survey trends in biometrically measured disease prevalence (HIV, hypertension, and diabetes) and SRH, examining variation by age group and gender among adults aged 40-plus. We then conducted ordinal logistic regression examining two questions: *What is the relationship between biometric and self-rated health? What accounts for variation, if any, in this relationship?* Finally, we conducted a series of robustness checks for our measures and analyses, which we describe in detail in the results section.

Stage 2: Qualitative Analyses. Next, we analyzed our LHI data through manual coding. In the first stage of coding, analysis began with deductive coding, examining responses to the module of questions focused on respondents' general health described above. For each respondent, we created a profile with their pseudonym (to preserve respondent anonymity) and their responses to each of the questions. In the second stage of coding, we engaged in inductive coding, where responses to these questions were considered in light of each respondent's interview as a whole. At this stage, we took account of other salient dimensions of their lives emerging from the first stage of analysis, such as livelihoods, household living arrangements, and family deaths, which were summarized in short memos and

added to respondent profiles. We also added biometric outcomes of chronic illness (HIV, diabetes, hypertensive status) from the survey to each respondent profile and examined their relationship to respondents' reports of their lived experience of health, especially where there were differences. We also noted whether respondents appeared to be aware of and/or disclosed their chronic condition. In the final stage of analysis, respondent profiles were analyzed by age group and gender. Summaries were created of each grouping (e.g., 40s women; 50s men, etc.) and systematically compared across gender and age groupings to examine similarities and differences among groups.

Stage 3—Triangulated Analyses. In the third stage, we examined whether findings from Stages 1 and 2 matched or were discrepant. We then conducted supplemental quantitative or qualitative analyses to investigate the discrepancies. Quantitative analyses included running interactions among key variables (e.g., work and gender), conducting subgroup analyses (e.g., separate gender and age group analyses), and examining alternative survey measures capturing different dimensions of health and overall well-being (e.g. FA and medication use). Qualitative analyses included focused coding to better understand and contextualize specific discrepancies (e.g. examining the relative importance of respondents' household and family life, their work lives, and discussions of other health conditions not captured by our three chronic disease measures, such as pain).

Results

Quantitative analyses and results

Descriptive analyses.

Sample demographics. Table 1 describes the sample of adults aged 40-plus in the *Ha Nakekela* study in Agincourt.³ Overall, 72 percent were living with at least one major chronic disease, with nearly two-thirds (60 percent) living with hypertension, over a fifth (22 percent) living with HIV, and 4 percent living with diabetes. However, 81 percent of the sample rated their health as good or very good. At the outset, this suggests a discrepancy between having a major chronic condition and SRH. There were also significant gender differences (nonoverlapping confidence intervals), with more men reporting very good health compared to women (58 percent and 48 percent, respectively). Most respondents reported not currently working (73 percent), and more men (35 percent) than women (24 percent) reported working. Reflecting high unemployment in the setting, even among men in their 40s and 50s, only 44 percent and 34 percent, respectively, reported current work. Finally, there were large gender differences in union status, with two-thirds (65 percent) of men in a union compared with just over one-third (38

TABLE 2 Disease prevalence by age group, Agincourt, South Africa

	40–49	50–59	60–69	70+	Total
Any disease	0.70	0.74	0.75	0.74	0.73
Only hypertensive	0.33	0.44	0.56	0.65	0.48***
Only diabetic	0.01	0.00	0.00	0.01	0.01
Only HIV+	0.19	0.12	0.06	0.02	0.11***
Multiple diseases (comorbid)	0.17	0.18	0.13	0.06	0.14***

NOTE: Asterisks indicate categories are significantly different (Wald test) in logistic regression with disease category predicted by age group. *** $p \leq 0.001$.

TABLE 3 Disease prevalence by age group and gender, Agincourt, South Africa

	40–49		50–59		60–69		70+	
	M	W	M	W	M	W	M	W
Any disease	0.69	0.70	0.74	0.74	0.79	0.73	0.69	0.77*
Only hypertensive	0.35	0.32	0.40	0.45	0.58	0.55	0.59	0.68*
Only diabetic	0.01	0.01	0.01	0.00	0.00	0.00	0.02	0.01
Only HIV+	0.17	0.20	0.17	0.10*	0.08	0.05	0.01	0.02
Multiple diseases	0.16	0.17	0.17	0.18	0.14	0.13	0.05	0.06

NOTE: Asterisks indicate gender categories are significantly different (Wald test) in logistic regression with disease category predicted by gender, separately by age group. * $p \leq 0.05$.

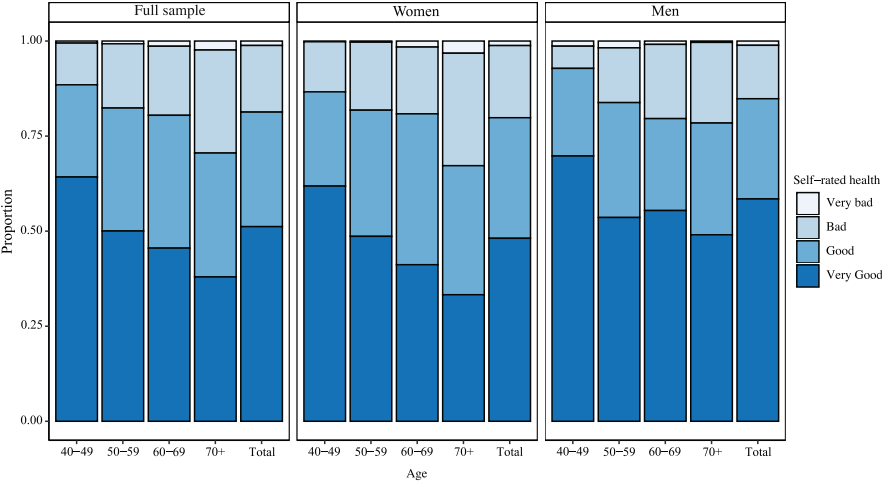
percent) of women. Most women were widowed (39 percent), divorced (9 percent), or separated (5 percent).

Biometric measures of health. As Table 2 illustrates, overall morbidity was high across all age groups, with no significant trend by age group in proportions having any disease. However, the *type* of morbidity significantly varied. Those aged 60 and over were more likely to be hypertensive compared to younger adults, while those in their 40s and 50s were more likely to be living with HIV, and more likely to be living with comorbidities compared to those aged 60-plus.

Table 3 disaggregates these results by gender. Below age 70, there were few significant gender differences in disease prevalence. The only exception was men in their 50s, who were significantly more likely to be living with HIV compared to same-aged women. Among those aged 70-plus, women were significantly more likely to be living with a major chronic disease, and specifically hypertension, compared to same-aged men (see also Houle et al. 2021).

Self-rated health. Figure 1 illustrates SRH reports (very bad, bad, good, very good) by gender and age group. The first panel presents results from the full sample, while the second and third panels illustrate results for women and men respectively. Respondents reported worse health in each subsequently older age group, with about 12 percent in their 40s and about 29 percent aged 70-plus reporting bad or very bad health.⁴ This suggests that

FIGURE 1 Self-rated health reports by age group and gender in Agincourt, South Africa (*n* = 2,107)



the largest discrepancy between biometric (Table 2) and SRH (Figure 1) was among those in their 40s, with 70 percent living with a major chronic disease, and 88 percent reporting good or very good health.

When disaggregated by gender, SRH differences were highest among those in their 40s and 70s. Among those in their 40s, more women (13 percent) reported bad or very bad health compared to men (7 percent); correspondingly more men (70 percent) reported very good health compared to women (62 percent). This gender disparity was similar among those aged 70-plus, with more women (33 percent) reporting bad or very bad health compared to men (22 percent). However, among those in their 50s and 60s, proportions reporting bad or very bad health did not differ by gender. Men, however, continued to report “very good” health more often than women. This suggests a potential divergence and convergence in gendered experiences of health in different age groups—a theme we explore in our qualitative and triangulated analyses.

Regression analyses.

Table 4 presents four ordinal logistic regression models predicting SRH. We used a three-category model specification for SRH, combining “very bad” and “bad”, as very few (1 percent) respondents gave a “very bad” response. (We describe tests of different model specifications in the next section.) We consecutively examined SRH’s association with having “any disease” (biometric-measured HIV, hypertension, or diabetes) (Model 1), age group, and gender (Model 2), and socioeconomic factors (education, wealth, and working status) (Model 3). Model 4 examines all factors. The coefficients

TABLE 4 Ordinal logit predicting self-rated health among age 40+ in Agincourt, South Africa

	Model 1: Health		Model 2: Age group and gender		Model 3: SES		Model 4: Full model	
	B	[95% CI]	B	[95% CI]	B	[95% CI]	B	[95% CI]
Any disease	−0.10	[−0.29, 0.09]					−0.06	[−0.25, 0.13]
Age category (ref = 40–49)								
Age 50–59			−0.55***	[−0.80, −0.30]			−0.42**	[−0.68, −0.17]
Age 60–69			−0.72***	[−0.95, −0.49]			−0.54***	[−0.79, −0.30]
Age 70+			−1.14***	[−1.39, −0.90]			−0.88***	[−1.16, −0.60]
Man			0.41***	[0.23, 0.59]			0.32**	[0.13, 0.51]
Formal education (ref = none)								
1–5 years					0.24*	[0.00, 0.49]	0.02	[−0.24, 0.27]
6–11 years					0.55***	[0.33, 0.77]	0.22	[−0.02, 0.45]
12+ years					1.02***	[0.62, 1.42]	0.56**	[0.14, 0.99]
Wealth tertile (ref = low)								
Medium					−0.05	[−0.26, 0.17]	−0.04	[−0.25, 0.18]
High					0.12	[−0.11, 0.35]	0.15	[−0.09, 0.38]
Currently working					0.34**	[0.13, 0.55]	0.14	[−0.09, 0.36]
In union							0.17	[−0.01, 0.35]
cut1	−1.63***	[−1.92, −1.34]	−2.08***	[−2.39, −1.77]	−1.16***	[−1.48, −0.85]	−1.74***	[−2.14, −1.34]
cut2	−0.19	[−0.47, 0.09]	−0.57***	[−0.87, −0.27]	0.32*	[0.01, 0.63]	−0.22	[−0.61, 0.17]
N	2,107		2,107		2,107		2,107	

NOTE: Coefficients are in log-odds form. Higher levels of self-rated health (SRH) indicate better health. Categories of SRH are Bad/Very Bad (0), Good (1), and Very Good (2). Village fixed effects are included in all models.
* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

are presented in log-odds form; positive values indicate a higher likelihood and negative values a lower likelihood of reporting better SRH. Tests indicate that the proportional odds assumption was not violated ($X^2 = 10.8$; $p = 0.21$).

Model 1 illustrates that there was no significant relationship between having a major chronic condition and SRH. This finding held after accounting for age group, gender, socioeconomic, and union status (Model 4). Model 2 shows that as age increased, there was a decreased log odds of reporting better health ($p < 0.001$). Men had an increased log odds of reporting better health ($p < 0.001$). Model 3 shows that those with progressively more schooling had significantly higher log odds of reporting better health compared to those with no formal education. While those who were currently working had a higher log odds of reporting better health ($p < 0.01$), there was no significant relationship between wealth and SRH. When

including all variables in Model 4, the significant relationship between age group and SRH and gender and SRH was robust. Only those with 12 or more years of schooling reported significantly better SRH.

Robustness checks. We conducted four robustness checks. First, we examined whether each specific disease may have a significant relationship with SRH (see Supplement Table A2). We found no significant association after adjusting for sociodemographic characteristics.⁵ Second, we tested the robustness of our three SRH category model specification (see Supplement Table A3). The results were largely consistent across our specifications.⁶ Third, we examined whether the link between biomarkers and SRH varied by gender and age group by testing interactions between age and the disease indicator and age and gender. We also ran gender-stratified models with disease*age interactions (see Supplement Table A4). Overall, we did not find any significant interactions, suggesting that the association between disease status and SRH is consistent across age groups.⁷ Fourth, we examined the relationship between FA and other measures of health. We found that SRH was significantly associated with FA (Supplement Table A5, Model 1); worse FA was associated with worse SRH. However, mirroring our findings in Table 4 on SRH, we did not find any significant association between FA and our three chronic conditions (Supplement Table A6).⁸

Qualitative and triangulated findings

The descriptive and regression analyses present two puzzles. First, why might there be no significant relationship between having a major chronic condition (HIV, hypertension, diabetes) and self-assessed health (SRH and FA)? Second, what might explain the gendered and age-based variation in SRH that persists after adjusting for biometric measurements of health status? Overall, our qualitative and triangulated analyses and findings suggest that against a backdrop of a socioepidemiological context characterized by widespread morbidity, our respondents' gender and life course stage worked together to increase or reduce the salience of chronic illness in their health self-assessments. In the next section, we organize our findings by age group and gender.

Family and household considerations in the 40s.

Women. When women in their 40s were asked in life-history interviews, "How is your health these days?," most reported that their health was good, regardless of their biometrically measured disease status. When responses diverged, they worked in opposite directions. For example, when 41-year-old Rita who disclosed her HIV and ART status was asked, "How is your health these days?," she responded, "My health is still ok, I don't feel any pain." Noma, 48 years, was among the 30 percent of women in the

survey who did not have any of the three biometrically measured illnesses; however, when asked how her health was, she responded:

I'm always having body pains and this left eye, sometimes it is painful and it causes me headaches, sometimes there are tears coming out.... most of the time when I go to the clinic, they normally check me for almost everything and they told me I don't have high blood pressure or HIV.

In addition to headaches and eye problems, other women reported ailments such as ulcers, chest pain, and reproductive issues, suggesting a larger proportion of the population than captured biometrically in the survey were managing a variety of illnesses that generated chronic pain (see also Igumbor et al. 2011; Jackson et al. 2016; Kamerman et al. 2020). In sum, while mirroring our quantitative analyses, there was no apparent association between having a biometrically measured condition and SRH, qualitative interviews illustrated the limits of these measures in encapsulating the full experience of illness.

When women were asked about *future* health concerns, the role of life stage in informing their health assessments emerged. Narratives showed that the underlying lens through which they viewed their health was whether they could take care of their household. For example, when asked "As you get older, what do you think your major health concerns will be?," Rita (quoted earlier), who was divorced and raising her five children, responded:

I never thought about what is going to happen to my health. I'm still caring for my children. They are still young. I still want them to grow up. I don't know the future, only God knows what is going to happen to me.

Nxalati, age 46, who also disclosed her HIV and ART status, was married with four children; she responded to the same question by noting:

Mmm... doing house chores, like now sometimes I feel like sleeping the whole day, not doing anything. But I'm fine when it comes to other things.

Meriam, age 47, was married and taking care of her children, grandchildren, and orphans of deceased relatives. Her biometric measure recorded probable diabetes. She responded:

Aah...I think my legs will be a problem because when walking I feel tired, and when I have carried my child my back and chest feel painful.

Overall, interview narratives suggest that women viewed their health through the lens of whether ailments interrupted their ability to carry out their household responsibilities (see also Schatz and Gilbert 2012, 2014). Thus, even if they had an illness or chronic pain, if they were able to take care of their family, they could characterize their health more positively. In supplemental statistical analyses, respondents reporting difficulty with

work or household activities in the last month were significantly more likely to report poorer SRH (see Supplement Table A5, Model 1).

Men. When same-aged men were asked to assess their health, their responses in the interviews largely did not address physical health, regardless of their biometrically measured disease status from the survey. Instead, they responded with reports of their work and employment status. For example, when asked whether he had any health concerns or issues, 41-year-old Masingita, who was living with HIV but was not on medication⁹, responded:

What I'm worried about my health is the way I work and when I want to do something only to find that I don't have money. I feel it is a big change in my life. I feel not living very well that way.

Married with children, Masingita was surviving on short-term contracts in construction. Enoch, aged 40 and a self-employed builder, who along with his wife and child was living with HIV and on ART, responded similarly:

Interviewer: Do you have current health concerns?

Enoch: My problem is money. It's what makes me worried.

Interviewer: On your body do you have concerns?

Enoch: No. I am feeling well.¹⁰

Lazarus, aged 43, who had just left a relationship and did not have any major illness or pain, responded similarly:

Interviewer: How is your health these days?

Lazarus: It is good. There is no problem. I don't have any pain. It's only a job problem.

Interviewer: Current health concerns or issues in the last year?

Lazarus: No. I am just looking for a job.

Comments related to work and employment also carried through to how men responded to questions about their future health concerns. For example, 41-year-old Tom who was living with HIV and on ART noted:

Interviewer: As you get older, what do you think your major health concern will be?

Tom: My concern will be not working. I think a lot of things don't work and I am growing old. And you finally destroy your future, and you think about children, that they will suffer. There will be a time that they will want to go to tertiary level, and you are not working.

To better understand the relationship between men's health and their employment, we re-estimated our ordinal logistic regression model and

included an interaction between working status and gender (see Supplement, Table A7). We found that men's advantage in SRH operated through their employment status. While being a man was no longer significantly associated with reporting better health, being an *employed* man was. We also found that employed men have a 12-percentage point higher probability of reporting very good health (66 percent) compared to men who are not working (54 percent). Conversely, for women, there is a negligible difference in the probability of reporting very good health by working status. These results suggest that men may use more functional rationales in assessing their health at ages when social expectations require them to provide materially for their families (see also Peersman et al. 2012; Zajacova, Huzarbazar, and Todd 2017).

In sum, our qualitative analysis and triangulated findings suggest that gendered familial expectations related to household care for women and breadwinning for men were integrally linked to how people in their 40s assessed their health. These expectations appeared to reduce or increase the salience of chronic illness depending on respondents' functional ability to take care of their family in gender-appropriate ways.

Common experiences of morbidity in the 50s and 60s. The lack of a significant association between biometrically measured illness and SRH persisted among people in their 50s and 60s (see Supplement, Table A8). Nonetheless, compared to those in their 40s, while there was no significant difference in their overall experience of biometrically measured morbidity (Table 2), there was a significant difference in their likelihood of reporting poorer health (Table 4). Further, Figure 1 illustrates an apparent convergence in gender differences in SRH in the 50s and 60s. These results were reflected in life-history interviews where respondents from both genders, when asked to assess their health, reported in similar ways about the range of chronic ailments they were managing. For example, when asked "How is your health these days?", David, aged 52, responded:

My health, I have lots of illness. I have a problem about my leg. I am on HIV treatment and high blood pressure. In English they call it Kaposi's Sarcoma. It's the disease I am taking treatment [for].

Sifiwe, aged 50, who disclosed her HIV and ART status, described the commonality of chronic illness among her group of friends and relatives:

Sifiwe: One of them is not feeling well. She is unable to walk. Then I push her with a wheelbarrow to go to the toilet. Yesterday I was there helping her...Like now, if she calls saying that she didn't sleep very well, she is very sick and hungry and very weak, I will cook my food and give it to her. When I arrive there I [bring] warm water and give her to bathe and give her food after bathing.... we just thought that if we can live in this way, things will go well...They are HIV negative. Their problems are sugar diabetes and high blood pressure.

Interviewer: Each has her own illness.

Sifiwe: Yes. [she laughs]

Reports of chronic illnesses were also common among respondents in their 60s. Tandia, a 65-year-old woman, who said she was on medication for high blood pressure and HIV, described herself as “feeling okay” now, but also noted that she “had a painful body, feeling tired all the time” over the past few days. Mandisa, a 65-year-old woman, who said she was taking medication for high blood pressure and pain, said, “I’m always sick. I don’t have good life. My body is always in pain; I’m on and off.” As 62-year-old Hezekiah, who was wheelchair-bound due to a disability, put it:

My health doesn’t have a station (*is not stable*). I have sugar diabetes and high blood pressure. These things are troubling a lot. Sometimes you have pains even if you have taken your medication. Sometimes it goes down. It is changing; it doesn’t have a station where you can say today you are all right.

These reports mirror findings from a recent nationally representative study in South Africa which found that one-third (34.4 percent) of adults aged 65+ experience chronic pain (Kamerman et al. 2020).

While there are no significant differences by age group in the proportion of respondents with chronic illnesses (Table 2), respondents in their 50s and 60s were in a different life stage than those in their 40s. In particular, their grown (sometimes resident) children, were available to share in household labor (relevant for women), as well as the financial provision (especially relevant for men). In their 60s, respondents received government pensions, representing a stabilization of income that might not have been possible in their younger years. Reflecting these shifts, the work and gender interaction was no longer significant for men aged 50 and over (see Supplement, Table A8). In sum, a changing life stage provided some relief from earlier family responsibilities. This may have increased the salience of physical health challenges for both men and women.

Caregiver concerns among the 70-plus

The survey illustrates significant gender differences among adults aged 70 and over; significantly more women have a major illness (Table 3) and report bad or very bad health compared to same-aged men (Figure 1). This is partly explained by mortality selection, with the sickest men having already died. As noted earlier, men in Agincourt experienced higher mortality than women, especially due to AIDS (Gómez-Olivé et al. 2014; Houle et al. 2014; Kabudula et al. 2017a). The gendered mortality shock to the community resulted in gendered experiences of widowhood in old age and was reflected in respondent reports of divergent gendered lived experiences of health that stemmed from a universal concern about caregivers. The

divergence emerged in the analysis of responses to the question “who takes care of you when you are ill?” and questions about future health concerns.

Men almost invariably mentioned their wife as their caregiver, and only occasionally mentioned children or relatives. In the Agincourt household census, most men in this age group (78 percent) had living wives (Houle et al. 2018). In interviews, men’s biggest health concern was what would happen if their wife died. Leonard, aged 79 and hypertensive in the survey, associated his good health with his wife’s presence:

Interviewer: As you get older, what do you think your major health concerns will be?

Leonard: I don’t know any difficulties. My difficulties will be when my wife dies. I will have difficulties if I am left alone. There is no one who can take care of me when I am sick. Now that I am here and my wife’s still here we are able to give each other soft porridge. She is getting a pension and I am also getting my pension. If I am sick she gives me soft porridge.

Nathan, aged 74, who did not have a biometrically captured illness, also associated his health with his wife’s presence:

Interviewer: Okay, I want to know that now that you are getting very old, what your major health problem going to be?

Nathan: I can have problems only if my wife is not there anymore but if she is alive I don’t see myself having problems. Look when I was ill, she was taking care of me. I couldn’t walk and she was able to carry me on a wheelbarrow to the clinic and even to hospital. And I thank her for all of that.

Thus, wives not only aided men’s health in practical terms but also influenced how they viewed their overall health. This was supported by statistical analyses disaggregating the models by age group, which revealed that being in a union is associated with better SRH for both men and women aged 70-plus, but not for younger age groups (see Supplement, Table A8).

Most women (70 percent) in this age group were not in a union, according to the Agincourt census, but were widowed (Houle et al. 2018). In interviews, they predominantly mentioned their children (often their daughters), as primary caregivers. Thomasina, aged 84, whose biometric measure indicated that she was hypertensive, said she was having “emotional problems because I have lost all my older children... They were helping me a lot because they were older, so it is difficult because they are no longer here.” At the time of the interview, Thomasina was widowed and was being helped by her younger son and two grandchildren. Mary, aged 71, twice widowed and without children, disclosed that she was on ART and high blood pressure medication, and did not want to “grow until I’m too old.” When asked why, she said:

I don’t want to be a burden. People will get tired of me and I won’t have anyone to take care of me. I don’t want to be too old that I don’t even manage

to go to the toilet/do things on my own. When I grow older, if this God was mine, I will tell him to take me.

For many older women, the absence or loss of caregivers compounded the impact of morbidities typical of old age. Mudege and Ezeh (2009) argue that women have a gender advantage at older ages accrued from a lifetime of investment in the domestic sphere that yields rich supportive networks. In Agincourt, our findings suggest that marriage was one way in which men benefited from women's gender advantage. Fewer women at older ages were married, however, and many dealt with diminishing support as they aged. This helps explain why in their narratives, men tied their health status to having a wife and women worried about the loss of caregivers. In sum, men and women in their 70s were differentially buffered from the challenges of aging with illness, increasing or decreasing the salience of poor health.

Study limitations

Our study has limitations. First, our data are drawn from survivors, with the sickest (particularly men) having been selected out of the sample. While we find gender differences in the salience of physical health as people age, we are sensitive to this bias in our analyses, examining men with and without physical ailments, and noting where this might be especially important in interpreting results, especially at older ages. While a limitation with respect to survivorship bias, this selection is also a strength in that it provides an important opportunity to examine how survivors in settings that have experienced significant and extended mortality shocks make sense of their health. Second, the quantitative data were collected two to three years before the qualitative life history interviews. It is reasonable to assume that symptoms resulting from respondents' biometric health status, and their health assessment may have changed over time, especially if, in line with our paper's arguments, they lost a caregiver, were diagnosed or put on medication, or experienced other major life transitions during that time lapse. To partially mitigate this limitation, we focus on examining similarities and differences between qualitative assessments of health and biometrically measured chronic disease, which is less likely to have changed over time. Third, while we include measures of HIV, hypertension, and diabetes, the survey did not collect information on other diseases or measures of pain as we highlight in our qualitative analyses. Thus, our findings underestimate the full burden of chronic conditions in Agincourt, and these other illnesses along with chronic pain may be more closely associated with SRH (see, e.g., Gómez-Olivé et al. 2013b; Wang et al. 2018; Kamerman et al. 2020). Relatedly, people may have a chronic illness like HIV or hypertension but be asymptomatic until a major health event occurs, such as an AIDS-related

illness or a stroke. Research in this setting suggests high levels of unawareness about hypertension (Gómez-Olivé et al. 2017). Indeed, we find that respondents reporting being on medication reported poorer health. As a result, biometric illness may not be experienced as a health challenge until diagnosis and/or the initiation of treatment. Finally, while we were able to utilize the three measures of self-assessed health available in the survey (SRH, FA, and medication use), the study could also have benefited from additional measures. An example is the SF-12 which captures multiple dimensions of self-assessed health such as physical and social functioning, mental health, and pain (Roelen et al. 2015; Leopold 2019). Additionally, the CES-D-10 or the PHQ-9 which examine depression would also have been beneficial as depression is a significant comorbidity among older adults and an increasingly significant dimension of self-assessed health as people age (Schnittker 2005; Monahan et al. 2009; Bhana et al. 2015; Adams et al. 2020). These additional measures may have had stronger associations with our biometric measures of chronic conditions. Despite these limitations, our study makes both empirical as well as methodological contributions to the literature, which we summarize next.

Discussion

This article examines the meaning of health in a rural South African population where 72 percent of those aged 40 and older are living with a major chronic condition, but 81 percent report good or very good health. To examine this puzzle, the study is distinctive in drawing on a unique mixed-methods population-based dataset incorporating multiple biometric measures based on clinical guidelines, survey-reported SRH, FA, and medication use and nested qualitative life history interviews asking a range of health-related questions, all from the same individuals. The dataset enabled us to conduct systematic and rigorous analyses, triangulate across data sources, investigate similarities and discrepancies in health assessments, as well as identify and fully contextualize factors underlying how and why these assessments varied across the population. Overall, our findings illustrate the intertwined role of gendered expectations, life course stage, and the socioepidemiological context in shaping health assessments as people age, and how they regulate the salience of physical illness in a high disease burden setting.

We find that SRH and FA were not associated with biometric measures of health, in contrast to findings from past research (e.g. Dowd and Zajacova 2010; Hardy, Acciai, and Reyes 2014; Onadja et al. 2013; Duboz et al. 2017). Our divergent findings may reflect the socioepidemiological context of widespread morbidity and mortality in Agincourt. When most people in a community have a chronic condition, health ratings may not be assessed relative to the complete absence of a health condition but rather

to full disability or death. Thus, any degree of independence and functioning may be perceived as good health (McMullen and Luborsky 2006; Wood, Taylor, and Lichtman 1985). Agincourt residents lived through a dramatic rise in mortality in the 2000s driven by the AIDS epidemic (Houle et al. 2014; Kabudula et al. 2017a), which likely informed their relative assessments of good health. Further, the rising burden of noncommunicable diseases in South Africa (Clark et al. 2015; Mayosi et al. 2009; Houle et al. 2021), as well as the ART-enabled transformation of HIV into a chronic disease, have combined to increase the proportion of the population who are living with chronic illness, as well as stretch the time spent chronically ill into both younger and older ages. This is reflected by our findings of both high levels of morbidity, as well as no significant variation by age group, in chronic illness prevalence among those aged 40 and over.

Agincourt is likely at the leading edge of the dual epidemiological transition across the continent, with a severe HIV epidemic among middle-aged and older adults as well as a high burden of noncommunicable disease. However, the continued resurgence of infectious diseases such as COVID-19, as well as the growing burden of chronic disease, suggest a heightened significance of the socioepidemiological context in shaping health assessments in other settings in the years to come. Future research might examine the role of the burden of disease in a population on the relationship between biometric and self-ratings of health, especially in cross-country or cross-group comparisons of assessments of health. As our study has shown, this research would be enhanced by a mixed-methods approach, with multiple measures of quantitative and qualitative assessments of health to enable robust examinations of the relative role of chronic conditions, the gendered life course, and the socioepidemiological context in shaping the meaning of health. High disease burden settings such as Agincourt also highlight the importance of expanding health infrastructures to accommodate chronic disease care and management, as chronic diseases are set to overtake infectious diseases as the main cause of death in low- and middle-income countries in the coming decades (Bain, Nkoke, and Noubiap 2017).

We also find that the socioepidemiological context intertwined with the gendered life course to regulate assessments of health, by increasing or reducing the salience of physical ailments as people aged. In their 40s, respondents interpreted health through the lens of family considerations. Women's health assessments were influenced by their ability to physically care for their households and family, while men interpreted health through the lens of their ability to financially provide for their family. Our narratives highlight the role of tenuous employment opportunities in Agincourt, and our survey analysis illustrates that men's gendered advantage in SRH was tied to their employment. Resident men struggled with itinerant and unreliable work—only 44 percent reported current work in the survey.

High unemployment reflects the enduring legacy of apartheid-era disinvestment in former homelands (Blalock 2014). In their 50s and 60s, physical illness had greater salience, overriding earlier household concerns, especially with grown children, and the stabilization of income provided by the postapartheid government's extension of pensions to Blacks aged 60-plus (Case and Menendez 2007; Schatz et al. 2012). The AIDS epidemic created many widows and women without living adult children (Houle et al. 2014; Kabudula et al. 2017a), resulting in a reduction of potential caregivers for women compared to men as they aged. Thus, among those aged 70 and older, the presence or absence of a caregiver shaped gendered experiences of health. Overall, these findings underscore the importance of incorporating the socioepidemiological context into qualitative health research in order to more fully contextualize individual experiences of illness and health.

Our qualitative interviews revealed the important role of chronic pain in how respondents assessed their health, regardless of their biometric status. There are a growing number of studies on chronic pain among older Africans, the heightened burden among women in particular, and limited access to pain medication (Igumbor et al. 2011; Dekker et al. 2012; Nchako et al. 2018; Wang et al. 2018). The first nationally representative study on chronic pain in South Africa showed that almost one in five (18.3 percent) South Africans are living with chronic pain, rising to one-third (34.4 percent) among those aged 65+ (Kanneman et al. 2020). The study also found a significant association between chronic pain and reporting poor SRH. Our mixed methods dataset thus helped to identify an important dimension of respondents' lives, unmeasured in the survey, which shaped their self-assessments of health and potentially mediated the relationship between biometric and self-rated health that might otherwise have been missed.

Conclusion

In conclusion, our study highlights the importance of collecting multiple measures of health. While previous studies have compared biometric and SRH assessments, or SRH assessments and qualitative interviews (e.g., Jylhä 1994; Miilunpalo et al. 1997; Duboz et al. 2017), our study is unique in combining health assessments drawn from biometric measurements, SRH, and qualitative interviews, from the same participants. We were also able to draw from survey measures on whether respondents were on medication for their conditions, their functional health assessments (difficulty engaging in daily activities), as well as rich life history information capturing respondents' lives as a whole, to place health assessments in context. Drawing on multiple and varied data sources enabled us to illuminate the intertwined role of the socioepidemiological context and the gendered life course in

shaping health assessments, and how they might serve to increase or reduce the salience of biometric assessments of health as people age. Future population-based research on health assessments might benefit from nested studies (Schatz 2012), which more fully capture the meaning of biometric or self-ratings of health. Overall, our study illustrates the rich potential of mixed methods research in elucidating the meaning of health as people age amidst complex epidemiological transitions.

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Data Availability Statement

Survey data used in this paper will be archived at DataFirst (<https://www.datafirst.uct.ac.za/>). Please contact Brian Houle for further information.

Notes

1 The interviewer guide in the *SAGE Manual* defines difficulty in the following way: "Difficulty" means increased effort, discomfort or pain, slowness or changes in the way a person carries out an activity" (WHO-SAGE 2006, 120).

2 While prior research has found significant associations between FA and SRH, there is also evidence that FA may serve an important mediating role between SRH and mortality, perhaps because it directly asks about daily tasks and activities that are likely to be affected by chronic disease and because it may give a more instrumental indicator of illness leading to eventual mortality (Idler and Kasl 1995; Bernard et al 1997; Scott et al 1997; Debuur et al 2010; Onadja et al 2013; Gómez-Olivé et al 2014). We thus include it as an alternative measure of self-assessed health.

3 See Supplement Table A1 for descriptive statistics comparing the imputed and nonimputed samples.

4 See Supplement Figure A1 for the distribution of SRH reports across our full survey (age 15–98). The figure illustrates that as people age, there is a steady decrease in the percentage reporting "very good" health. The largest drop occurs from ages 40–49 to ages 50–59 (from 64 percent to 51 percent) and 80–89 to 90–98 (from 38 percent to 24 percent). There is a concomitant rise in the percentage reporting "bad" health as people age. The largest jump occurs from the 80s to the 90s (from 28 percent to 34 percent). The percentage reporting "very bad" health is consistently low but jumps to 5 percent at ages 90–98.

5 We re-ran our analyses substituting "any disease" for each condition (HIV, hypertension, and diabetes) individually. While we find no significant association between hypertension and SRH, or diabetes and SRH, we find that having HIV is associated with reporting better SRH health in Model 1 (no sociodemographic adjustments). However, after adjusting for sociodemographic characteristics, there is no significant association (Supplement Table A2).

6 To test the robustness of our three SRH category model specification, we compared several model specifications of the full model (Table 4, Model 4): (1) the four-category SRH variable (very good, good, bad, very bad) specified with an ordinal logistic regression; (2) the four-category SRH variable specified with a linear regression; (3) a dichotomous version of SRH specified with a logistic regression, where bad or very bad SRH is compared to good or very good SRH; and (4) a logistic regression where good, bad, or very bad SRH are compared to very good SRH. The results are largely consistent across these specifications. The key differences we find are (a) in specification 2, those who have 6–11 years of formal education and those in a union report significantly better health than their comparison groups; (b) in specification 3, those with 12+ years of education, men, and those aged 50–59 no longer report better health than their reference groups (Supplement Table A3).

7 We tested whether the link between biomarkers and SRH vary by gender and age group in two ways—first, in the full model, we tested an interaction between age category and the disease indicator; and second, in gender-stratified models, we also interacted the disease indicator with age category (see Supplement Table A4). In both approaches, we did not find any significant interactions, suggesting that the association between disease status and SRH is consistent across age groups. One important difference we found in the gender-stratified models was that higher levels of education were significantly associated with better SRH among women but not men. Finally, we tested whether there was a significant interaction between age and gender in the full model and found no significant results. This suggests that poorer SRH among older respondents is consistent for both men and women.

8 We tested whether biomarkers were associated with FA in two ways. First, in Models 1 and 2, we tested whether the presence of any disease (HIV, diabetes, or hypertension) was associated with functional ability reports and found no association before

and after adjusting for covariates. Second, in Models 3 and 4, we tested whether specific conditions were associated with functional ability and found no association before and after adjusting for covariates. Like SRH, we found that age, gender, and educational attainment were associated with functional ability reports. Additionally, we found that individuals who were currently working or in a union were more likely to report better functional ability.

9 Masingita was not on ART because he said he did not meet the CD4 count threshold for medication. The current “test and treat”

policy now places people testing positive directly onto ART medication.

10 In supplementary statistical analyses, adjusting for a patient’s medication use did not significantly change the null association between disease status and SRH. Contrary to expectations, respondents who self-reported being on diabetes or hypertension treatments were significantly more likely to report *poorer* SRH (Supplement, Table A5, Model 2), suggesting that respondents may have ineffective medication, or viewed it as a sign that they were especially ill, even if it alleviated symptoms.

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