Assessing Adult Mortality through Parental Survival histories in Malawi: Findings from a Mobile Phone Survey

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Extended abstract

Introduction

Population censuses and surveys remain the primary data sources for adult mortality information in most sub-Saharan African countries due to the limited presence of efficient civil registration and vital statistics systems (Reniers, Masquelier and Gerland, 2011; UN Secretariat, 2022). However, these methods may not always yield timely mortality estimates during health crises, especially when field-worker mobility for face-to face interviews is restricted (Ayumi Arai, 2020; Castano, 2020). The COVID-19 outbreak, for instance, led to the suspension of fieldwork activities for major survey programs like the Demographic and Health surveys, while several countries also delayed scheduled population and housing censuses for 2020 and 2021. Additionally, the time-consuming nature of census data analysis means that results are not promptly available to inform emergency response efforts (Ayumi Arai, 2020).

This extended abstract utilizes parental survival histories obtained via phone interviews to estimate adult and old age mortality rates in Malawi, both prior to and during the COVID-19 outbreak. It is worth noting that in high-income countries, COVID-19 mortality has predominantly affected older age groups, particularly those aged 65 and above (Bassett, Chen and Krieger, 2020). However, in many low-income countries like Malawi, estimates of old-age mortality are often derived from mortality assessment at younger ages, including sibling histories and orphan-hood data (Timæus and Jasseh, 2004; Adams *et al.*, 2021). Therefore, employing parental survival histories as primary data for measuring old age mortality makes a significant contribution to the existing literature.

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When presenting our results, we provide details on data quality checks and the procedures used to weight the mortality estimates, aiming to extrapolate the findings from a sub-population of mobile-phone users to the general population. This aspect is particularly pertinent in Malawi, where mobile phone ownership remains relatively low at 59.1%, with an uneven distribution of 82.2% in urban areas and 54.7% in rural areas (Centre for Social Research, 2022).

Methodology

Data

This extended abstract draws upon data obtained from the Malawi Rapid Mortality Mobile Phone Survey (RaMMPS) project, which took place from January 2022 to March 2023. The survey employed a methodology that involved randomly generating telephone numbers using the numbering structure of the two main providers in Malawi (Airtel and TNM). The fieldwork involved a team of 15 interviewers who contacted the selected numbers to introduce the study, assess the eligibility of mobile phone users and seek their consent to participate in the survey. Eligibility for RaMMPS was determined based on gender, age (18-64), and place of residence. To estimate adult mortality attributable to COVID-19, this paper specifically focuses on the parental survival section of the mortality module. In this section, participants were asked about the age of their surviving parents, the age and year of the deceased parents.

Analytical approach

As mentioned in the introduction, mobile phone ownership in Malawi is characterized by low levels and a distribution that differs from the overall population distribution. To address this bias in the joint distribution of the sample subpopulation compared to their true distribution, post-stratification weights were calculated (Kulas *et al.*, 2018; Royal, 2019).These weights aimed to adjust the quotas based on regional residence, age, and sex or gender of the respondents, using the 2018 Malawi Population and Housing Census as a benchmark.

For estimating adult or old age mortality, we utilized parental survival data obtained from survey participants. The participants reported on the survival status of their mother and father, providing the age of the living parents and the age at death and year of death for deceased parents. Before proceeding with the computation of mortality estimates, we assessed the reported ages for both deceased and surviving parents to identify any missing

cases. The descriptive analysis revealed that 30.7% of participants were unaware of the age at death of their mother, while 36.2% did not know the age at death of their father. Additionally, a significant proportion of participants lacked knowledge of the current age of their surviving mother (11.2%) or father (17.7%). To address these missing cases, we employed bootstrapping and multiple imputation techniques using STATA 14. For the estimation of adult or old age mortality, we utilized the "demogsurv" package available in the R statistical software.

Results

Background characteristics of the sampled population

The results of the descriptive analysis presented in Table 1 in the Appendix provide insights into the proportional distribution of the sample before and after applying weighting, along with a comparison to the 2018 Malawi Population and Housing Census (MPHC). The unweighted results reveal a slightly higher proportion of males (50.9%) compared to females (49.1%). The table also highlights that a majority of the sample (53.1%) falls within the age range of 18 to 29 years. Following stratification, the proportional distribution of the 18 to 29-year-old age group decreases and aligns more closely with the 2018 census distribution. A similar pattern can be observed in the 30-49 year age group and the 50 to 64 year age group.

Regarding the survival status of the parents, the findings from table 2 in the appendix reveal that 73.3% of the participants' mothers were alive, while 26.6% had unfortunately lost their mothers. However, it is important to note that a portion of the participants had insufficient information regarding the survival status of their parents. Consequently, these participants were excluded from the analysis due to their lack of knowledge.

Imputation of age and year at death

To address the issue of missing data caused by participants lacking knowledge about the current age, age at death, and year of death of their parents, both bootstrapping and multiple imputation analysis were employed. The results obtained from these analyses indicate that there is no significant distinction in the age distribution between the reported ages and imputed values. Furthermore, a comparative analysis of the mean age reveals a slight disparity between the reported mean age at death of the parents (57.3) and the mean age of the imputed values (58.0) as illustrated in table 4.

Mortality estimation

Figure 1 in the Appendix presents initial estimates of the probability of dying within specific age ranges, namely, between 40 and 60, 30 and 60 and 50 and 80. The findings indicate that during the period from 2015 to 2021, men exhibited a higher likelihood of mortality in comparison to women. Moreover, it is noteworthy that the year 2021 shows a significant surge in mortality rates. On the other hand, the mortality estimates for 2020 appear relatively low, indicating a need for further investigation and analysis.

A comprehensive comparison between the results obtained from the RaMMPS survey, the 2018 MPHC and the World Population Prospect (WPP) estimates reveals interesting insights. Specifically, the RaMMPS estimates regarding the probability of dying between ages 40 and 60 were relatively higher for males and slightly lower for females in 2021 when compared to the WPP estimates. This trend remained consistent for the probability of dying between ages 50 and 80. The RaMMPS survey indicate slightly lower mortality estimates for both males and females compared to the World Population Prospects estimates ad illustrated in Figure 2.

Discussion and conclusion

In this study, we present mortality estimates related to old age based on primary survey data collected through a mobile phone survey conducted in Malawi. The descriptive analysis reveals a noteworthy disparity in the proportion of participants who lost their fathers compared to those who lost their mothers. Furthermore, a significant portion of the population lacks information regarding the age at which their parents passed away. To address the issue of missing data, we employed multiple imputation and bootstrapping techniques, which yielded imputed values comparable to the non-missing cases.

Regarding adult mortality, the demographic survival analysis demonstrates a remarkable increase in the mortality of adult men in 2021, coinciding with the peak of the COVID-19 pandemic in Malawi. This spike in mortality among adult men is higher compared to females and relative to the mortality estimates provided by the World Population Prospect.

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Appendix:

Table 1: Table presenting Background characteristics of the sample

Background characteristics	Unweighted sample		Weighted sample		2018 Census	
	%	Number	%	Number	%	Number
Sex						
Male	50.9	5,367	43.3	4560	47.9	3,841,895
Female	49.1	5,180	56.7	5987	52.1	4,170,433
Age-group						
18-29	53.1	5,596	46.5	5,013	46.7	3,740,985
30-49	39.1	4,124	38.1	4,007	41.7	3,341,692
50-64	7.8	827	15.4	1,527	11.6	929,651
Place of residence						
Rural	75.5	7,962	84.0	8,732	81.2	6,506,827
Urban	24.5	2,585	16.0	1,815	18.8	1,505,501
Region						
Northern	15.5	1,636	11.5	1,386	13.0	1,045,109
Central	39.8	4,193	41.7	4,273	43.7	3,498,237
Southern	44.7	4,718	46.9	4,888	43.3	3,468,982
Total	100	10,547	100	10,547	100	8,012,328

Table 2: Table presenting the survival status of the sampled population

Is your biological parent still alive	Mother		Father	
	%	Number	%	Number
YES	73.3	7,695	55.0	5,796
NO	26.6	2,791	43.7	4,608
DONT KNOW	0.49	52	1.2	126
REFUSE	0.09	9	0.16	17
Total	100	10,547	100	10,547

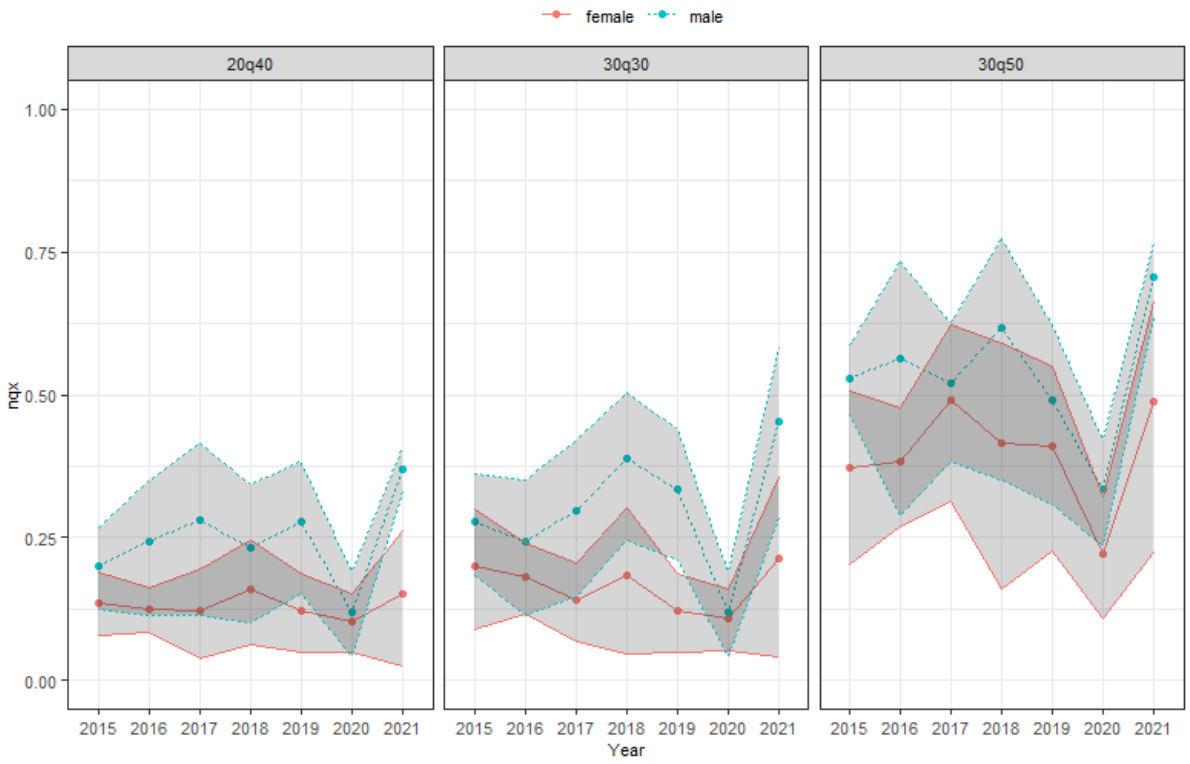

Figure 1: Figure presenting the probability of dying from age 40 to 60; 30 to 60 and 50 to 80

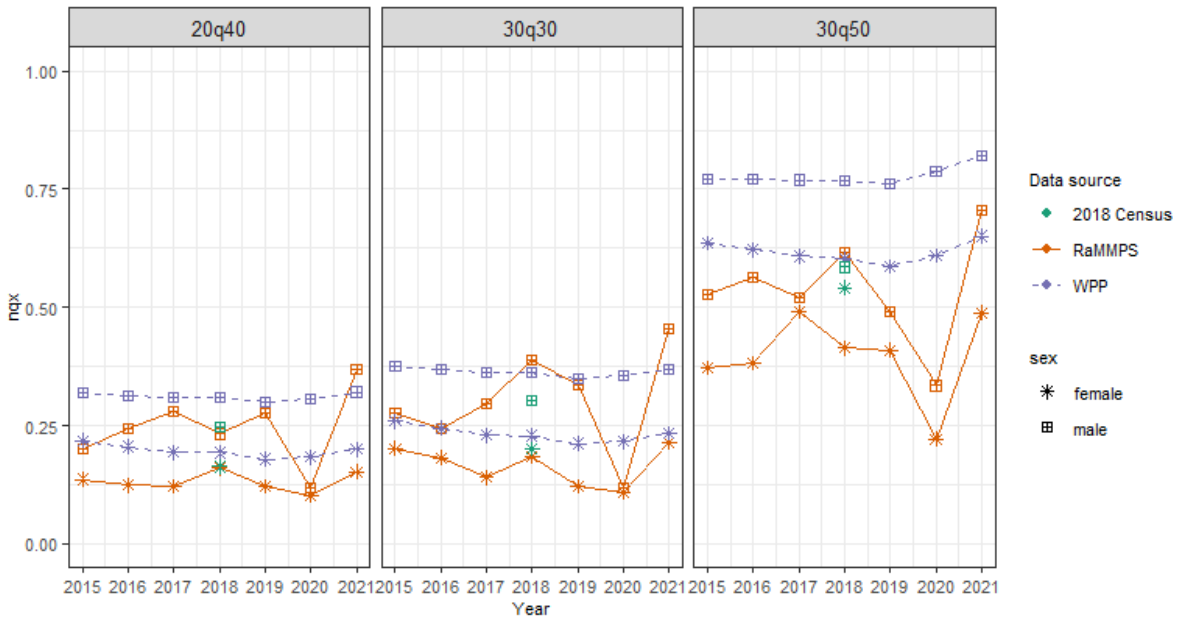

Figure 2: A comparative analysis of the probabilities of dying between the RaMMPS data and the 2018 Malawi Population and Housing Census and the UN World Population Prospectus