

Persistent educational inequalities in mortality among older adults in Mexico: Evidence from multiple data sources

Ana C. Gómez Ugarte¹, Ugofilippo Basellini¹, Carlo G. Camarda², Emilio Zagheni¹, and Fanny Janssen^{3,4}

¹*Max Planck Institute for Demographic Research, Rostock, Germany*

²*Institut national d'études démographiques, Aubervilliers, France*

³*Aging and Longevity, Netherlands Interdisciplinary Demographic Institute - KNAW/University of Groningen, The Hage, The Netherlands*

⁴*Population Research Centre, Faculty of Spatial Sciences, University of Groningen, Groningen, The Netherlands*

Abstract

Although significant socioeconomic inequalities in mortality are observed globally, little is known about educational inequalities in mortality in the world's most unequal regions, such as Latin America. In these regions, there is usually no single data source that can comprehensively measure inequalities in mortality. Vital statistics often suffer from quality issues, while other data sources, such as the Demographic and Health Surveys or older adults' surveys, have limited samples. Mexico presents a unique case, in which for certain groups (older adults) and time periods (2002-2007 and 2013-2018), educational inequalities in mortality can be estimated from two distinct data sources. This dual-source availability allows for cross-validation and strengthens the robustness of findings. We provide the first systematic comparison of two primary data sources for estimating education-specific mortality in Mexico: the Mexican Health and Aging Study (MHAS) and a combination of death certificates and census data. To limit data quality issues, we focus on two education categories and use 85 years and older as the open-ended age group. Despite differences and limitations across data sources, our analysis reveals persistent educational inequalities in mortality among the population aged 60 years and older since 2001. Additionally, we found greater inequalities among females than males. Next steps will consist of leveraging the advantages of each data source by combining them to derive a single estimate of education-specific mortality rates for the Mexican population, potentially extending it to younger age groups.

1 Introduction

Socioeconomic inequalities in mortality have been extensively studied in high-income countries (HICs) where a consistent gradient has been observed: individuals with lower socioeconomic status (SES) tend to experience higher mortality levels. However, research on SES inequalities in mortality remains limited in some of the world's most unequal regions, including Middle East, North Africa, Sub-Saharan Africa and Latin America. In these regions, it is likely that underlying income inequalities are reflected in SES inequalities in mortality.

One of the greatest challenges to study mortality by socioeconomic characteristics in these regions is the availability and quality of data. In many low- and middle-income countries (LMICs), vital statistics systems often fail to collect or report socioeconomic characteristics, such as educational attainment or occupation. Even when such data is available, it may be incomplete, inconsistent, or subject to reporting errors. To address these limitations, researchers have turned to surveys and other complementary data sources that collect detailed socioeconomic information, and that include or can be linked to mortality outcomes. However, these data sources also present challenges, including limited sample sizes, focus on specific age-groups, or data quality issues. Furthermore, in contexts where multiple data sources exist, direct or systematic comparisons of these data sources are rarely conducted.

Mexico, one of the most unequal countries in the world, presents a unique case, in which for certain groups (older adults) and time periods (2002-2007 and 2013-2018), educational inequalities in mortality can be estimated from two distinct data sources: i) the [Mexican Health and Ageing Study \(2018\)](#) (MHAS), and ii) a combination of vital statistics and census data ([INEGI, 2018](#); [Ruggles et al., 2025](#)). The MHAS provides detailed longitudinal data on health and aging. However, its relatively small sample size might produce volatile and imprecise estimates. On the other hand, the combination of vital statistics and census data offers broader population coverage, but it might be subject to under coverage and misreporting of age and education. Little is known about the consistency of education-specific mortality estimates between these two data sources. Moreover, it remains uncertain which source produces the most reliable figures. Therefore, further analysis is necessary to identify the similarities and differences between these two data sources and to better understand the factors influencing the observed patterns. Such comparison is crucial for providing robust estimates and understanding levels and trends of educational inequalities in mortality among older adults in Mexico.

In the present study, we measure and analyze levels and trends of educational inequality in mortality among older adults in Mexico. To achieve this, we systematically compare education-specific mortality estimates from two key data sources in Mexico: the Mexican Health and Aging Study (MHAS), and a combination of the death certificates and the census. Despite the strengths and limitations of each source, this dual-source availability allows for cross-validation and strengthens the robustness of findings. Using Mexico as a case study, the analytical approach we develop is not limited to this context and can be generalized to other settings with comparable data structures and availability.

2 Data and methods

In order to compare the data sources, we generated three sets of estimates, each based on different data sources: i) MHAS, ii) vital statistics and census and, iii) vital statistics, census and CONAPO.

To address our research questions we compared mortality estimates based on observed data, applying only the adjustments mentioned above without any statistical model. The comparison of the data sources is based on several measures of mortality and inequality, including sex- and age-specific mortality rates, age-standardized death rates (ASDR),

partial life expectancy between ages 60 and 85 and three measures of inequality. All measures were estimated from single ages with 85+ as the open-ended age group.

3 Results

Despite the differences across data sources and their respective limitations, our results consistently show that educational inequalities in mortality among Mexican adults aged 60 years and older have not decreased since 2001. For males, the vital statistics data reflects an increase in inequality. Whereas, according to the MHAS, there was no educational gradient in mortality for males during the period 2002-2007. However, by 2013-2018, both the mortality rate ratio and the gap in partial LE became significant (not shown here), indicating widening educational inequalities among males. In contrast, inequalities in mortality for females remained relatively stable over time with no signs of reduction.

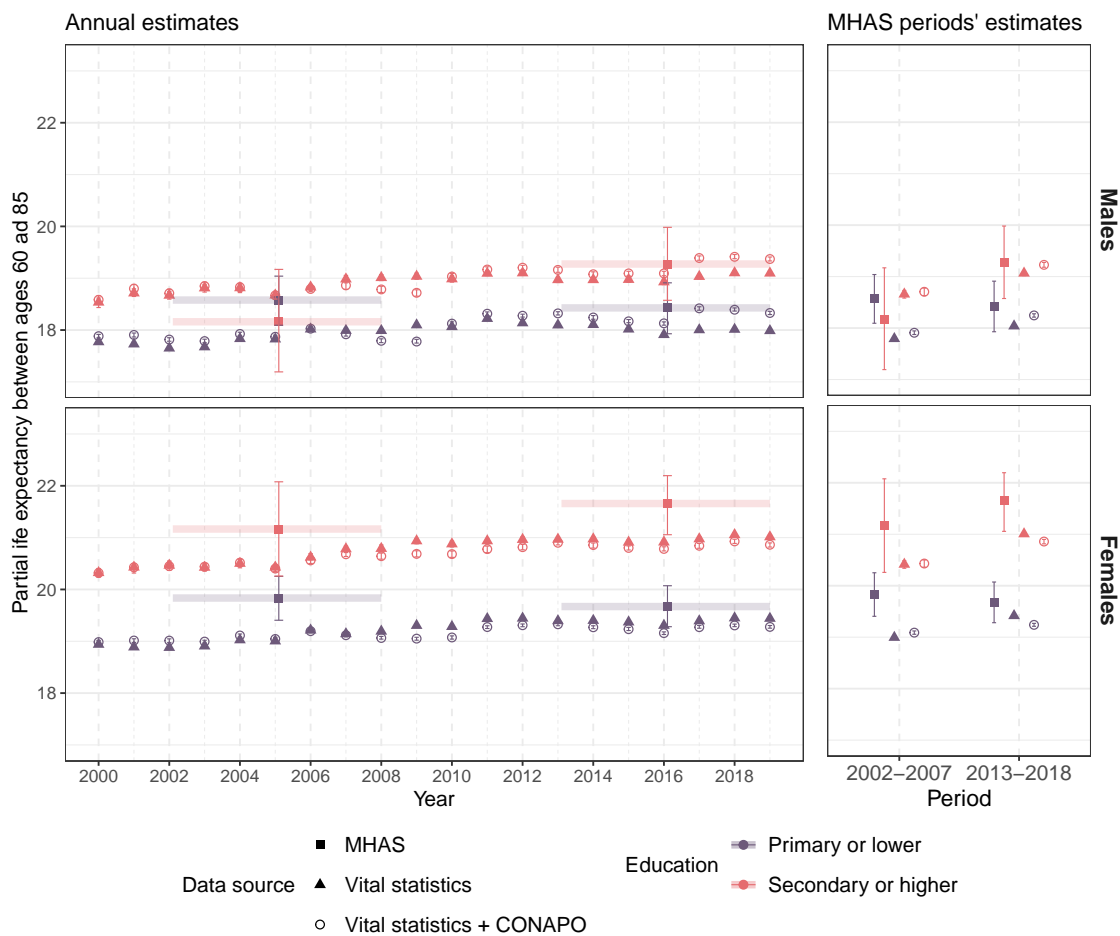


Figure 1: Partial life expectancy between ages 60 and 85 by education and sex. The left panels present the annual estimates for the vital statistics and the periods 2002-2007 and 2013-2018 for MHAS. The faded horizontal lines represent the period covered by each MHAS estimate. The right panels show the estimates in a comparable time frame, 2002-2007 and 2013-2018 for both data sources.

Source: Authors' own elaborations with data from MHAS and vital statistics.

Another important finding from the present study is that educational inequalities in mortality were consistently greater among females than males. Similar results have been observed in other studies (Beltrán-Sánchez et al., 2020; Rosero-Bixby, 2018).

4 Next steps

After comparing both data sources, the next steps will consist of leveraging the advantages of each data source by combining them to derive a single estimate of education-specific mortality rates for the Mexican population, potentially extending it to younger age groups. Specifically, we'll jointly model both data sources. Assuming that the MHAS provides unbiased estimates of education-specific mortality at ages 60 and above, we combine it with information from the vital statistics and the census, which provide biased estimates of mortality by education for ages 30 and above, to produce education-specific mortality rates that account for the biases and sources of in-comparability of each source. We extend previous estimates to include mortality at younger ages and for more recent time periods. Our modeling approach will incorporate both sources of information with explicit assumptions in a transparent framework that accounts for different sources of bias and uncertainty.

References

- Beltrán-Sánchez, H., Goldman, N., Pebley, A., and Flores Morales, J. (2020). Calloused hands, shorter life? Occupation and older-age survival in Mexico. *Demographic Research*, 42:875–900.
- INEGI (2001-2018). Estadística de defunciones generales. Marco metodológico. [Statistics of registered deaths. Methodology]. Retrieved from <https://www.inegi.org.mx/programas/mortalidad/#Microdatos>. Accessed on 19-02-2024.
- Mexican Health and Ageing Study (2001-2018). Data Files and Documentation (public use): Mexican Health and Aging Study (Master Follow-up File and Core survey Data). Retrieved from <https://www.mhasweb.org>. Accessed on 05-03-2024.
- Rosero-Bixby, L. (2018). High life expectancy and reversed socioeconomic gradients of elderly people in Mexico and Costa Rica. *Demographic Research*, 38:95–108.
- Ruggles, S., Cleveland, L., Lovaton, R., Sarkar, S., Sobek, M., Burk, D., Ehrlich, D., Heimann, Q., Lee, J., and Merril, N. (2025). Integrated Public Use Microdata Series, International: Version 7.6.