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Socioeconomic disparities in adult mortality in Latin America

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ABSTRACT

Introduction Large socioeconomic disparities in healthcare utilisation and health outcomes have been well-documented in Latin American countries. However, little is known about disparities in mortality rates. We estimate socioeconomic gradients in mortality in the Latin American region and discuss their patterns.

Methods We use death certificate data from the national vital statistics systems and population data from national censuses in Argentina, Brazil, Chile, Colombia, Ecuador, Mexico and Peru (2010–2023) to calculate mortality rates by age, sex and educational attainment. We also calculate mortality rates by cause of death. Data are harmonised to ensure comparability across countries and between death certificates and census data within countries. To analyse socioeconomic disparities, we compute the ratio between the mortality rate for individuals with a lower level of education (secondary incomplete or less) and the mortality rate for individuals with a higher level of education (secondary complete or more) by age and sex. The socioeconomic analysis is limited to adults aged 20 years or older.

Results Mortality rates for individuals with lower education are generally higher at any age group than for individuals with higher education, with larger disparities observed in younger age groups. Differences across countries in these inequalities are also more pronounced in younger cohorts. Particularly, in the 20–29 age group, individuals with lower education show much greater dispersion in mortality rates across countries compared with those with higher education. Lower education is associated with higher mortality rates from violent causes, particularly before age 50. Among non-violent causes, mortality due to non-communicable diseases exhibits larger socioeconomic gradients than mortality due to communicable diseases in older age groups, while for younger age groups, it depends on sex and the specific age group. Among non-communicable causes, deaths from diabetes and cardiovascular diseases exhibit more socioeconomic inequality than those from neoplasms.

Conclusion Despite overall improvements in average health indicators in the region, which are concomitant to a fall in income inequality and expansion of universal health coverage, significant challenges remain in addressing disparities in mortality rates, particularly for younger populations and women.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Latin America has long been recognised for substantial socioeconomic disparities in key health outcomes, including life expectancy and infant mortality. While previous studies have focused primarily on specific age groups (eg, infants or the elderly) or aggregated levels (eg, countries or select cities), there is limited evidence on socioeconomic inequalities in overall mortality rates across the life course or for different causes of death, mainly using individual-level data.

WHAT THIS STUDY ADDS

⇒ This study comprehensively analyses socioeconomic disparities in mortality across seven Latin American countries between 2010 and 2023. Using detailed microdata from censuses and death certificates, it highlights mortality disparities by educational attainment, age and sex, revealing a clear educational gradient that diminishes with advancing age. These findings offer novel insights into health inequities in the region.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Our findings underscore the need for targeted interventions and policies to address the persistent mortality inequalities in Latin America, particularly among the most vulnerable populations. The observed patterns also provide a basis for future research to explore the drivers of these disparities and evaluate the impact of social and health policies to reduce inequalities in the region.

INTRODUCTION

Latin America remains one of the most unequal regions globally, where deep-rooted socioeconomic disparities significantly impact key health outcomes. These inequalities are consistently observed across various dimensions, including life expectancy, infant mortality and cause-specific mortality rates.[1–5] Despite considerable progress in expanding healthcare coverage and access, these disparities persist, possibly driven by structural inequalities ingrained in the region's social and economic systems.[6 7] These inequalities

are evident between countries and within them, with stark differences observed across urban and rural areas and between different socioeconomic groups. This persistent inequality underscores the critical need for ongoing research and targeted policy interventions to address Latin America's underlying social determinants of health.

Most existing studies on mortality inequalities in Latin America have focused on single countries, primarily investigating infant and maternal mortality, often relying on surveys such as the Demographic and Health Surveys and UNICEF Multiple Indicator Cluster Surveys.[2 8–10] While these studies have been crucial in identifying specific disparities, they provide a limited understanding of the broader mortality patterns across the life course and various health outcomes. The SALURBAL (in Spanish, Salud Urbana en América Latina) research group has offered valuable insights into urban health disparities in Latin American cities in recent years.[1 11 12] However, over the past decade, there has been a notable gap in research that systematically and comprehensively compares adult mortality inequalities within and across multiple Latin American countries, particularly concerning all-cause mortality or disease-specific causes and how they vary at different ages. Addressing this gap is essential for a complete understanding of health disparities in the region and for informing targeted public health interventions.

This study aims to provide a comprehensive and systematic analysis of socioeconomic inequalities in adult mortality across seven Latin American countries: Argentina, Brazil, Chile, Colombia, Ecuador, Mexico and Peru. By focusing on individuals aged 20 and above, we ensure that the population studied has a higher likelihood of completing or being near the completion of their formal education. This approach allows for a more robust link between individual educational attainment and age-adjusted mortality rates. A novel aspect of this research is using the most recent census data, combined with death certificates from the year immediately following the census, enabling precise, fine-grained within- and cross-country comparisons. Our findings offer critical insights into persistent health disparities across various causes of death, age groups and sexes, demonstrating that these inequalities persist despite significant socioeconomic changes and health system reforms in the region. These results have the potential to significantly influence targeted public health policies and interventions aimed at reducing health disparities and promoting equity in health outcomes throughout Latin America.

METHODS

Study design and population

We study socioeconomic disparities in mortality in seven Latin American countries: Argentina, Brazil, Chile, Colombia, Ecuador, Mexico and Peru. We selected these countries based on the availability of educational attainment information in the death certificates and population census. Mortality rates for any given group (ie, education-age-sex combination) are calculated as the ratio between the number of deaths in period t+1 of that group and the population count of that same group in period t, as this corresponds to the population at risk.

We follow the literature in using educational attainment as a measure of socioeconomic status.[13–17] We divide the population into two groups: (1) those with completed primary education (which may include people with incomplete secondary education) or less and (2) those with completed secondary education or more. Although more detailed classifications (eg, distinguishing tertiary education) could be informative, these were not consistently available across countries, and their use would limit comparability. Because we use education as a measure of socioeconomic status, we focus on the population aged 20 and older, who have completed secondary education.

We calculate mortality rates by age group, sex and educational attainment. We begin by analysing disparities in all causes of death. We then examine inequalities by cause of death: communicable, maternal and nutritional versus non-communicable diseases (NCDs).[18] Finally, we compare socioeconomic gradients between intentional (ie, violent) versus unintentional injuries.

Informed consent was not required because we used anonymised and retrospective data.

Data

We use death certificate data from the national vital statistics systems and population data from censuses in our analysis (see online supplemental appendix, table S1, for details on the sources). The countries and years included in our analysis are Argentina (2023 and 2011),[19–21] Brazil (2023 and 2011),[22–24] Chile (2018),[25 26] Colombia (2019),[27 28] Ecuador (2023 and 2011),[29–31] Mexico (2021 and 2011)[32–34] and Peru (2018).[35 36]

For all countries in our study, we obtain population counts by age, sex and educational attainment from the entire population censuses. However, for Brazil in 2011, the educational attainment variable is only available for a subsample of residents, and hence we use IPUMS—International 10% public-use microdata to estimate population counts for this country in 2011.[22] We use the international classification codes (International Classification of Diseases, 10th revision (ICD-10)) to identify the cause of death. We considered various causes of death, either as the primary or secondary cause. We follow closely the WHO classification of ICD-10 codes into the following disease groups[18]: (1) communicable, maternal and nutritional, (2) non-communicable, (3) intentional and (4) unintentional injuries. Within non-communicable mortality, we further focus on cardiovascular diseases, diabetes and neoplasms, as these conditions have increasingly ranked among the leading causes of disease burden in the region.[5 37] We also categorise intentional injuries into homicides and suicides to differentiate between crime-related and mental health-related root causes.

Data are harmonised to ensure comparability across countries and between death certificates and census data within countries (see online supplemental appendix, tables S2–5, for details on the sources). Education categories were defined to construct analogous categories across each country and database. The two categories, which refer to the maximum educational attainment, are (1) primary education complete (which may include individuals with incomplete secondary education) or less and (2) secondary education complete or more. We refer to these two levels as low and high education levels, respectively. Education categories from death certificate registries and census data were harmonised to align with these two education levels (see online supplemental tables S2–4 for a detailed description of the construction of the variable).

The quality of death certificate registries in the countries analysed has been classified as medium to high, with the exception of Peru, which is classified as low quality (the data quality criteria for death certificates include completeness of mortality registration, ill-defined codes and timeliness of reporting).[38] Estimates from the Pan American Health Organisation indicate that the under-reporting of deaths in the years considered in this study amounts to 20% in Ecuador (2011) and 29% in Peru (2018).[39] Under-reporting estimates are much lower in other countries: around 13% for Colombia (2019) and below 10% in the rest of the countries, with Argentina (2011) showing no under-reporting issues. Online supplemental file 1 section S1.1.5 reports the percentage of death certificates which have missing information on education and cause of death (see online supplemental tables S6 and S7).

Statistical analysis

We study inequality in mortality by constructing mortality rates based on age and sex and across low and high educational attainment (as defined above). Additionally, we examine these differences by cause of death. Mortality rates are expressed as deaths per 1000 population to be comparable with national statistics. The rates are obtained as a simple ratio between death and population counts:

$$\text{mortality rate}_{t+1} = \frac{\text{Deaths}_{t+1}}{\text{Population}_{t}} \times 1000 \qquad (1)$$

We measure socioeconomic inequality by age and sex as the ratio of the mortality rate of the least educated to the most educated:

$$\text{RATIO}_{\frac{Lowest}{Highest}} = \frac{\text{mortality rate}_{\text{Lowest}}}{\text{mortality rate}_{\text{Highest}}} \times 1000 \qquad (2)$$

A ratio greater than one means that the mortality rate of the less educated is higher than that of the more educated. We compute these measures for all deaths and by specific cause of death.

We assume that the distribution of educational attainment among individuals with missing educational attainment in the death certificate is the same as the distribution observed in the census for individuals of the same age and sex. For Peru, 28% of the death certificates had the cause of death missing and were excluded from the cause of death analysis. Online supplemental file 1 section S1.1.5 (see online supplemental tables S6 and S7) provides more detailed information on missing information.

For the main analysis, we use the most recent census of each country. In addition, for Argentina, Brazil, Ecuador and Mexico, we compared mortality inequalities across the two most recent census decades (2010s vs 2020s) to examine temporal changes, including potential pre-COVID-19 and post-COVID-19 differences. Finally, we conducted exploratory cross-country analyses assessing the association between mortality inequalities and macro-level indicators such as health expenditure, the Gini index and gross domestic product (GDP) per capita.

Funding

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Patient and public involvement

Patients and the public were not involved in this research's design, conduct, reporting or dissemination plans.

RESULTS

General results

Our study covers seven Latin American countries over fourteen years. These countries are characterised by relatively high life expectancy at birth rates (see table 1). For females (males), the rate in 2025 ranged from 78.2 (72.6) in Mexico to 83.4 (79.7) in Chile. The differences in longevity between men and women translate into a significantly larger share of the population over 65 that is female in the countries we study. The analysis of mortality rates that follows should be assessed against the backdrop of these statistics.

Socioeconomic disparities in mortality rates

Ratios of adult mortality rates between low and high education are reported by sex and age group in figure 1 and online supplemental appendix, table S9 and S10. Inequalities in mortality rates are pronounced across sex and age. Inequalities are larger in younger age groups than in older ones. For women (men), the unweighted median inequality ratio by age group for our sample of countries falls continuously from 2.60 (2.48) in the 20–29 age group to 1.20 (1.16) in the 80+ age group.

The variability of socioeconomic mortality ratios across countries is much larger in younger than older age groups. It is evident that the greatest disparities in the 20–29 age group are found in Peru (2018) and Chile (2018) for women and Peru (2018) and Ecuador (2023) for men, where the mortality rates of the least educated are more than three times higher than those for the most educated and can be up to five times larger (men in Peru). In contrast, the largest mortality ratio for the 80+ age group is 1.51 (women in Colombia).

Table 1 Life expectancy at birth and share of population aged 65+ yearsd (United Nations)

		Life expectancy at birth		Population +20 (%)		Population +65 (%)	
Country	Year	Female	Male	Female	Male	Female	Male
Argentina	2011	79.4	72.7	67.2	64.7	12.3	8.6
Argentina	2019	79.4	74.1	69.2	67.1	13.4	9.8
Argentina	2025	80.2	75.1	72.1	70.2	14.4	10.8
Brazil	2011	77.5	70.7	68.1	66.2	7.7	6.1
Brazil	2019	79	72.7	72.2	70.3	10.3	8.3
Brazil	2025	79.3	73.1	74.6	72.7	12.7	10.3
Chile	2011	81.5	76.9	71.5	69.9	11.3	9.1
Chile	2019	82.6	78.1	75.2	74	13.4	11.2
Chile	2025	83.4	79.7	77.9	76.7	15.7	13.4
Colombia	2011	78.4	72	64.7	62.6	6.7	5.4
Colombia	2019	79.7	73.6	70.4	68.4	9	7.4
Colombia	2025	80.8	75.4	73.6	71.8	11.2	9.2
Ecuador	2011	78.1	72.3	60.1	58.4	6.6	5.3
Ecuador	2019	80	74.6	64.8	63.3	8.1	6.7
Ecuador	2025	80.5	75.1	68.2	66.6	9.4	7.7
Mexico	2011	76.5	71.3	62.4	59.5	6.5	5.9
Mexico	2019	77.4	71.6	66.2	63.1	7.8	6.9
Mexico	2025	78.2	72.6	69	65.9	9.2	7.8
Peru	2011	75.6	71.2	62.1	61.6	7.7	7.1
Peru	2019	78.6	74.1	66.1	64.9	9.1	8.1
Peru	2025	80.45	75.8	68.8	67.3	10.1	8.8

Data comes from United Nations, Department of Economic and Social Affairs, Population Division (2024). World Population Prospects 2024, Online Edition.

Socioeconomic disparities in mortality rates in communicable, maternal and nutritional versus NCDs

Communicable, maternal, nutritional and NCDs represent 89.2% of all the deaths in our sample (see online supplemental appendix, table S8). Across all countries in our analysis, the majority of mortality is due to NCDs (a percentage as large as 83.4% in Chile in 2018) rather than communicable, maternal and nutritional diseases (a percentage as large as 34.26% in Brazil in 2023 and 43.4% in Peru in 2018). Injuries and ill-defined diseases explain the remaining deaths.

Online supplemental appendix, tables S11–14 and figure 2 report socioeconomic inequality mortality ratios by sex and age group, according to whether the cause

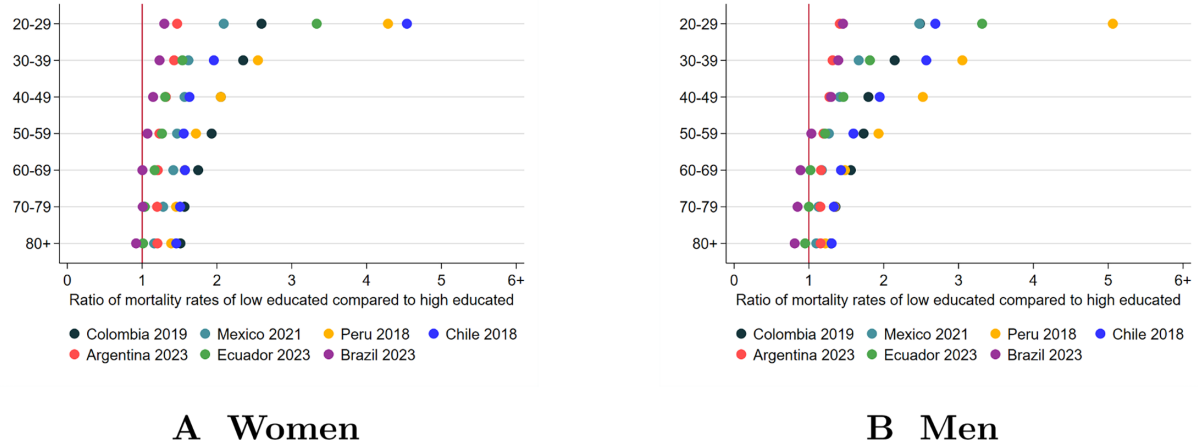

Figure 1 Socioeconomic inequality in mortality, by age and sex. Authors' calculations based on census and death certificate data. See online supplemental appendix, table S1, for details on data sources.

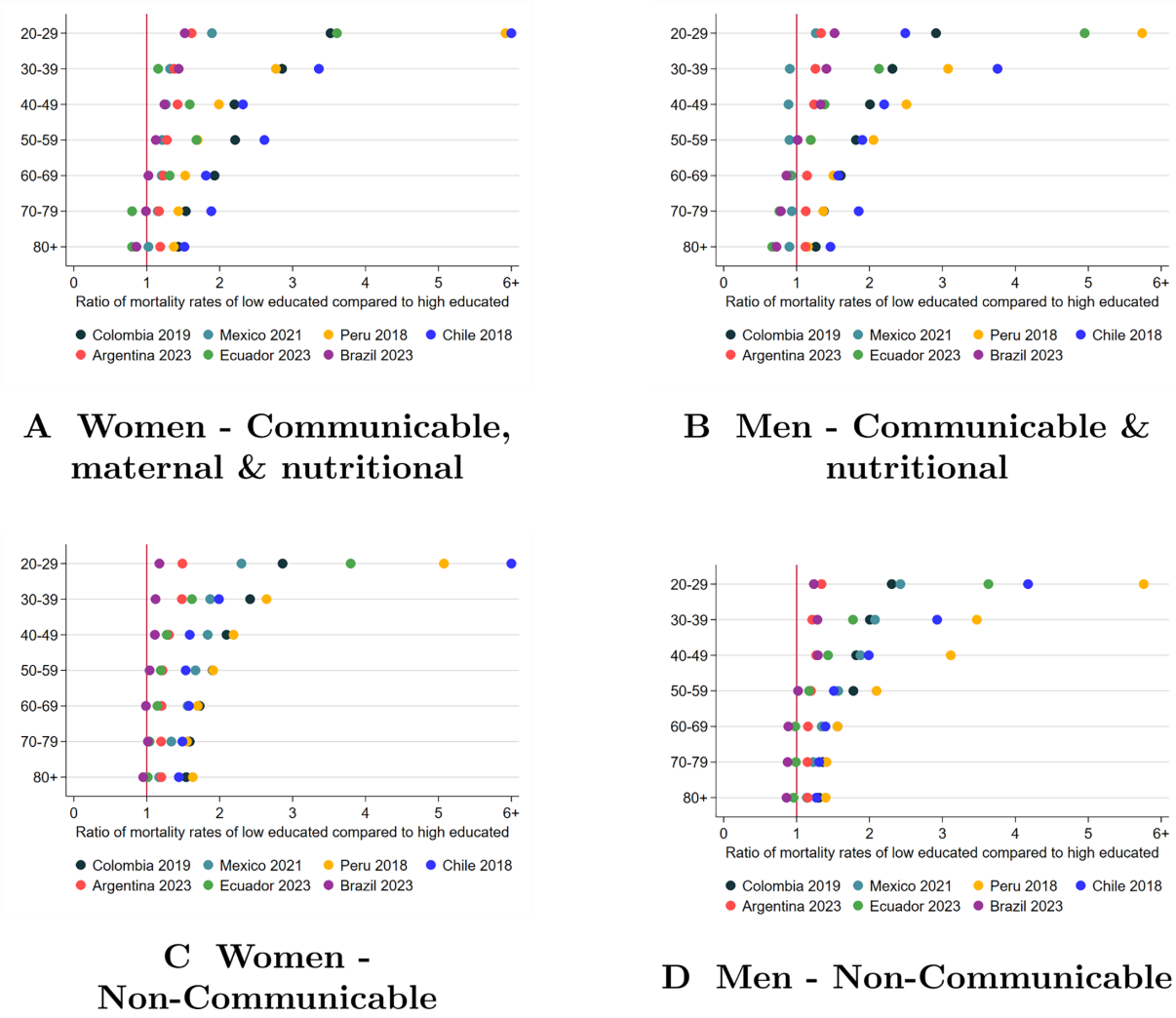

Figure 2 Socioeconomic inequality in mortality, by age, sex and cause (communicable vs non-communicable). Authors' calculations based on census and death certificate data. See online supplemental appendix, table S1, for details on data sources.

of death was a communicable, maternal, nutritional or NCD. Not surprisingly, the patterns of inequality by age and sex and across countries, particularly at younger ages, are still very significant, irrespective of the causes of death. For women in the 20–29 age group, the unweighted median inequality ratio due to communicable, maternal and nutritional diseases (3.52) is much larger than for NCDs (2.86). Beyond age 30, the relation becomes more nuanced, with higher mortality inequality associated with NCDs at older ages (60+). For men, the pattern is more even at younger ages (20–39). However, from age 40 onwards, mortality inequality is consistently higher for NCDs.

Online supplemental appendix, tables S15–20 and figures S1–3 report socioeconomic inequalities within communicable, maternal and nutritional diseases. These socioeconomic inequalities in mortality due to communicable diseases are larger than for maternal deaths. For example, in women aged between 20 and 29, the unweighted median inequality ratio for communicable diseases is 3.94, while for maternal deaths, it is 2.09. The mortality rates due to nutritional causes are near zero, except for older ages.

Online supplemental appendix tables S21–26 and figures S4–6 report socioeconomic inequalities within some main categories of NCDs: neoplasms, cardiovascular and diabetes. Socioeconomic inequalities due to diabetes-related deaths are larger than for cardiovascular-related deaths for all age groups (both sexes) except for men in the age groups 20–29, 70–79 and 80+ and for women in the age group 20–29. Socioeconomic inequalities in neoplasm-related deaths are the smallest of the three, with the unweighted median ratio across countries smaller than 2.5 for all age groups (for women ranging from 2.46 to 1.09 across age groups, and for men from 1.40 to 0.98).

Socioeconomic disparities in mortality rates by injuries (intentional and unintentional)

Intentional and unintentional injuries represent 7.47% of all the deaths in our sample (see online supplemental appendix table S8). Of these deaths, 49% are classified

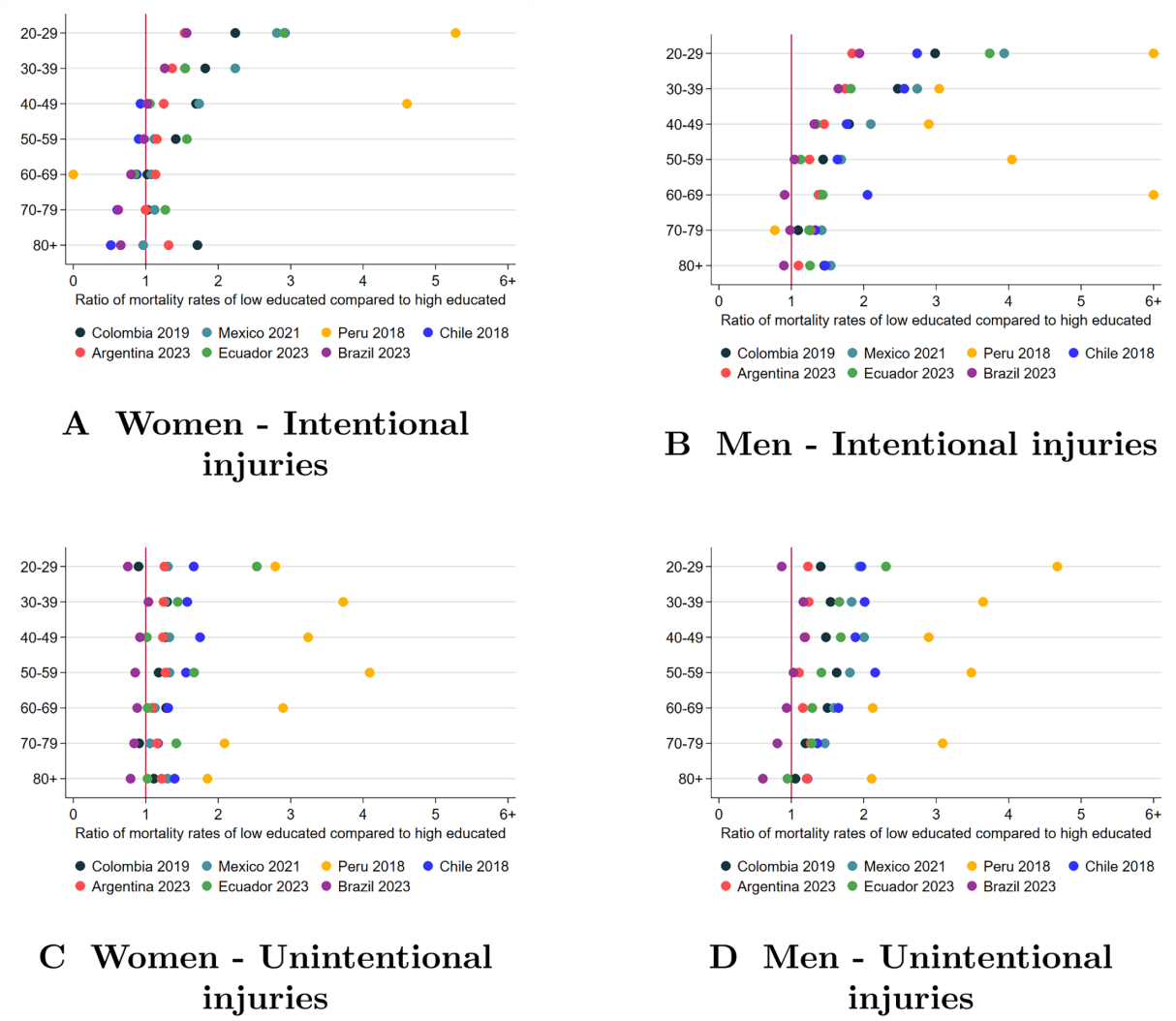

Figure 3 Socioeconomic inequality in mortality, by age, sex and cause (intentional vs unintentional injuries). Authors' calculations based on census and death certificate data. See online supplemental appendix, table S1, for details on data sources.

as intentional. Online supplemental tables S27–30 in the appendix and figure 3 report socioeconomic inequality mortality ratios by sex and age group, according to whether the cause of death was intentional or unintentional injury.

The unweighted median mortality ratio from intentional injuries tends to decrease with age for both men and women. For instance, the unweighted mortality ratio for women is larger than 1.25 for the age group 40–49 and younger, while the ratio is smaller than 1.14 for the age groups 50–59 and 60–69. The relation between the unweighted mortality ratio and age is more nuanced for unintentional injuries.

Across both intentional and unintentional injuries, the socioeconomic mortality inequality is higher for men than women: across all ages, the unweighted median mortality ratio is higher for men than women, except for unintentional injuries in the age group 80+. Within intentional injuries, online supplemental appendix tables S31 and S32 and figureS7 report suicide mortality rates and ratios, while online supplemental appendices S33 and S34 and figure S8 report them for homicides. In each age group and sex, the homicide and suicide rates are higher among the lower educated than the higher educated, with a few exceptions: in homicides for women in the age groups 70–79 and 80+ and in suicides for women in the age groups 50–59, 60–69, 70–79 and 80+. As in all-cause mortality, the unweighted mortality ratio for suicides and homicides also tends to decrease with age. For the age groups 20–29 and 30–39, the unweighted mortality ratio is higher for homicides than for suicides, while the relation is nuanced for older age groups.

Trends of socioeconomic inequalities in mortality rates

In this section, we analyse changes in socioeconomic inequalities in mortality between the last two census rounds available for Argentina, Brazil, Ecuador and Mexico. These four countries were selected because they are the only ones in Latin America with census data collected during the 2020s, enabling comparison across two different decades. This design provides a unique opportunity to examine the evolution of inequalities

before and after the COVID-19 pandemic. Online supplemental figures S9–13 summarise these changes. For Argentina and Brazil, a clear improvement is observed in the most recent decade, with reductions in inequalities for all-cause mortality and for most disease-related causes of death. In Mexico, improvements are also evident, particularly among women, although inequalities persisted among young adults aged 20–29 and men aged 60+, where little or no progress was achieved. By cause of death, Mexico shows a marked reduction in inequalities for communicable, maternal and nutritional conditions, but little progress on mortality inequalities due to non-communicable conditions, and a deterioration in inequalities related to intentional injuries. In contrast, Ecuador shows no overall improvement and has suffered a very marked increase in mortality inequalities among young adults (20–29 years) for nearly all categories of causes of death.

Finally, we explored cross-country variation in mortality inequalities by comparing them with macroeconomic indicators, including health expenditure, the Gini index and GDP per capita (online supplemental figure S14 in the Appendix). These exploratory analyses did not reveal consistent patterns, suggesting that single macroeconomic indicators cannot capture the myriad of societal, epidemiological and economic factors which are responsible for mortality inequalities, including household resources, empowerment, information, prevailing societal norms, targeted policies and organisation of the health system.

DISCUSSION

This study provides a comprehensive analysis of mortality inequalities across socioeconomic groups, age ranges and sex in Latin America, offering crucial insights into the complex landscape of health disparities in the region that complements ongoing efforts to characterise life expectancy and mortality in Latin American cities.[11] Our findings must be interpreted within the broader context of socioeconomic, epidemiological and health system changes that have occurred in Latin America over the past several decades, including an unprecedented surge in violence since the 2010s.[6 7 40–42]

Concurrent with a fall in income inequality,[42] Latin America has experienced a significant epidemiological transition, consisting of a broad shift from communicable, maternal, neonatal and nutritional disorders towards NCDs and injuries between 1990 and 2010.[37] The burden of disease has also shifted from children aged under 5 years to reproductive age groups (15–49 years).

Our results show that socioeconomic inequalities in mortality are more pronounced in younger age groups. This pattern persists across various causes of death, both for diseases and injuries. These findings suggest that despite overall improvements in income inequality and access to health services, significant challenges remain in addressing health disparities, particularly for younger populations. The larger inequalities in younger age groups may reflect the persistent challenges in providing equitable access to preventive care and early intervention, especially for lower socioeconomic groups.

The observed patterns in mortality from intentional injuries, including the higher rates among lower education groups, particularly before age 50, underscore the complex interplay between socioeconomic factors and violence that has also been shown in ecological studies.[43] The varied sex patterns across countries (eg, higher inequality for men in Argentina, Brazil, Colombia and Mexico at almost all age groups, but more nuanced patterns in Ecuador) highlight the need for context-specific approaches to addressing violent mortality.

When comparing median unweighted mortality ratios due to non-communicable versus communicable causes, men exhibit higher inequality in mortality due to non-communicable causes than communicable causes at all age groups except 30–39. The relation is more nuanced for women, who exhibit higher inequality in mortality due to non-communicable conditions in the 60+ age group but the contrary in younger age groups (except 30–39).

Regarding NCDs, the largest inequalities are found in mortality due to diabetes, followed by cardiovascular diseases, and the smallest for neoplasms. This hierarchy of socioeconomic inequalities across different non-violent causes of death provides valuable insights for health policy and suggests that these areas may benefit most from targeted interventions aimed at reducing health disparities.

We also explored whether cross-country differences in mortality inequalities were associated with macro-structural indicators such as health expenditure, income inequality (Gini index) and GDP per capita. These exploratory analyses did not reveal consistent patterns, likely reflecting that mortality inequalities are likely to be influenced by a myriad of societal, epidemiological and economic factors, such as household resources, empowerment, information, prevailing societal norms, targeted policies and organisation of the health system.

Our findings reveal critical implications for regional policy, which needs to consider greater disparities among younger age groups. Additionally, a comprehensive approach that considers socioeconomic determinants of health and healthcare system factors is essential to address mortality inequalities effectively. Given the varied patterns of violent mortality across countries and socioeconomic groups, context-specific strategies for violence prevention are also necessary.

The growing burden of NCDs necessitates greater focus on equitable prevention and management strategies, particularly for diabetes and cardiovascular diseases. This shift is crucial as the region continues its epidemiological transition, with NCDs becoming increasingly prevalent across all socioeconomic groups. However, diverting resources needed to address NCDs away from efforts to treat and prevent communicable diseases

could exacerbate existing inequalities in communicable diseases, which already show the greatest disparities. To reduce health inequalities during this transition, health systems will require more efficient ways to use existing resources, additional resources and increased policy attention.[44]

Continued health system reform remains a priority, with efforts to achieve universal health coverage needing further strengthening. Particular emphasis should be placed on reducing barriers to access for lower socioeconomic groups, ensuring that healthcare services are both accessible and affordable for all segments of the population.

Health production is influenced by a variety of interrelated individual and societal factors, including household resources, empowerment, information and prevailing societal norms. Although expanding healthcare coverage and addressing barriers to accessing quality healthcare are essential steps in tackling health inequalities, these efforts may not be sufficient. Policies designed to reduce health disparities must go beyond the healthcare sector and address the broader social determinants.[45]

This study provides valuable insights but also has limitations. The cross-sectional nature of the data limits the study of how mortality inequalities evolve over time. By comparing the 2010s and 2020s for selected countries, we were able to capture some temporal dynamics. Nevertheless, future research with more countries and a longer follow-up period is needed to better understand the long-term evolution of inequalities, especially in the aftermath of the COVID-19 pandemic. In addition, our analysis is affected by data quality issues in death certificates, particularly missing information on education in some countries and under-reporting of deaths in others. Another limitation is the absence of other relevant dimensions of inequality, such as race/ethnicity, income or place of residence (urban/rural), which are not systematically captured in death certificates across countries and therefore could not be incorporated into our cross-country comparisons.

In conclusion, while Latin America has significantly reduced income inequality and improved overall health indicators, substantial mortality inequalities persist. Complex interactions between socioeconomic status, age, sex and cause of death shape these inequalities. Addressing these disparities will require sustained, targeted efforts sensitive to the unique contexts of each country in the region.

Contributors SMDP, AB and DdlM conducted the statistical analyses and prepared the study programmes. All authors (SMDP, AB, DdlM, SB, MVH and GB) contributed to the study design and development of the research idea. SB, DdlM and MVH secured the funding for this study. AB and DdlM wrote the first draft of the manuscript. All authors critically revised the manuscript and approved the final version. GB is the guarantor of the work. We used Claude AI, ChatGPT and Grammarly as writing tools to improve readability and grammar, and the authors are fully responsible for the manuscript's content.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study is based on publicly available, de-identified data from national statistical agencies, including census data and death certificates. As such, ethical approval was not required because the study did not involve direct interaction with human participants, nor did it collect or use personally identifiable information. The use of secondary data complied with all relevant legal and institutional guidelines.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available in a public, open access repository. All data sources used in this study are publicly available and were obtained from official repositories. Detailed information about the specific data sources for each country is provided in online supplemental appendix section 7.1.1. Any additional information regarding data access can be provided upon reasonable request.

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