

Does Increasing Health Insurance Coverage Reduce Inequalities in Mortality? The impact of the Health Care Reform in Colombia

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ABSTRACT

Background

Recent health care reforms in several middle-income countries have increased health care insurance coverage (HIC). This study examines the impact of a major increase in HIC in Colombia on socioeconomic inequalities in total and cardiovascular disease (CVD) mortality from 1998 to 2007.

Methods

Data on deaths by educational level from mortality registries were linked to population census data (n=3,984,450) for the period 1998-2007. We used Poisson regression to examine inequalities in mortality by education based on the relative index of inequality (RII). We compared trends in inequalities between periods of moderate (1998-2002) and accelerated (2003-2007) increase in HIC.

Findings

Lower education was associated with higher total and CVD mortality, and these inequalities widened over the study period. Among men, the RII increased from 2.27 (95%CI [Confidence Interval] 2.23, 2.32) in 1998-2002 to 2.71 (95%CI 2.65, 2.76) in 2003-2007, while among women it increased from 2.62 (95%CI 2.55, 2.71) to 2.87 (95%CI 2.79, 2.95). Within each period, however, inequalities increased at a different rate. In 1998-2002, a period of moderate increase in HIC, inequalities increased every year by 10% in men and 3% in women. In contrast, in 2003-2007, a period of accelerated increase in HIC, inequalities increased by 2% in men and 1% in women.

Interpretation

Socioeconomic inequalities in mortality widened throughout the post-reform period, but increased coverage may have slowed down increasing trends in inequality. Increasing insurance coverage may not be sufficient to eliminate inequalities, but it may contribute to curb increasing inequality trends.

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INTRODUCTION

Socioeconomic inequalities in mortality have been extensively examined in high-income countries. However, few studies have examined mortality inequalities in middle-income countries, many of which introduced major health care system reforms in the last decades¹. In 1993, Colombia introduced a major health care reform that included mandatory social health insurance. Before this reform, health care was fragmented by financing through a national health system and a loosely regulated private sector, with low coverage levels². After the reform, health care insurance coverage (HIC) increased from 47% in 1994³ to 98% in 2010⁴.

The case of Colombia is particularly interesting from an equity perspective, because the reform replaced direct subsidies to providers with a new scheme of subsidies targeted to the poor. In the current system, citizens fall under one of two schemes based on their income: the contributory scheme, which covers workers with an income above a cut-off and their families and is financed through payroll and employer's contributions, and the subsidized scheme, which covers the poor as identified through a proxy means test⁵. After the reform, HIC increased from 6% in 1993 to over 70% in 2009 in the poorest quintile,⁵ an increase largely attributable to the subsidized scheme⁴.

The reform may have improved access to care among the poor^{2, 5}, but whether it ultimately influenced their mortality risk has not yet been established. Increased equity in access to care may have improved outcomes by ensuring timely care, and bringing the poor in closer contact with the health care system⁶. However, the reform also increased the complexity of the system potentially leading to delays in care⁷ and reducing spending in prevention and public health⁸. In addition, health care reform may not have been sufficient to curb autonomous trends in cardiovascular risk resulting from secular lifestyle changes towards more sedentary life-styles and higher obesity⁹. In addition, absolute poverty levels continue to be relatively high in Colombia, which will directly influence health and limit the impact of the reform among the poorest².

In this paper, we examine whether increasing trends in health insurance coverage are associated with trends in socioeconomic inequalities in mortality in the years that followed the health care reform in Colombia. We hypothesized that increased HIC was not sufficient to eliminate mortality inequalities, but it contributed to curbing unfavourable trends in mortality inequalities. We examined trends in mortality inequalities by educational level separately for two periods (Figure 1). The first period (1998-2002) was characterized by a moderate increase in HIC, while the second period (2003-2007) covered the years of rapid increase in coverage among the poor following a process of decentralization¹⁰. The discrepancy in HIC trends between these two periods offers a natural experiment to examine the impact of HIC on socioeconomic disparities in mortality.

METHODS

Data

Appendix Table 1 summarizes data on deaths and mid-year populations used to estimate mortality rates. Data on deaths came from the national statistics agency, which collects and harmonizes data on all deaths, based on international guidelines. Causes of death were coded according to the International Classification of Diseases (ICD-10). We focus on total mortality and mortality from cardiovascular diseases, which is the major cause of death in Colombia and partly reflects changes in lifestyle associated with the epidemiological transition⁹. CVD was defined as codes I00 to I99 (Chapter IX ICD-10). For all deceased individuals (n =3,984,450), data were collected on sex, age of death and educational level. Data on age and sex were available for more than 99% of all deaths, while data on educational level were available for 70.7% of all deceased cases. We used multiple imputation procedures to impute missing values of educational level¹¹.

Data on the distribution of education was obtained from the International Institute of Applied System Analysis and the Vienna Institute of Demography of the Austrian Academy of Sciences (IIASA/VID) database¹². This database contains information on the distribution of education by 5-year age group, sex and year, for 5-year intervals in the period 1970-2000, based on data from census, national surveys and demographic projections for 120 countries. We estimated the mid-year population according to educational level by multiplying the proportion of individuals in each educational category by yearly population estimates from census and statistical projections. The mid-year population for years in-between was estimated using the demographic Software AGEINT® (US Census Bureau). National educational levels from both the IIASA/VID database and national mortality registries were reclassified into three categories based on the highest level completed (primary, secondary or tertiary). Appendix Table 1 shows the correspondence with the International Standard Classification of Education (ISCED).

Methods of analysis

We distinguished two broad post-reform periods from 1998-2002 and 2003-2007. Our rationale was that while HIC increased slightly in the first period, it increased at a faster rate from 2003 to 2007, particularly for the subsidized scheme. Overall, the increase per year in HIC was 7.7% from 1998 to 2002, and 39.3% from 2003 to 2007. We focused on mortality before age 65, because our interest is in the impact of the health care reform on avoidable mortality. In addition, data on educational level from death registries has been shown to be unreliable at ages 65 and beyond, potentially leading to biased estimates of differences in mortality by education in unlinked census-mortality studies¹³.

We first calculated age-standardized mortality rates by education and sex using the World Health population of 1997 as reference. We then used Poisson regression to model mortality as a function of education, controlling for age, sex and year. To examine trends in inequalities in mortality, we then estimated the relative index of inequality (RII), a regression-based measure that models mortality as a function of the mid-point of the cumulative distribution of education¹⁴. We used the RII because it explicitly accounts for changes in the distribution of education over time. The RII can be interpreted as the relative difference in mortality between two hypothetical individuals in the lowest and highest point of the educational distribution each year¹⁴.

We examined the association between changes in HIC and inequalities in mortality by estimating the interaction between educational level and year separately for the two reform periods. This approach

assumes that except for changes in HIC, yearly trends in other factors were similar between these two periods. A difference in the interaction would indicate that trends in inequalities in mortality differed between the two periods, potentially due to faster growth in HIC in the period 2003-2007. All analyses were conducted in SAS® version 9.2.

RESULTS

From 1998 to 2007, men and women with only primary education or less schooling had higher mortality rates than those with secondary or tertiary education (Figure 2). In all educational groups, mortality from both total and CVD mortality declined over the study period. However, Figure 3 shows that men and women with tertiary education experienced a faster decline in mortality than those with only secondary or primary education. The average annual percentage change (AAPC) in mortality according to educational level was -4.89% (95%CI -5.33, -4.45) in men and -2.15 (95%CI -2.86, -1.43) in women with tertiary education, compared to -1.23% (95%CI -1.38, -1.09) in men and -1.30% (95%CI -1.48, -1.11) in women with only primary education. Similar disparities were observed for CVD mortality.

Inequalities by education in total and CVD mortality as measured by the RII widened over the study period in both men and women (Figure 4). Model 2 in Table 1 summarizes the RII separately for the period 1998-2002 and 2003-2007. For total mortality, the RII increased from 2.27 (95%CI 2.23, 2.32) in 1998-2002 to 2.62 (95%CI 2.55, 2.71) in 2003-2007 in men, and from 2.62 (95%CI 2.55, 2.71) in 1998-2002 to 2.87 (95%CI 2.79, 2.95) in 2003-2007 in women. There was a particularly steep increase in inequalities in CVD mortality in women, which increased from 3.29 (95%CI 3.09, 3.50) in 1998-2002 to 4.00 (95%CI 3.77, 4.24) in 2003-2007.

Separate models are presented in Table 1 for the period of moderate (1998-2002) and accelerated (2003-2007) increase in HIC. Inequalities in mortality widened significantly less in the period of accelerated increase in HIC, as compared to the period of moderate increase in coverage. The RII for total mortality increased by 10% (RR=1.10, 95%CI 1.08, 1.11) in men and 3% in women (RR=1.03, 95%CI 1.08, 1.11) per year in the period 1998-2002, but only by 2% (RR=1.02, 95%CI 1.01, 1.04) in men and 1% (RR=1.01, 95%CI 0.99, 1.03) in women in the period 2003-2007. Similarly, the RII for CVD mortality increased by 10% in men and 5% in women in 1998-2002, but by only 1% in both men and women in 2003-2007. The interaction between the RII and year was always significant for the period 1998-2002, while in the second period, it was only significant for total mortality in men.

DISCUSSION

Our analyses suggest that there are large inequalities in mortality by educational level in Colombia, which widened significantly during the post health care reform period owing to more favourable trends in mortality among the higher-educated. The large increase in HIC during the second period, however, was associated with a slowdown in increasing trends in inequalities as compared to the first period. Findings suggest that increasing insurance coverage may not be sufficient to eliminate inequalities, but it may contribute to curb increasing inequality trends.

Limitations of the study

Despite several strengths, some limitations should be considered in our study. Data on mortality came from mortality registries, while data on the population distribution by education came from census and demographic projections. This may have led to the so-called numerator/denominator bias, which generally results in an overestimation of inequalities^{13, 15}. Another limitation is that for some years, data on population size came from demographic projections combined with distributions of education from surveys. To assess the impact of this potential bias, we experimented with different education distributions from multiple data sources^{12, 16, 17}. Overall, although distributions and absolute rates sometimes differed, the overall trends observed in our study were robust to different assumptions on the distribution of education.

Practices in the coding of causes of death may have changed over the study period. However, since we focus primarily on all-cause mortality and a broad category of CVD, changes in diagnostic practices are unlikely to influence our overall results. Although in some regions there was lower registration of deaths, in most regions it was close to 100%. Under-registration was more common in economically deprived areas, which may have led to an underestimation of inequalities in mortality at the national level.

Our study is based on a comparison of trends in socioeconomic inequalities in mortality between two periods. We assumed a common trend in other factors than coverage between the first and second period. In preliminary analyses, we found that our results were robust to adjustment for several national-level variables such as GDP growth and employment rates. However, we cannot discard the possibility that other time-varying covariates contributed to trends in mortality. For example, increased coverage occurred parallel to other changes in the health care system^{3, 5} that may be responsible for trends in mortality. Our results may therefore reflect the impact of the entire reform package rather than the exclusive impact of increased coverage.

Interpretation of results

There is no conclusive evidence on the impact of insurance coverage on health outcomes and health inequalities². While some studies suggest that the subsidized scheme led to improvements in maternal and child health⁵, little is known about impact on other outcomes. The slowdown in inequalities in adult mortality observed in our study during the period of rapid increase in coverage may have been the result of increased access to care^{6, 18}. Those insured in the subsidized scheme are approximately 40% more likely to have used outpatient visits in the past year as compared to the uninsured, half as likely to have experienced barriers to access when needing care⁵, and less likely to have experienced catastrophic spending⁵. In addition, studies from other countries suggest that increased coverage may contribute to reduce disparities in health care utilization. A study in Taiwan,

which in 1995 implemented a similar insurance-based reform, found that increased coverage significantly increased physician visits in all income groups¹⁹, but middle and lower household income groups experienced larger increases in visits than their higher-income counterparts¹⁹.

Despite potential beneficial effects, several studies support the hypothesis that health insurance access is insufficient to eliminate inequalities in health, and may play only a minor role as compared to other determinants of health and mortality^{20, 21}. Despite almost universal coverage, low-income groups in Colombia still faced more barriers in access to care as compared to their higher higher-income counterparts²². In Thailand, following a large health care reform that increased coverage significantly, large disparities in health care utilization remained²³. Several studies in Europe and the US show that even in countries with universal health care coverage, there are large inequalities in mortality that have persisted and increased during the last decades²⁴⁻²⁶. A possible explanation is the persistence of disparities in behavioural determinants of mortality uninfluenced by access to care. In 2003, the prevalence of smoking among lower-educated Colombians was 41%, compared to 26% in those with College education. Similarly, a recent study estimated that 26% of lower-educated Colombians aged 25-50 years have at least a risk factor for cardiovascular disease, as opposed to only 5.9% in those with a University degree²⁷.

Socioeconomic inequalities in distal determinants of mortality such as poverty, living and working conditions may also have contributed to disparities. The gap in earnings among higher and lower educated workers has grown during the last decades²⁸. It is estimated that 59% of lower educated households live in poverty, as opposed to only 4.1% among their higher-educated counterparts²⁹. 96% of households in the highest income quintile has access to water services as opposed to 75% in the lowest income quintile. Similarly, 90% of households in the highest income quintile has access to drainage services, in contrast to 54% in the lowest income quintile³⁰. The persistence of inequalities in these and other non-medical determinants of mortality may explain why inequalities persist even after universal access to care has been achieved.

Conclusions

Socioeconomic inequalities in mortality widened throughout the post-reform period, but increased coverage may have slowed down increasing trends in mortality inequalities. The reform may take several decades to have a meaningful impact on the mortality of disadvantaged populations. Therefore, future studies should closely monitor changes in inequalities in mortality in the coming years. Nonetheless, our findings underscore the importance of understanding the impact of determinants other than health care in explaining inequalities in mortality, including lifestyle, as well as the living and working conditions of the poor. In conclusion, increasing insurance coverage may not be sufficient to eliminate inequalities, but it may contribute to curb increasing inequality trends.

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TABLES

Table 1. Rate Ratios (RR) and Relative Index of Inequality (RII) of mortality Rates by educational level at ages 25-64 in Colombia (1998-2007)

	All-cause mortality				Cardiovascular disease mortality			
	Males		Females		Males		Females	
	1998-2002	2003-2007	1998-2002	2003-2007	1998-2002	2003-2007	1998-2002	2003-2007
Model 1								
Tertiary	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Secondary	1.60 (1.56, 1.63)	1.75 (1.72, 1.79)	1.56 (1.51, 1.62)	1.59 (1.54, 1.64)	1.45 (1.38, 1.52)	1.51 (1.45, 1.58)	1.72 (1.59, 1.85)	1.76 (1.65, 1.88)
Primary	2.07 (2.03, 2.11)	2.40 (2.35, 2.44)	2.26 (2.19, 2.34)	2.36 (2.30, 2.43)	1.67 (1.59, 1.74)	1.93 (1.86, 2.01)	2.74 (2.55, 2.95)	3.03 (2.84, 3.23)
Year	0.93 (0.91, 0.94)	0.97 (0.96, 0.98)	0.96 (0.94, 0.98)	0.98 (0.96, 1.00)	0.91 (0.89, 0.94)	0.96 (0.94, 0.99)	0.94 (0.89, 0.99)	0.95 (0.91, 0.99)
Secondary*year	1.09 (1.07, 1.10)	1.00 (0.98, 1.01)	1.04 (1.01, 1.06)	0.99 (0.97, 1.01)	1.06 (1.02, 1.09)	1.03 (1.00, 1.06)	1.03 (0.98, 1.09)	1.03 (0.98, 1.08)
Primary*year	1.11 (1.09, 1.12)	1.01 (1.00, 1.02)	1.04 (1.01, 1.06)	0.99 (0.97, 1.01)	1.08 (1.05, 1.12)	1.03 (1.00, 1.06)	1.04 (0.99, 1.10)	1.02 (0.98, 1.07)
Model 2								
RII	2.27 (2.23, 2.32)	2.71 (2.65, 2.76)	2.62 (2.55, 2.71)	2.87 (2.79, 2.95)	1.70 (1.62, 1.78)	2.16 (2.07, 2.26)	3.29 (3.09, 3.50)	4.00 (3.77, 4.24)
Year	0.95 (0.94, 0.96)	0.96 (0.95, 0.96)	0.97 (0.96, 0.98)	0.97 (0.95, 0.98)	0.92 (0.90, 0.94)	0.98 (0.96, 1.00)	0.93 (0.91, 0.96)	0.96 (0.93, 0.98)
RII*year	1.10 (1.08, 1.11)	1.02 (1.01, 1.04)	1.03 (1.01, 1.05)	1.01 (0.99, 1.03)	1.10 (1.06, 1.13)	1.01 (0.98, 1.05)	1.05 (1.00, 1.09)	1.01 (0.97, 1.05)

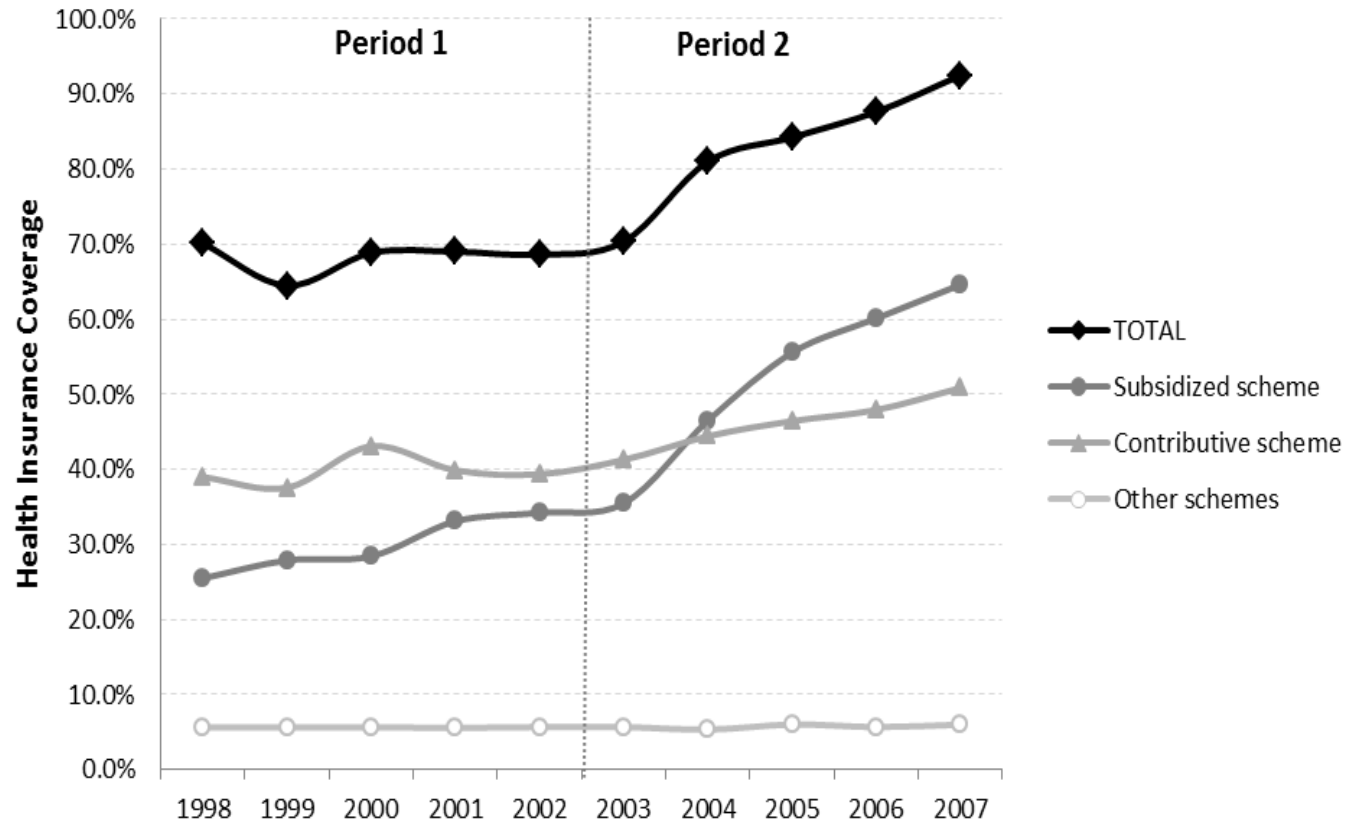
Year dummies are included in all models but omitted from the table. Estimates for education are parameterized estimates for the year 2000 in the first period, and for the year 2005 in the second period

RII stands for Relative Index of Inequality

Model 1 is based on a regression of mortality on dummies of educational categories, while model 2 is based on a regression of mortality on the mid-point of -the cumulative distribution of education (RII)

FIGURES

Figure 1. Percentage of population with Health insurance coverage (HIC) in Colombia (1980–2010)



Source: Annual reports of the Ministry of Health and Social Protection.

Other schemes include primarily members of the military and teacher and oil workers syndicate members.

Figure 2. Age-standardized rates of all-cause and cardiovascular mortality at ages 25-64 according to educational level in the period 1998-2007 in Colombia

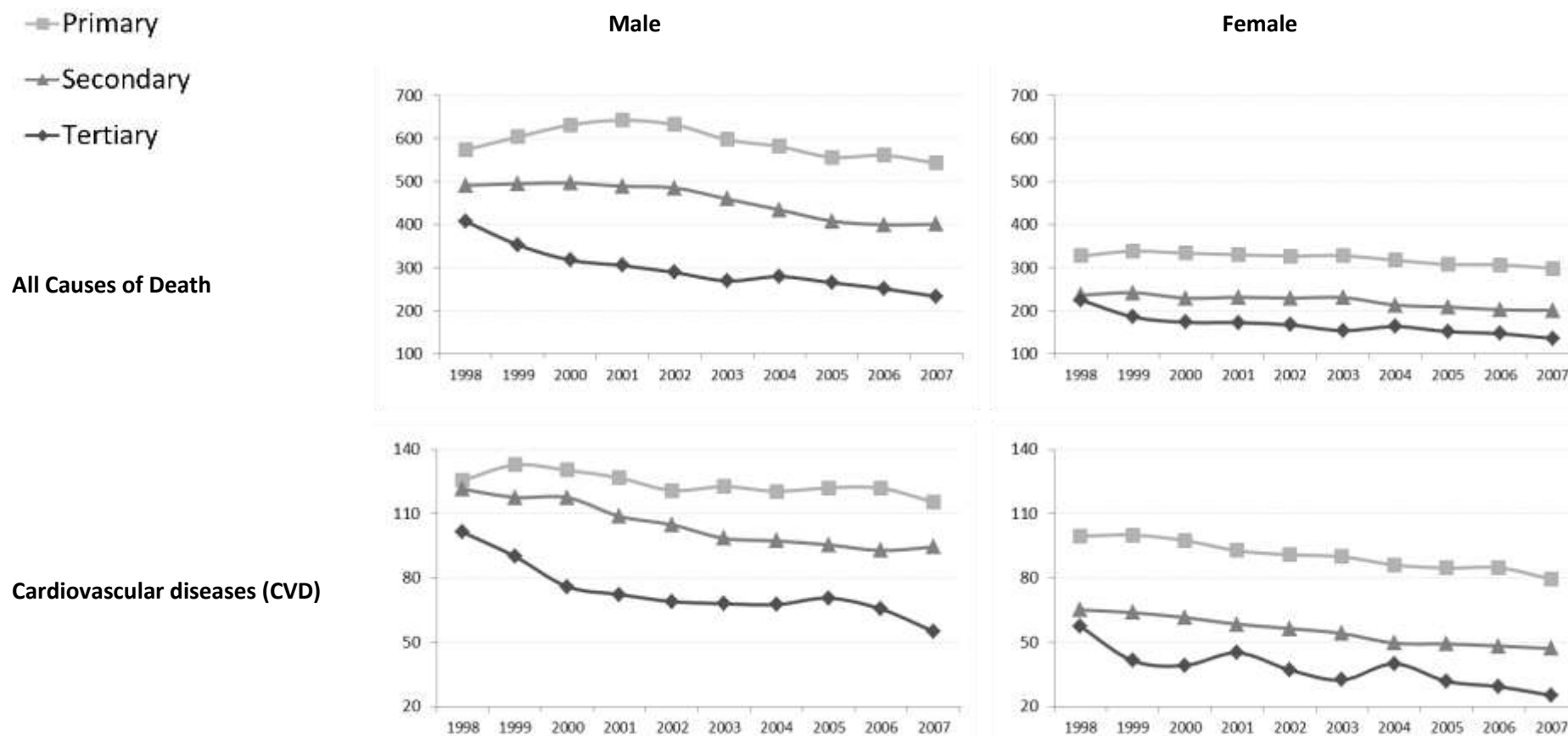
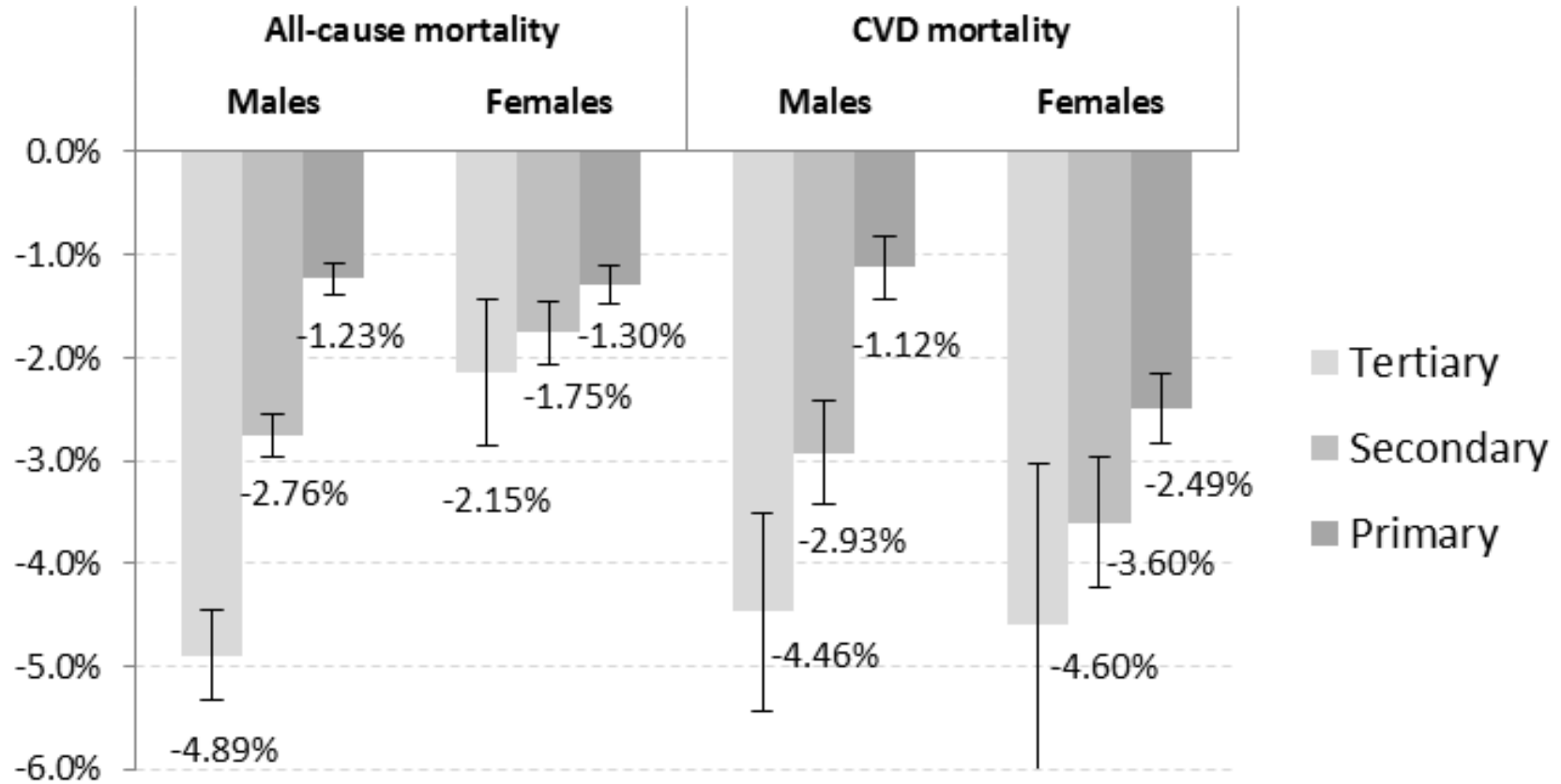
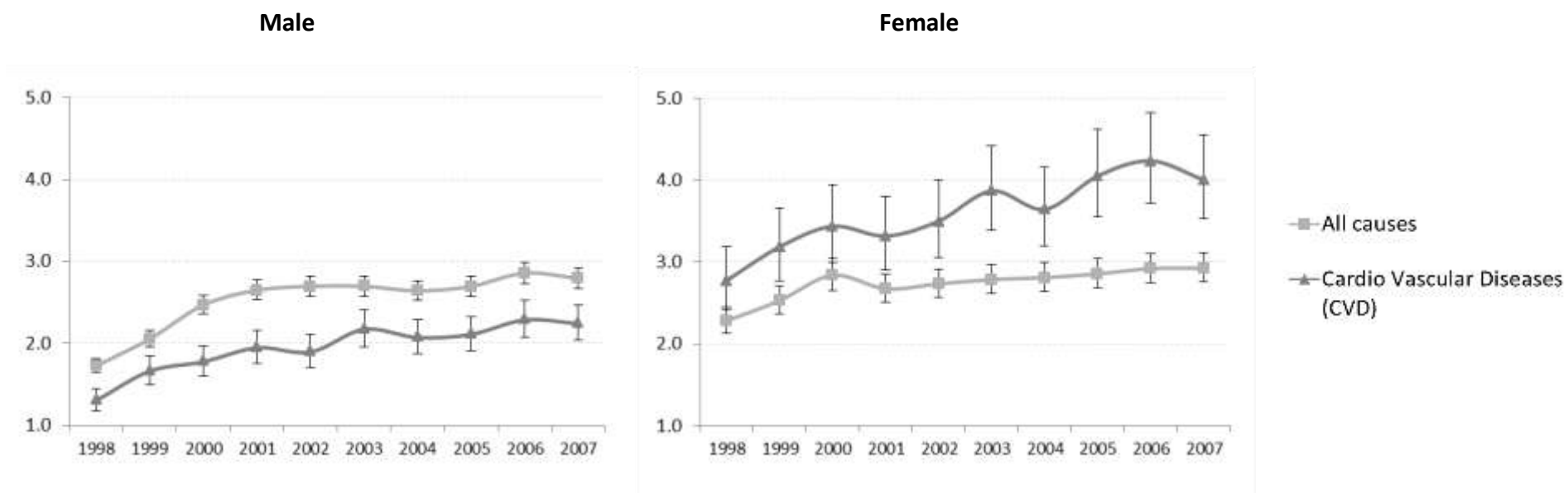


Figure 3. Average annual percentage change (AAPC) in mortality rates according to educational level in the period 1998 to 2007 at ages 30–64 in Colombia



AAPC comes from separate Poisson regression models for men and women that control for age, year and education

Figure 4. Trends of the Relative Index of Inequality (RII) of mortality by educational level at ages 25-64 in the period 1998-2007 in Colombia



WEB APPENDIX:

Table 1. Criteria for merging educational categories of the International Standard Classification of Education (ISCED) and the Colombian database with registries of mortality

EDUCATIONAL LEVELS	INTERNATIONAL STANDARD CLASSIFICATION OF EDUCATION (ISCED)	CATEGORIES OF COLOMBIAN DATABASE WITH REGISTRIES OF MORTALITY
Primary	E1	No education Preschool
	E2	Incomplete primary Complete elementary school
		Incomplete lower secondary -
Secondary	E3	Completed lower secondary Incomplete high school
		Incomplete higher secondary Complete high school
		Completed higher secondary Incomplete university
Tertiary	E4	Completed tertiary Complete university

Panel

Research in context

Systematic review

We searched PubMed, Medline, and Scielo with the search terms “disparities in health”, “mortality”, “education”, “Colombia”, and “socioeconomic status”, with diverse combination of keywords. We also checked the reference lists of some relevant papers. The most common reason for excluding studies was data quality. In addition, we also excluded studies focused on specific outcomes rather than on disparities in health.

After an extensive review, we found that there are large inequalities in Colombia in access and use of health services, which could contribute to inequalities in mortality. However, no studies have previously examined trends in socioeconomic inequalities in mortality after the health care reform, and there is no evidence on the potential effect of healthcare insurance coverage on health disparities.

Interpretation

Socioeconomic inequalities in mortality widened after the reform, but amplified coverage may have slowed down increasing trends in inequality. Increasing insurance coverage may not be sufficient to eliminate inequalities, but it may contribute to curb increasing inequality trends.