

Income inequality and mortality among working-age people in Canada and the US

Highlights

- Canadian provinces and metropolitan areas had generally lower income inequality and lower mortality than their US counterparts.
- Within Canada, there was no association between income inequality and mortality at either the provincial or metropolitan area levels. However, this relationship is strong in the United States.
- This Canada-US comparison suggests that the Canadian urban environment may be more beneficial to health than its US counterpart.

When we study large groups of individuals in industrialized countries, people with higher socioeconomic status (SES) (for example, higher incomes and education levels) report better health than those in lower SES groups. Richer individuals are also less likely to be sick and to die prematurely than are poorer individuals. The relationship between SES and health is one of the most pervasive in the epidemiologic literature and has held up over time and in countries throughout the world.

Given this relationship at the individual level, we might expect that the richest countries would also have the healthiest populations (measured by life expectancy or age-standardized mortality rates). But when researchers looked at the relationship between gross national product (GNP) per capita and mortality, they found that higher GNP is associated with lower mortality primarily at lower levels of GNP.^{1,2} Between \$5,000 and \$10,000 per capita (1991 US dollars),³ the gain in life expectancy is about three years. Beyond \$10,000, the gains in life expectancy are very slight. The highest-income countries such as the United States and Germany do not fare as well in life expectancy as upper

middle-income societies such as Iceland or Greece. On the other hand, among these higher-income countries, there is an association between income inequality within the country and its average mortality rate.

These findings suggest that what matters for mortality and health in an industrialized society may not be so much the absolute level of income of that society, but rather how evenly that income is distributed. Studies in support of this idea have

examined data from different countries,^{1,2} US states⁴ and US metropolitan areas.⁵

There are two broad ways of thinking about why the income distribution of a particular place might affect the health of the population living there. A *psychosocial* interpretation suggests that income inequality affects health through perceptions of level in the social hierarchy. Individuals at the bottom of the income distribution could feel greater anxiety and shame in their social relationships with those

Methods

Data sources

US data: Mortality data for the 50 US states are from the Centers for Disease Control (CDC) Wonder website. Mortality rates by state, sex and age were averaged over three years (1989-1991) to improve the stability of the estimates. State median share proportions and the median income values were generated from the 1990 US Census and have appeared in a previous paper.³ Metropolitan area mortality rates and median share proportions are from Lynch and colleagues.⁴

Canadian data: the income inequality data for Canada are from a 1991 Census of Canada microdata file. Canadian mortality data were based on three-year averages (1990-1992) by province, sex and age group, and by metropolitan area and age group.

Analytical techniques

Associations between income inequality and working-age mortality were studied in the 50 US states and the 10 Canadian provinces, as well as in 282 US and 53 Canadian metropolitan areas with populations greater than 50,000 (1990 in the United States and 1991 in Canada). All mortality rates were age-standardized to the Canadian population in 1991. The associations were examined separately by the following age and sex groupings for the states and provinces: infants (less than one year), children and youth (1 to 24), working-age men (25 to 64), working-age women (25 to 64), elderly men (65 or older) and elderly women (65 or older). Age groupings were the same for metropolitan areas, but breakdowns by sex for US metropolitan areas were unavailable. Correlation and weighted regression analyses were the key analytic techniques.

Limitations

The study is cross-sectional in nature and, therefore, cannot determine that income inequality is a cause of mortality. Instead,

this study suggests that there is something about the social environment of unequal places in North America that is contemporaneously related to mortality. The study design is also “ecologic” in that it compares attributes of geographically defined populations (mortality rates and income inequality measures are fundamentally characteristics of populations) and not individual people. Another approach, more demanding in terms of data requirements, would consider health outcomes of individuals as a simultaneous function of individual attributes and social context characteristics.

In analyses like these that consider associations between variables, there is always the chance that a third variable is important to the explanation of the observed association. For example, these analyses do not rule out the possibility that regions with high income inequality are also regions with high dispersion in educational attainment.

Definitions

Inequality was measured as the proportion of total household income in the less well-off 50% of households within a geographic area (that is, the “median share” of income). In a situation of complete inequality, the bottom half receives 0, and the top half 100%, of all income; with perfect equality, the bottom half of the income distribution receives 50% of the total income and the geographic area then has a median share value of 0.50. In this range from 0 to 0.50, higher median share values indicate more equal income distributions.

Income included income for all household members from wages and salaries, net self-employment income, government transfers and investment income, before deducting income tax.

further up the social hierarchy. Over time, such negative emotions may translate into poorer health through biological responses in the human body to chronic stress. Another interpretation, *neo-material*, suggests that the health effects of income inequality result primarily from “the differential accumulation of exposures and experiences that have their sources in the material world.”⁶ According to this view, the adverse effects on health result from the underinvestment in social resources, like education and health care, in places that tolerate larger gaps in income between the rich and the poor.

These two mechanisms may be interrelated. Varying levels of income inequality can be associated with social situations that generate unhealthy environments in the home, at work, and in the community. These unhealthy environments are deprived both materially and socially, but the psychosocial effects of exposure to them take on increased importance in well-off but more unequal places. Those at the bottom of a steep social hierarchy are affected disproportionately by their day-to-day, year-to-year interactions with unhealthy environments—made worse for psychosocial health when those on the bottom are acutely aware that others manage to escape or avoid those environments altogether.⁷

This analysis, based on a recent research article,⁸ reports on the relationship between income inequality and death among working-age Canadians and Americans. In doing so, the Canada-US comparison recognizes that citizens in both countries experience similar cultural influences. Despite these similarities, there are also major historical differences between the two countries in social policy, racial make-up, and in the gap between the rich and the poor.

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We focus here on the working-age (25 to 64) population, mainly because we found that the association between inequality and mortality is

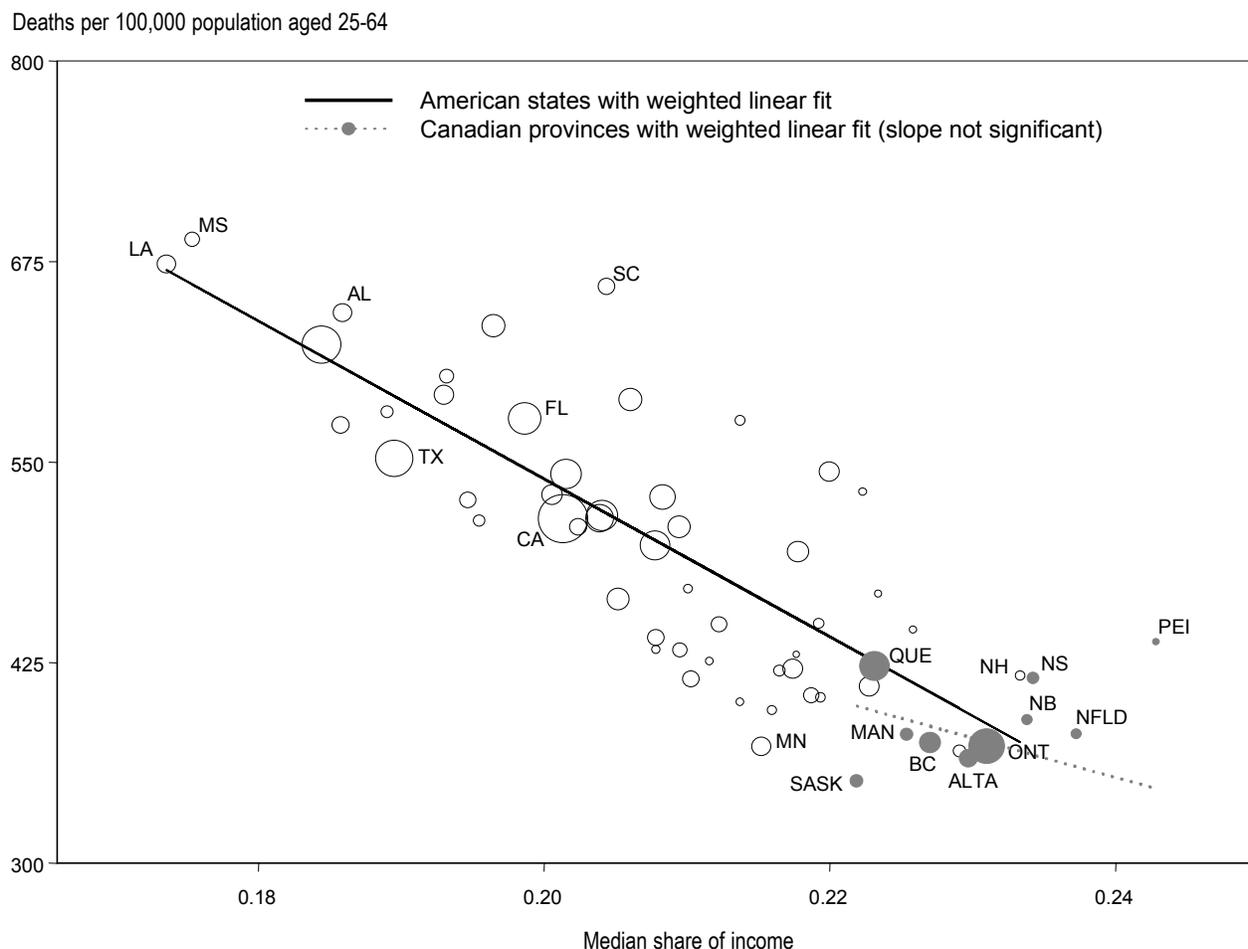
strongest for this population group.⁸ There are at least two related explanations that might account for the strong association of income inequalities on mortality for those of working-age. The first is that these are the years when one is most likely to be aware of social position. This interpretation is consistent with a hypothesis suggesting that perceptions of relative status operate through psychological effects on physiological functions. The second is that by the time individuals reach working age, they have had the opportunity to receive a reasonable “dose” of the material features of an unequal society that affect their health.⁷

States and provinces

Chart 1 shows the pooled results for US states and Canadian provinces. The median share values for the states/provinces ranged from .17 (least equal) in Louisiana to .23 (most equal) in New Hampshire for the US states, while the range for the Canadian provinces was .22 (least equal) for Saskatchewan to .24 (most equal) for Prince Edward Island (Chart 1). The vertical axis of the figure is an age-standardized mortality rate for working-age males per 100,000 population, while the horizontal axis is the median share income inequality measure. The open circles represent US states, and solid circles are Canadian provinces. The areas of the circles are proportional to the population sizes of the states and provinces. There was little overlap between US states and Canadian provinces in regard to income inequality, with only Wisconsin, Vermont, Utah and New Hampshire sharing levels of income inequality similar to the Canadian provinces. The Canadian provinces as a group appear almost as a more equal extension of US states, having both lower mortality and lower inequality.

When we consider all 60 points together, there is a strong association between income inequality and mortality in North America, combining the Canada and US observations. The strongest relationship with inequality was for working-age populations, and in particular, working-age males, compared with analyses of infants, youth and the elderly. However, when the Canadian and US observations are examined separately, significant differences emerge.

Chart 1
Mortality rates[†] of population aged 25 to 64 in Canadian provinces and American states, by percentage of total household income in province or state received by households with income below the median, 1991 (Canada) and 1990 (United States)



Data sources: 1991 Census of Canada; Canadian Vital Statistics Data Base; Centers for Disease Control
[†] Standardized to 1991 Canadian population

The solid sloped line through the US observations shows a significant linear statistical relationship. When we look only at the Canadian data points, on the other hand, there is no statistically significant relationship between income inequality and mortality for any of the age groups, though the small number of observations means that the ability to detect a relationship is very limited.

Metropolitan areas

Chart 2 shows similar data, but this time the observations correspond to US and Canadian metropolitan areas. The populations of the 282 metropolitan areas in the United States ranged from

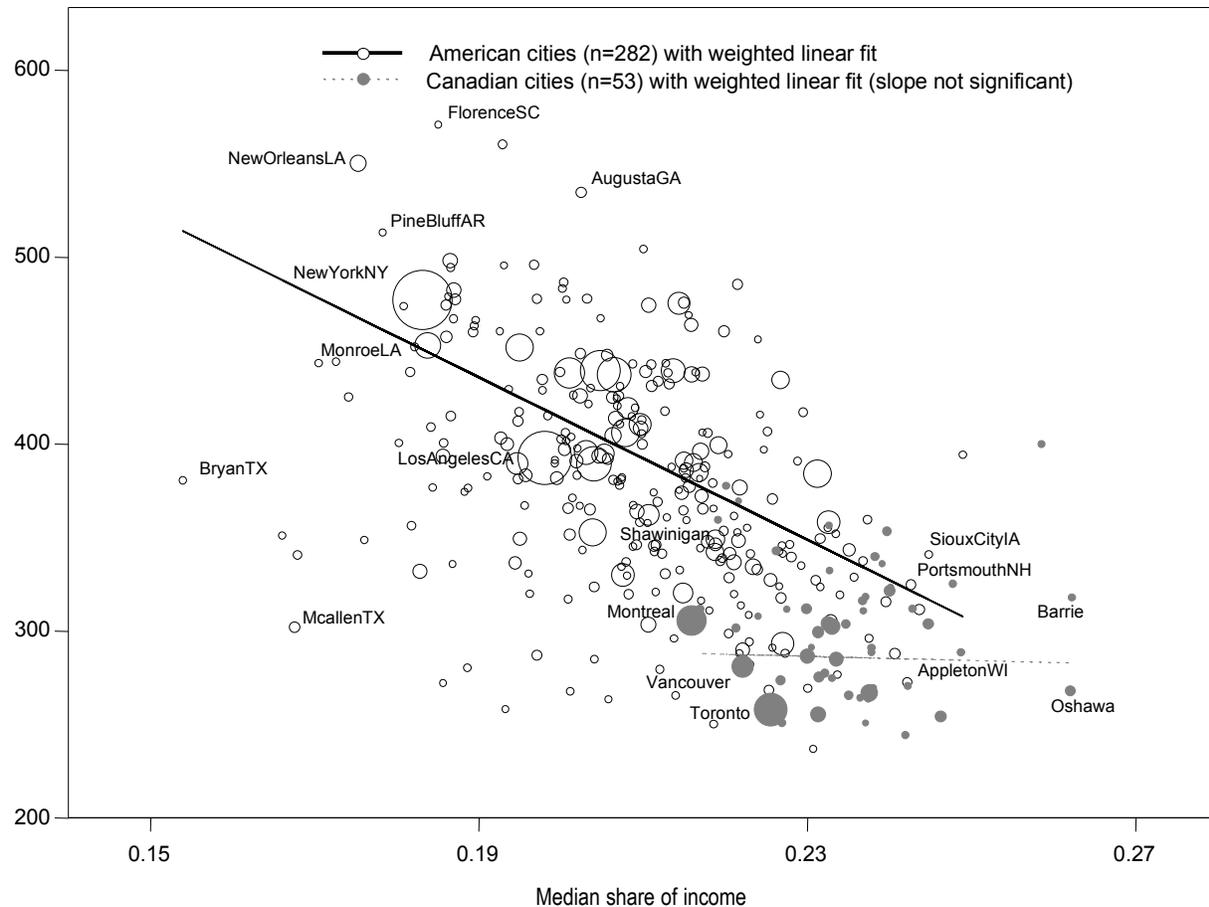
56,700 (Enid, Oklahoma) to 18,087,300 (New York, New York) with a median size of 242,800. The populations of the 53 metropolitan areas in Canada ranged from 50,200 (Saint-Hyacinthe, Québec) to 3,893,000 (Toronto, Ontario) with a median size of 116,100. This large number of observations will support stronger statistical conclusions. The median share values ranged from .15 (least equal) in Bryan, Texas, to .25 (most equal) in Jacksonville, North Carolina, for the United States. The range in Canada was .22 (least equal) for Montréal, Québec, to .26 (most equal) for Barrie, Ontario.

Similar to the state/provincial analyses, the relationship between income inequality and mortality

Chart 2

Mortality rates[†] of population aged 25 to 64 in Canadian and American metropolitan areas, by percentage of total household income in metropolitan area received by households with income below the median, 1991 (Canada) and 1990 (United States)

Deaths per 100,000 population aged 25-64



Data sources: 1991 Census of Canada; Canadian Vital Statistics Data Base; Centers for Disease Control
[†] Standardized to 1991 Canadian population

was strong for the combined 335 metropolitan areas in North America. The relationship is also strong for the 282 US metropolitan areas (the open circles). The strength of these associations, furthermore, is unaffected in a multivariate analysis, which also includes the median incomes of the metropolitan areas. When the 53 Canadian metropolitan areas (the solid circles) are considered on their own, however, there is no statistically significant association. This finding is a major counter-result to the US and international research to date.

Concluding remarks

For states, provinces and metropolitan areas in North America, overall income inequality is strongly related to mortality, and this relationship is strongest for working-age populations. However, there is no relationship between income inequality and mortality within Canada, even though the association is very strong in the United States. The juxtaposition of Canadian and US polities in these analyses raises questions about differences in the social and material conditions of the two countries that appear to mute

inequality's relationship to mortality in Canada, compared with that in the United States.

A major difference between the two countries is the way in which resources such as health care and high-quality education are distributed. In the United States, these resources tend to be distributed by the marketplace, so their utilization tends to be associated with ability to pay; in Canada, they are publicly funded and universally available. As a consequence, in the United States, an individual's income, in both a relative and absolute sense, is a much stronger determinant of one's life chances, and, in turn, their "health chances," than in Canada.

American metropolitan areas also differ from Canadian metropolitan areas in terms of the extent of economic and social inequality. One conjecture is that US cities tend to have much more concentrated areas of affluence and of poverty than Canadian cities. The possibility that such urban residential segregation affects health is the focus of ongoing Canadian-US comparative research.

These results raise intriguing questions about the nature of Canadian society; particularly, about the nature of urban environments in Canada, that appears to exempt Canadian cities from the adverse association of inequality with mortality, seen so clearly in the US data. ●

For more information, contact Michael Wolfson (613-951-8216; wolfson@statcan.ca), Institutions and Social Statistics Branch, Statistics Canada.

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