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Inequality in Mortality: Updated Estimates for the United States, Canada and France*

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Abstract

This study provides comparisons of inequalities in mortality between the United States, Canada and France using the most recent available data. The period between 2010 and 2018 saw increases in mortality and in inequality in mortality for most age and gender groups in the United States. The main exceptions were children under 5 and adults over 65. In contrast, Canada saw a further flattening of mortality gradients in most groups, as well as further declines in overall mortality. The sole exception was Canadian women over 80 years old, who saw small increases in mortality rates. France saw continuing improvements in mortality rates in all groups. Both Canada and France have distributions of mortality that are much more equal than those in the United

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JEL classification numbers: I14, J1.

States, demonstrating the importance of public policy in the achievement of equality in health.

I. Introduction

The number of years that a person can expect to live is a fundamental measure of well-being, so it is not surprising that inequalities in mortality are a subject of intense interest. The COVID-19 pandemic has brought inequalities in mortality rates into even sharper focus, as groups with lower socio-economic status have been disproportionately affected. This reality underlines the importance of documenting these inequalities and how they have evolved over time. Such basic information is key to addressing them.

Prior to the pandemic, a robust literature had developed arguing that US gaps in mortality had widened and that, for the first time in a century, overall life expectancy was actually falling for some demographic groups.¹

Most of these studies focused on adults, for some obvious reasons. First, after infancy, deaths are much more common among older people than among younger people. Moreover, many deaths among younger people are due to 'accidents', which may (wrongly) be viewed as outside the reach of social policy, although many policies such as those dealing with motor vehicle safety strongly affect them. Second, in the US, data on indicators of socio-economic status are missing from children's death certificates, while the death certificates of adults usually have education and some imperfect information about occupation.

The approach suggested by Currie and Schwandt (2016) allowed all of the deaths for the entire population to be included. As described in the introduction to this special issue, they first ranked areas from richest to poorest and then grouped them into 20 'bins' of approximately equal size. Age-specific mortality rates were then examined by age and gender groups for each bin in the census years 1990, 2000 and 2010. Looking at the data through this lens led to a striking conclusion that was only partially in agreement with the previous literature: while US inequality in mortality had indeed risen among the middle-aged, it had fallen dramatically among the young. Death rates among US children fell more sharply in poorer areas than in richer areas, leading to much more equal 'gradients' in mortality in 2010 than in 1990.

This finding was out of step with the prevailing narrative in which increases in income inequality in the US had led inexorably to increases in health inequality. Instead, while US income inequality increased for all age groups, inequality in mortality rose for some age groups and fell for others. This observation offered a ray of hope in an otherwise gloomy literature as it

¹See, for example, Cutler et al. (2011), Chetty et al. (2015), National Research Council (2015), Case and Deaton (2015, 2017), Olshansky et al. (2012), Wang et al. (2013) and Murray et al. (2006).

suggested that expansions of the US safety net for children since 1990 had been effective in protecting and improving the health of children, even in the face of rising income inequality.

Changes in the safety net meant that while the number of US children who were officially poor stayed roughly constant, the number of children who were counted as poor, using a supplemental poverty measure that includes transfer income, fell from 25 per cent to 16 per cent between 1990 and 2010.² Moreover, the number of children with health insurance increased dramatically due to expansions of the Medicaid programme and the creation of the Child Health Insurance Program.³

The Currie–Schwandt approach lends itself to comparisons across countries as, in principle, each country in the comparison can be treated similarly (i.e. rank areas by poverty rates and then examine area-level mortality rates by demographic group across census years).

Baker, Currie and Schwandt (2019) adopted this approach to compare the US and its neighbour, Canada. Despite many similarities across the two countries, they found that mortality was lower for every age and gender group in Canada compared with the US, and that it was also much more equally distributed. In many age and gender groups, mortality rates in the richest US places were similar to those in Canada, indicating that the higher US death rates were concentrated in poorer areas. Hence, in a very real sense, higher overall US death rates are a reflection of inequality between rich and poor.

Looking over time, Baker, Currie and Schwandt showed that between 1990 and 2010, death rates for young children in the US converged towards the lower Canadian levels, with the gradient between rich children and poor children becoming more similar in the two countries. This flattening of the US gradient to match the lower and flatter Canadian gradient only occurred for children. For other age groups, gaps between Canadian and US death rates remained large and US gradients remained much steeper. Hence, this analysis provided additional evidence consistent with the idea that improvements in the US safety net to protect children had been effective in reducing child death rates, even in the face of growing income inequality.

Currie, Schwandt and Thuilliez (2020) compare the US and France. They show that inequalities in mortality are also much lower in France than in the US. One interesting pattern is that, in 1990, mortality rates in the richest parts of France were initially higher than mortality rates in the richest areas of the US for middle-aged men, suggesting that the flat profiles were partially the result of relatively high French death rates among the rich. By 2010, this pattern had disappeared and French rates were lower than US death rates in all areas for both men and women, with the largest gaps in poor areas.

²National Academies of Science, 2019.

³Currie and Duque, 2019.

Probing causes of death, they found that for younger adult men, much of the gap could be explained by a higher prevalence of violent deaths in the US. Surprisingly, ‘deaths of despair’ did not explain much of the gap – France had fewer overdoses but more deaths due to chronic liver disease and suicides than the US.

This study updates some of the findings discussed above to 2016 (for Canada) and 2018 (for the US and France), the most recent available years of data. Overall, as we show, the US trends are sobering – in less than a decade, mortality not only ceased to fall, it rose sharply in many age groups. This deterioration in people’s health prospects occurred against a backdrop of continued improvement in Canada and France. Moreover, the one bright spot in the US picture seems to have darkened as the trend among children towards mortality rates that were both lower and more equally distributed has stalled and reversed among children over five years old. This later result may reflect the accelerating unravelling of the US safety net for children since 2016, as public health insurance has become increasingly difficult to obtain, and families with immigrant members shrink from utilising public programmes that their children are entitled to for fear of jeopardising their immigration status.⁴ It likely also reflects the impact of the opioid epidemic on adolescents as the epidemic continues to move into younger age groups.

Together, these results suggest that there is nothing mechanical about the link between inequality in incomes and inequality in health outcomes. While inequality in income tends to lead to unequal health outcomes, this tendency can be combatted through appropriate public policy, so that everyone has an equal chance to live a long and healthy life.

II. Data and methods

Because this paper represents an update of work presented in Currie and Schwandt (2016), Baker, Currie and Schwandt (2019) and Currie, Schwandt and Thuilliez (2020), in this section we provide only a general overview of our data and procedures.

1. US data

Dividing counties into groups that represent equal fractions of the population is not an exact procedure because counties at the margin will overlap the bins, making one group too large and another group too small.⁵ In practice,

⁴Currie, 2020; Currie and Chorniy, 2021.

⁵In order to smooth the size of the county groups, we divide the five largest counties in our sample – Cook County, IL (which includes the city of Chicago), Los Angeles County, CA, Riverside County, CA, Harris County, TX (including Houston) and Maricopa County, AZ (including Phoenix) – into three smaller groups, each of identical size and with identical mortality rates.

however, this variation in county group size is relatively small, and it is not systematically related to county-level poverty.⁶ We use the decedent's county of residence from the vital statistics data, because the county of residence is what the census reports, rather than the county where the death occurred (vital statistics report both).

In order to account for changes in the age structure within age groups (e.g. the fact that within a group such as 20–49 the age distribution can change over time so that there are, for example, relatively more people in their 40s and fewer people in their 20s), we age-adjust mortality rates in 2000 and 2010 using the 2015 population. This means that we apply the age-specific mortality rates in 2000 and 2010 to the 1990 population, which effectively keeps the age composition within broader age groups constant over time. The same age adjustment using the 2015 US population is applied to the Canadian and French data, accounting not only for changes in the age structure within broader age groups, but also for differences in the age structure across countries.

US poverty rates are taken from the census (in 1990 and 2000) and from the American Community Survey (ACS) in 2010 and 2018. The ACS replaced the long form of the census. In the US, the Census Bureau measures the official poverty rate using a set of money income thresholds that vary by family size and composition. If a family's total income is less than the family's poverty threshold, then that family and every individual in it is considered poor.

As in Currie and Schwandt (2016), we re-ranked counties using the poverty rate in each census year. However, this re-ranking has little impact on the analysis because the ranking of counties by poverty status is quite stable over time.

2. Canadian data

In Canada, a census takes place every five years. Here we use data from the 1991, 2001 and 2016 censuses. For the 2011 census, the federal government of the day replaced the mandatory long-form census with the voluntary National Household Survey (NHS), which was distributed to one-third of households. The response rate was under 70 per cent compared to the usual response rate in Canada of over 90 per cent. As a result, data from 2011 have greater sampling error and may be subject to reporting biases, so we have omitted 2011 here in favour of focusing on 2016 data, which were collected using the traditional census.

⁶Most of the poorest counties that together make up 10 per cent of the US population in both 1990 and 2010 were located in the South and Southwest, together with some counties in the Midwest (in particular, in South Dakota), and in Alaska. Conversely, the counties with the lowest poverty rates that make up 10 per cent of the population in both 1990 and 2010 are predominantly located in the North, with clusters in the Northeast.

The geographic unit we use in Canada is called a census division (CD). CDs are smaller than provinces and territories but larger than tertiary census subdivisions, such as municipalities. In five of ten provinces, CDs generally correspond to counties. However, some CDs, such as the city of Toronto, are very large.

Canada did not have an official poverty line over the sample period.⁷ However, the low income cut-off (LICO), a measure based on the proportions of income spent on food and shelter, has effectively functioned as a poverty line in the absence of an official version. Using the LICO, Canadian cities have high shares of 'low-income' households because Statistics Canada defines the LICO to be higher in larger cities. In fact, when mortality rates are ranked by the LICO in Canada, places with the highest shares of low-income people have the lowest death rates. This surprising result is entirely driven by the largest cities, suggesting that the wrong-signed mortality gradient is an artefact of the higher thresholds being used to define the LICO in these cities. In order to deal with this issue, we created a 'fixed cut-off' LICO that is more comparable with the US national poverty line because it uses the same income cut-off in all jurisdictions.⁸

We construct three-year averages of one-year mortality rates by age, centred on the census years of 1991, 2001 and 2016. Because we only have the denominator (the population counts) of the mortality rate for census years, we construct the rates for 1990, 1991 and 1992, for example, as the vital statistics counts of deaths in these years with respect to the corresponding population count in 1991. We then average these three estimates to construct the '1991' rate. The population counts are taken from the 100 per cent short-form census in the relevant year. The assignment of CDs to ventiles is on the basis of the fixed cut-off LICO rates calculated from the, one-third, long-form census for each census year. This departs from Baker, Currie and Schwandt (2019), who rank the CDs in each census year based on the fixed cut-off LICO rates from the 2001 census. That is, we re-rank the data using our proxy for the poverty line in each year, just as we do for the US data discussed above.⁹ As mentioned above, mortality rates in the Canadian data are age-adjusted using the 2015 US population to facilitate comparisons. In practice, age adjustment had little impact on the results.

⁷The market basket measure (MBM) became the official poverty line in Canada starting at the end of 2018. The MBM thresholds are not available for the entire period under study.

⁸Specifically, we use the LICO thresholds for 'small urban regions', which are urban areas of less than 30,000 people, and we apply them to all CDs.

⁹Baker et al. (2019) did not re-rank areas in each year because of the problems with the 2011 Canadian data.

3. French data

In France, we focus on mortality trends in groups of départements, which is the level of government in between the administrative region (until 2015, there were 27 of these regions; in 2016, the number was reduced to 18) and the smaller communes. The data come from the Institut National de la Statistique et des Etudes économiques (INSEE)¹⁰ and we also take three-year moving averages of one-year mortality rates by age, centred on the census years of 1990, 2000, 2010 and 2018. To date, 2018 official mortality rates have not been provided by INSEE. The last official death rates were for 2016. Hence, for the 2018 three-year mortality rate, we used the raw registries of deaths received and processed by INSEE. Our results for this year should be reasonably representative of the situation in France, but they should be considered preliminary and may differ from future official statistics.¹¹

We rank all 96 mainland départements in 1990, 2000, 2010 and 2018 by their poverty level in 2017 and then we divide them into 20 roughly equal groups. We use the 2017 level for all years because the poverty and income measures available from INSEE before 1996 are not produced using a single consistent methodology and because the data at the department level were not available before 2006.¹² The results are not sensitive to ranking by poverty rates in 2010 instead, and Currie, Schwandt and Thuilliez (2020) show that the use of other proxies and rankings does not affect the results.

INSEE, like other European countries, measures income poverty with respect to the distribution of income in the whole population. Specifically, in France, a family with income less than 60 per cent of the national median family income is considered poor.

As mentioned above, mortality rates in the French data are also age-adjusted using the 2015 US population for the sake of comparability. This means, for example, that differences between the profiles of people aged 20–49 in the US and France are not due to the population of the US being relatively younger or older within that group.

¹⁰See Bonnet (2020) for a methodological presentation and discussion of the data.

¹¹Municipalities have a legal deadline of one week for sending death notices to INSEE. If the death certificate is sent on paper, there is an additional time limit for sending it by post and for it to be entered by the INSEE services. In practice, these legal deadlines may be extended for some municipalities in special situations. Several other checks and restatements are also carried out by INSEE on the raw mortality data in relation to population estimates, before official statistics are shared.

¹²For more details, please refer to: Insee-DGI, enquêtes revenus fiscaux 1975 à 1990; Insee-DGI, enquêtes Revenus fiscaux et sociaux rétrospectives de 1996 à 2004; Insee-DGFiP-Cnaf-Cnav-CCMSA, enquêtes Revenus fiscaux et sociaux 2005 à 2018 (<https://www.insee.fr/fr/metadonnees/source/serie/s1231>).

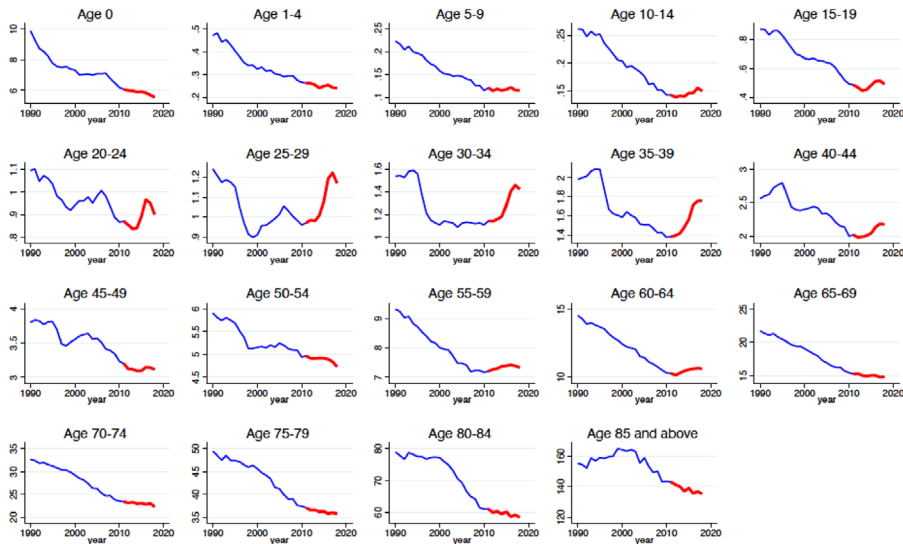
III. Evolution of overall mortality in the US

Figure 1 shows the evolution of overall mortality in the US by age group.¹³ The thinner blue line shows trends from 1990 to 2010, while the thicker red line shows data from 2010 to 2018. The figure shows some evidence of continued improvements for infants and children younger than 5 as well as for those aged over 65. After slowing declines during much of the 2000s, deaths in the under-5 age group resumed their falling trend and continued to fall until 2018. Among the elderly, mortality also continued to decline between 2010 and 2018, though at a slower rate than between 2000 and 2010. However, in other age groups, mortality increased. After falling continuously since 1990, mortality among those aged 5–19 rose. There were abrupt and dramatic increases among prime-age people (the 20–49 age group), as well as a smaller increase among those aged 50–64.

Figure 2 summarises the data for all ages by showing the evolution of US life expectancy since 2000. The figure shows that the increases in mortality largely reflect the impact of the US's raging opioid epidemic, which has

FIGURE 1

Age-specific mortality in the US, 1990–2018

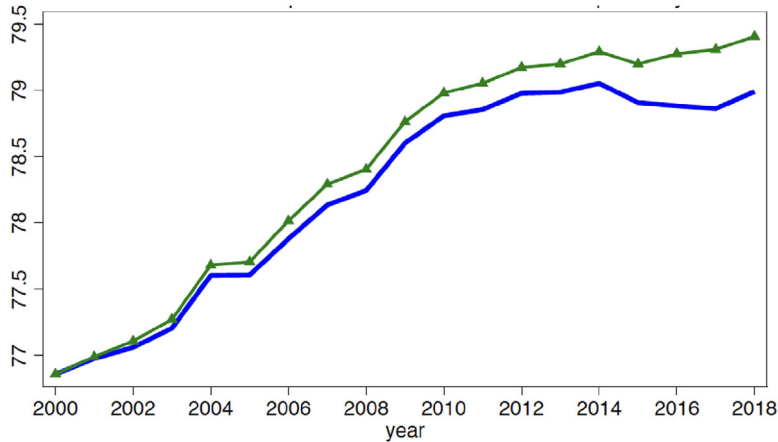


Note: The y-axis shows deaths per 1,000. The thinner blue line shows data up to 2010, while data from 2010 to 2018 are shown by the thicker red line.

¹³A similar figure for France is provided in the appendix of Brüning and Thuilliez (2019).

FIGURE 2

Actual life expectancy, and the life expectancy that would have prevailed had overdose deaths remained at year 2000 levels



Note: The y-axis shows life expectancy at birth in years. The thicker blue line shows the evolution of actual life expectancy. The green line with triangles shows the life expectancy that would have prevailed had overdose deaths stayed at their year 2000 levels.

Source: Authors' calculations.

become increasingly deadly since the introduction of synthetic prescription opioids such as OxyContin® in the late 1990s. The thick solid line in Figure 2 plots actual US life expectancy, which fell from 2014 to 2017 before recovering slightly in 2018. The figure also shows the counterfactual life expectancy measure that would have existed if deaths due to drug overdoses had stayed at their 2000 level for all age groups. The divergence between the two lines illustrates the increasing impact of the opioid epidemic. Although this divergence was notable before 2010, it has grown much larger since then, reflecting the increasing number of addicts who have turned to deadly illegal opioids such as fentanyl.

Currie and Schwandt (2021) argue that one of the main factors driving the opioid epidemic in the US has been largely unregulated prescribing of opioids, which continues to be much more extensive than in any other country. Such prescribing predictably creates addicts, who then provide a thriving market for illegal opioids. A lack of adequate treatment is a third factor creating a 'perfect storm' of addiction and death. Reports suggest that the same pharmaceutical companies that sparked the epidemic in the US are seeking to expand sales in other countries by lobbying to reduce regulatory barriers to opioid prescriptions and by working to popularise the idea that physicians

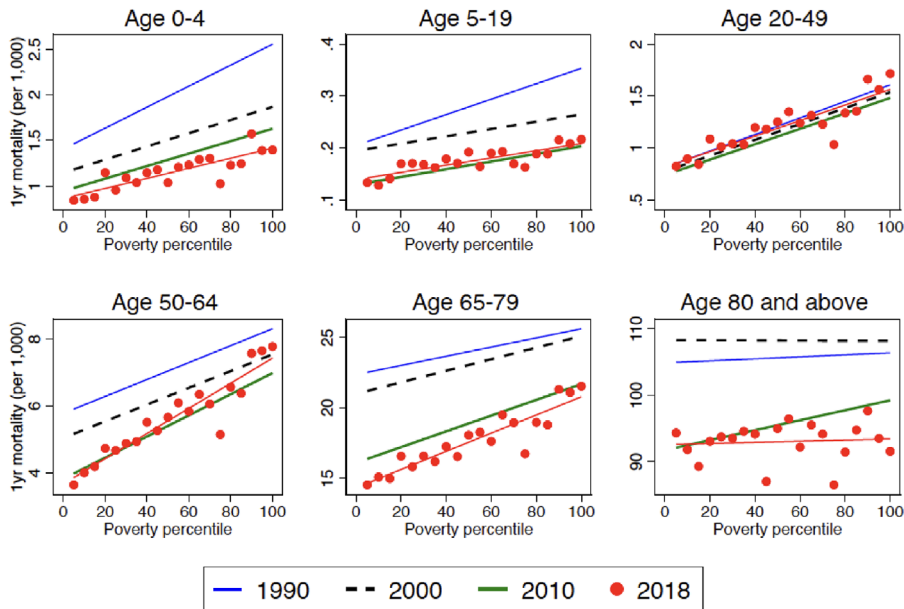
have a duty to treat pain aggressively.¹⁴ The US experience should serve as a cautionary tale.

1. Inequality in mortality in the US

Discussions of overall trends in mortality shed little light on its distribution. Figures 3 and 4 follow Currie and Schwandt (2016) but add a fourth line showing the poverty–mortality ‘gradients’ for 2018. Each line represents a regression through 20 points representing the relevant age-specific mortality rate in each ventile of counties in each year. To avoid clutter, the markers showing the mortality rates for each ventile are suppressed, except for the lines for 2018. For ease of interpretation and comparability with the other countries

FIGURE 3

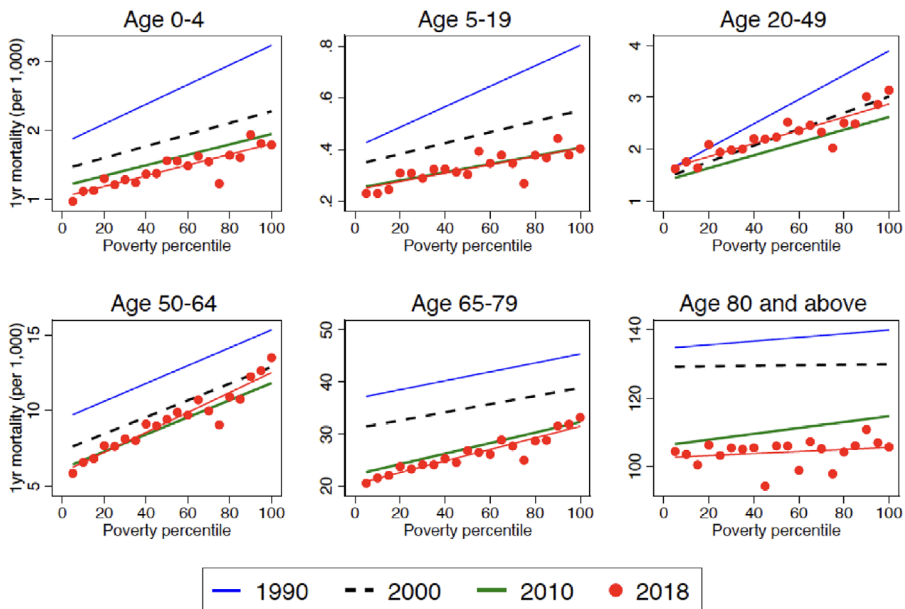
Evolution of inequality in mortality among women in the US, 1990–2018



Note: The richest areas are those with the lowest poverty percentiles (i.e. those at the extreme left of each graph). As richer areas have lower death rates, the gradient lines slope up. Each line runs through 20 points similar to those shown for 2018. To avoid clutter, those points have been suppressed for the other years.

¹⁴Ryan, Girion and Glover, 2016.

FIGURE 4
Evolution of inequality in mortality among men in the US, 1990–2018



Note: The richest areas are those with the lowest poverty percentiles (i.e. those at the extreme left of each graph). As richer areas have lower death rates, the gradient lines slope up. Each line runs through 20 points similar to those shown for 2018. To avoid clutter, those points have been suppressed for the other years.

in this volume, these figures and those that follow focus on six age groups: 0–4, 5–19, 20–49, 50–64, 65–79 and 80+. The qualitative findings are quite similar in more disaggregated age groupings.

Because areas are ranked from richest to poorest, the gradients slope upwards, indicating that richer areas have lower death rates than poorer ones. The flatter the line, the more equally mortality is distributed across rich and poor areas. The distance between the lines shows how the gradients have evolved over time. If mortality falls more for the poor than for the rich, the lines will become flatter, and vice versa. If the lines shift in a parallel way over time, then mortality is changing similarly in all places.

Figure 3 shows gradients for women. As men tend to have higher mortality than women at all ages, it is useful to separate the age groups by gender. In children younger than 5, mortality continued to fall but at a slower rate than between 1990 and 2000 (when it declined greatly) or between 2000 and 2010. Mortality declined more in the poorest areas than in the richest areas, leading to slight reductions in inequality in mortality.

Among girls aged 5–19, mortality increased, reversing two decades of large declines. There is some suggestion that it may have increased by a greater amount in the richest areas, leading to slightly less inequality but at a cost of greater overall mortality.

Women aged 20–49 show large increases in mortality rates in all areas, reversing all of the improvements in mortality that occurred between 2000 and 2010. In the richest areas, mortality increased and returned to levels last seen in 1990, while in the poorest areas, mortality remained slightly less than in 1990. Hence, as in the 5–19 age group, among women there is some reduction in inequality in mortality but at a cost of higher overall mortality levels, especially in richer areas.

The main difference between the patterns among women aged 50–64 and among women aged 20–49 is that among rich women aged 50–64 mortality stalled at its 2010 level through to 2018, rather than increasing. In the poorest areas, mortality rates increased and returned almost to levels last seen in 2000, erasing all of the progress that had occurred among women aged 50–64 in these areas between 2000 and 2010.

Women aged 65–79 continued to see declines in mortality, though at a much slower rate than between 2000 and 2010. These declines were greater in the richest areas, leading to increases in inequality in mortality. In contrast, among women aged over 80, there were large declines in mortality in the poorest areas without any decline in the richest areas. This led to a gradient that was almost flat among the most elderly women in 2018.

Figure 4 shows comparable information for men. Changes in the gradients for men are, for the most part, remarkably similar to those for women at all ages. One difference is that the deterioration in mortality between 2000 and 2018 is more pronounced among men aged 20–49 than it is among women. A second difference is that the improvement in mortality among men aged 65–79 is much smaller than among women that age. One possible reason for improvements among women relative to men in this age group is that doctors have started to treat conditions such as heart disease more aggressively in older women.

The patterns for most of the younger age groups may reflect the fact that opioids have been an equal opportunity scourge, affecting both men and women, and both rich and poor. This latter observation is consistent with the fact that most prescription opioids are actually paid for by employees' private health insurance plans. So, wealthier people may actually be more exposed to the risk of becoming addicted by being prescribed opioids. Still, overdose deaths rates are higher for poorer and less-educated people, which may reflect a greater tendency to transition to illegal opioids, less access to treatment, or other factors.¹⁵

¹⁵Currie and Schwandt, 2021.

2. Comparisons between the US and Canada

Canada is arguably quite similar to the US, in terms of standards and modes of living, and available medical technology. Canada is also similar to the US in being a large country where people drive long distances, a factor that leads to higher numbers of automobile deaths. Canada is also suffering an opioid epidemic¹⁶ driven by the same factors as the US epidemic, although the Canadian epidemic is not as severe.

However, Canada differs in two key respects from the US. First, there is less income inequality. Second, Canada's public health insurance system covers the entire population and leaves little role for private provision of health care.¹⁷ Hence, a comparison of health inequalities in these two countries arguably offers insights into the effects of providing a comprehensive system of public health insurance and a more robust social safety net. Figures 5 and 6 suggest that these factors are incredibly important.

Figure 5 shows gradients for women. As in Baker, Currie and Schwandt (2019), we can see the strong narrowing of the gaps between rich and poor children aged 0–4. Although in the poorest areas, US children in this age group still had mortality rates about 75 per cent higher than comparable Canadian children, in 1990 they had rates 200 per cent higher. Among girls aged 5–19, Canadian mortality rates in 2019 were everywhere much lower than in the US. It is striking that the Canadian gradient is flat, indicating equal (and low) probabilities of death across the country.

Among women aged 20–49, the differences between the US and Canada are even more striking. Figure 5 shows that there has been virtually no improvement in female mortality in this age group in the US since 1990, in either rich or poor areas. In contrast, Canada continued to see improvements in mortality and a flattening of the mortality gradient. Focusing for a moment on rich areas, we can see that, in 1990, women in Canada and the US had approximately equal mortality rates. But, by 2018, even US women in rich areas had fallen behind comparable Canadian women.

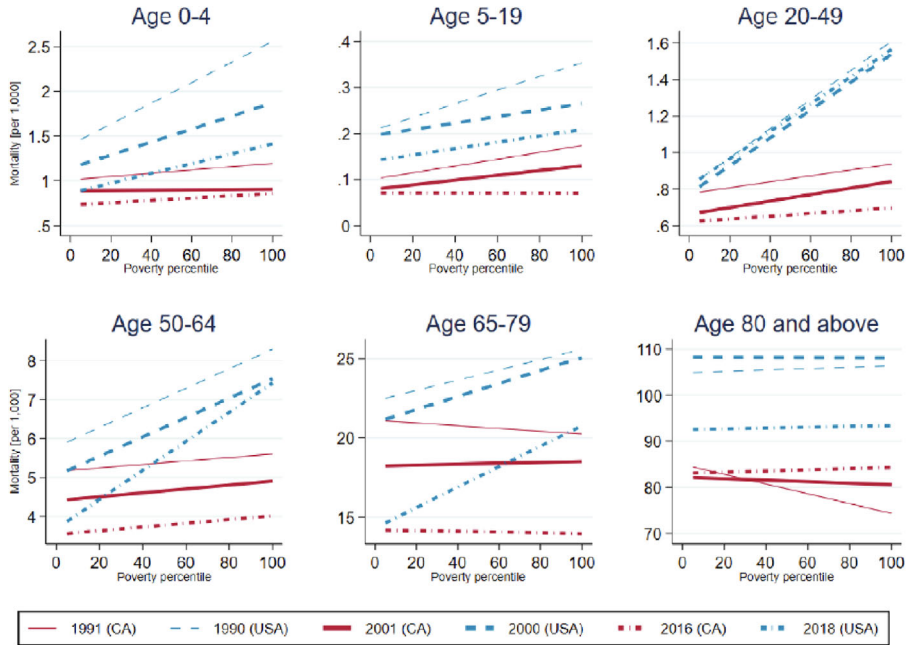
Among women aged 50–64, the overall pattern is one in which Canadian lower mortality rates continued to fall in a roughly parallel way, while in the US, mortality fell more in rich areas than in poor areas, as discussed above. Among women aged 65–79, there was little change in mortality gradients, and the main story is a huge decline in mortality in both the US and Canada. The similar developments in the two countries lend support to the idea that they may be a result of greater access to medical technologies for older women, fuelled by the realisation that diseases such as heart disease and strokes kill women as well as men.

¹⁶See, for example, Belzak and Halverson (2018).

¹⁷In the Canadian system, private provision is generally prohibited except in specific areas such as physiotherapy and psychological services, where public provision is limited.

FIGURE 5

Evolution of inequality in mortality among women in the US and Canada, 1991–2016



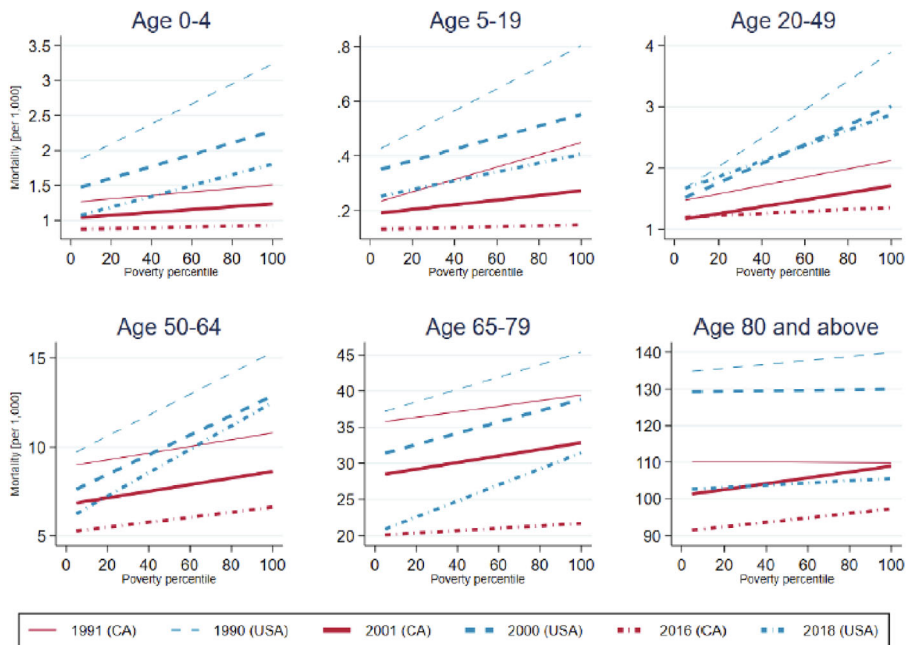
Note: The richest areas are those with the lowest poverty percentiles (i.e. those at the extreme left of each graph). As richer areas have lower death rates, the gradient lines generally slope up. Each line runs through 20 points corresponding to approximately 5 per cent of the population.

For women aged 80 and above, we see once again the huge improvement in the US between 2010 and 2018, and the almost flat gradient. In Canada, there is a wrong-signed gradient for 1990, a flat gradient for 2001 and a small increase in mortality rates in 2018 relative to 2001. This increase in mortality rates among elderly women deserves to be investigated further to see, for example, if it might reflect increased rationing of medical services through delays in access to care.

Figure 6 shows the equivalent results for men. The takeaways are similar to those from Figure 5, with some notable differences. First, in the US, men aged 20–49 in poor areas did see declines in mortality between 1991 and 2001, but there has apparently been little progress since then, in contrast to Canada where the mortality gradient became almost flat. There were also only small improvements in mortality between 2010 and 2018 for men aged 50–64. For men aged 65–79, there was great progress in reducing mortality between 2010 and 2018 in addition to earlier gains. If this decline is a result of better medical

FIGURE 6

Evolution of inequality in mortality among men in the US and Canada, 1991–2016



Note: The richest areas are those with the lowest poverty percentiles (i.e. those at the extreme left of each graph). As richer areas have lower death rates, the gradient lines generally slope up. Each line runs through 20 points corresponding to approximately 5 per cent of the population.

care, it would suggest that men gained access to these improvements before women did.

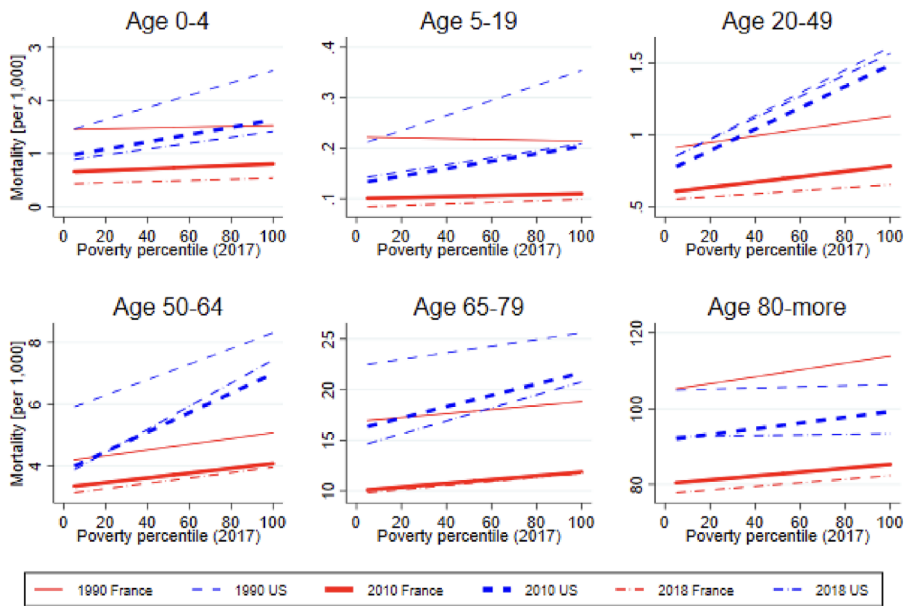
Most strikingly, in the 80+ age group, mortality rates among Canadian men declined across the board, in contrast to the slight increase in rates among Canadian women. Thus, since 2001, there appears to be a declining gender gap between the oldest Canadian men and the oldest Canadian women, driven by rising mortality rates among Canadian women and falling rates among Canadian men. Because men had higher mortality rates to begin with, it is possible that the increasing focus on causes of death in elderly men has come at the expense of attention to reducing mortality among Canadian women.

3. Comparisons between the US and France

This comparison is of interest in part because the French and US health care systems are often compared. The so-called French model – with its principle of equal access to care – aims to promote equality of access to health care

FIGURE 7

Mortality gradients for women in the US and France, 1990–2018



Note: The richest areas are those with the lowest poverty percentiles (i.e. those at the extreme left of each graph). In the US, the figures are based on 20 groups of counties, while in France they are based on 20 groups of départements. As richer areas have lower death rates, most of the gradient lines slope up. Each line runs through 20 points. To avoid clutter, those points have been suppressed for all other years.

among citizens.¹⁸ The broader social safety net in France is also believed to play a role in supporting health.¹⁹ In 2000 (before the recent US Affordable Care Act, sometimes known as Obamacare), the French health care system was regarded by the World Health Organization as one of the best health care systems in the world, while the US ranked only 54th in the World Health Report 2000.²⁰ France also has a more equal income distribution than either the US or Canada.

Figure 7 compares mortality gradients for women in the US and France. As in the comparison between the US and Canada, the fact that mortality gradients for France are so much flatter than those for the US is one of the most striking features of the figure. These flat profiles indicate that mortality risk is evenly spread across rich and poor areas of France among children. There is still a slight gradient at older ages, though the gradient is still much flatter than in the US. Gradients among the middle-aged also became noticeably flatter in

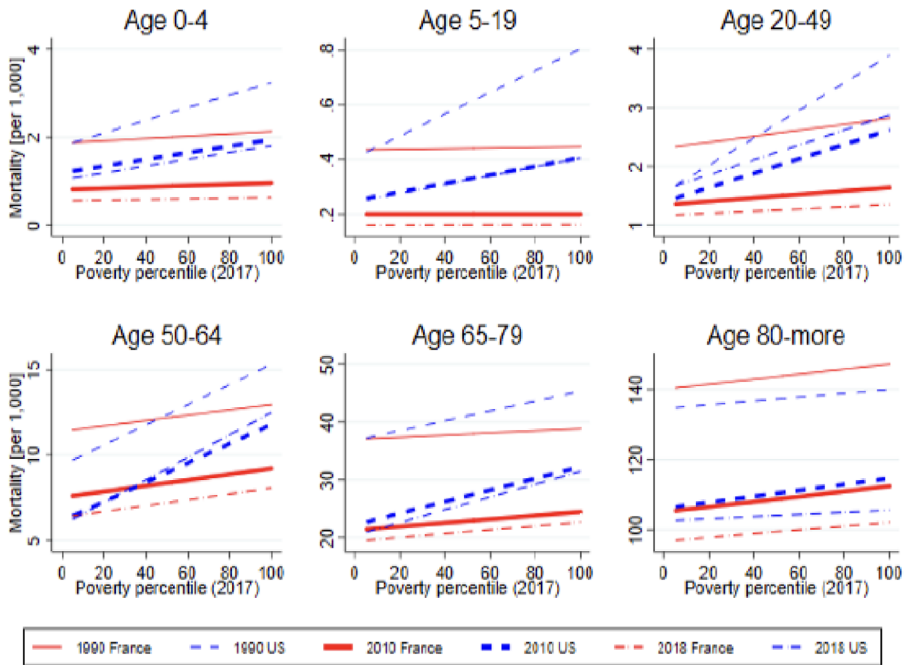
¹⁸Nay et al., 2016.

¹⁹Brüning and Thuilliez, 2019.

²⁰World Health Organization, 2000.

FIGURE 8

Mortality gradients for men in the US and France, 1990–2018



Note: The richest areas are those with the lowest poverty percentiles (i.e. those at the extreme left of each graph). In the US, the figures are based on 20 groups of counties, while in France they are based on 20 groups of départements. As richer areas have lower death rates, most of the gradient lines slope up. Each line runs through 20 points. To avoid clutter, those points have been suppressed for all other years.

France between 2010 and 2018, showing a trend towards even greater equality in the last decade.

Another notable feature of the data is that while in 1990 US and French mortality rates were quite similar for most age groups in rich areas, by 2018 mortality rates in France were lower in all areas in all age groups. The gaps were especially large in poor areas. Hence, while things were moving backwards in the US in terms of both higher mortality rates in the adolescent to middle years and more inequality in mortality, France continued to make progress in terms of reducing both death rates and inequality in mortality. It was only among the elderly that the US showed any gains relative to France. Among the elderly, the gaps between the US and France narrowed, especially in the poorer areas. It may be no coincidence that the elderly are the one group that have universal health insurance in the US.

Figure 8 shows the same mortality gradients for men. The story for men is similar to that for women, with French gains in terms of both lower mortality

levels and reduction in inequality in mortality. Focusing on the most recent period between 2010 and 2018, we see that, in the US, mortality improvements stalled or were reversed in most age groups except for the 80+ age group. In contrast, France continued to see improvements in mortality in all age groups over this period.

IV. Discussion and conclusions

Perhaps we should not be surprised that trends in inequality in mortality have evolved so differently both within countries over time and across countries. Income inequality grew in all three countries discussed here (though it remained much lower in France, and somewhat lower in Canada, than in the US). But the policy environment differs tremendously within and across countries, particularly with regard to health care.

Differences in the provision of public health insurance may be among the most important policy differences. The two groups that continued to see mortality declines in the US are those who are most comprehensively covered by public health insurance: the old and the very young. While millions gained health insurance following the passage of the Affordable Care Act in 2010, those gains have been eroded, especially during the past four years as administrative changes to the Medicaid programme (which covers low-income Americans) have made it increasingly harder for people to enrol and remain enrolled.²¹

General safety net programmes are also likely to have had an impact. For example, Canada has recently expanded its anti-poverty programmes, including the introduction of the Canada Child Benefit, a tax-free monthly per-child payment, the expansion of the Canada Workers Benefit, which is a refundable tax credit for low-income workers, and an enhancement of the Guaranteed Income Supplement for vulnerable seniors. In France, social protections for children are already extensive and, as shown above, mortality rates among children are very low. Hence, discussions are focusing on how to improve the health and autonomy of the elderly.²²

At the same time, the US has made it more difficult to access safety net programmes, such as the Supplemental Nutrition Assistance Program, by imposing work requirements and other administrative barriers. Most recently, the Trump administration had threatened to deport legal immigrants who used safety net programmes, including public health insurance, deeming them a 'public charge'.

²¹Currie and Chorniy, 2021.

²²See *Grand âge et autonomie* (https://solidarites-sante.gouv.fr/IMG/pdf/dossier_de_presse_grandage-autonomie.pdf).

A third set of policies that are extremely important pertains to the opioid crisis. The US has a fragmented system in which drug manufacturers and providers advertise directly to consumers and are often rated and compensated on the extent to which they manage a patient's pain. US jurisdictions have been slow to implement monitoring of opioid prescribing or to promote effective medication-assisted treatment for those who become addicted. In fact, the US sharply limits the ability of providers to treat opioid addiction effectively, even though it places few limits on opioid prescribing.²³ Canada also has a problem with opioids, though it has been less severe than in the US, perhaps because the Canadian system is somewhat more unified in terms of creating guidelines for prescribing and treatment. Like most other European countries, the French have so far largely escaped this epidemic through the maintenance of strict controls on opioid prescribing and a reliance on safer drugs for medicating pain.

A fourth set of policies concerns the adoption of health technologies. In the US, this is done in a decentralised way that is sensitive to the incentives of individual providers. Because Medicare, the health insurance programme covering seniors, provides relatively generous reimbursement for high-tech services and procedures, such procedures are widely available whether they are efficacious or not.²⁴ In Canada and France, decisions about technology adoption are more centralised and so availability of services may lag the US in some areas. Currie, Schwandt and Thuilliez (2019) reported that cancer death rates were actually higher for men in France than in the US. In Canada, the rise in death rates for women aged over 80 (especially striking given the decline in mortality in the same cohort of men) may reflect decisions about the way that new technologies are adopted or allocated.

In contrast to the important effects of policy, it is unlikely that differences in health behaviours, such as smoking, drinking or unhealthy eating, and obesity can explain the trends in the cross-country differences that we see. Banks et al. (2006) show that British citizens have lower morbidity than Americans even though they tend to smoke and drink more and are almost equally likely to be overweight. The same is likely true of Canadians. And while the French have lower rates of obesity, obesity rates are increasing in France,²⁵ rates of cirrhosis are higher, and the French smoke more than Americans.²⁶ Some of the differences between cohorts within countries may possibly be explained by things such as historical differences in smoking patterns, as past smoking

²³Currie and Schwandt, 2021.

²⁴Chandra and Skinner, 2012.

²⁵See the OECD web page, Obesity and the Economics of Prevention: Fit not Fat – France Key Facts (<https://www.oecd.org/els/health-systems/obesityandtheeconomicsofpreventionfitnotfat-francekeyfacts.htm>).

²⁶Pampel et al., 2017.

can have long-term negative consequences even among people who have not smoked for many years.²⁷

Moreover, health behaviours themselves are shaped by public policy. Declining smoking rates in the US reflect many years of multi-pronged effort ranging from higher cigarette taxes, to public service announcements, to bans on smoking in workplaces and public spaces. Also, deaths due to automobile accidents respond not only to changes in automobile technology (themselves often mandated, as in the case of seatbelts) but to a range of policies from speed limits to prohibitions on drunk driving.

A limitation of our approach is the focus on a specific poverty line or LICO in order to rank areas. However, in principle, areas can also be ranked by other measures of social welfare, such as education, median income or even life expectancy. In our past work, we have shown that these alternative rankings generally yield similar qualitative findings. This reflects the fact that measures of socio-economic status tend to move together.²⁸

This study has delineated trends in mortality rates and inequality in mortality that were in effect before the COVID-19 pandemic. It remains to be seen whether these trends will reassert themselves once the pandemic has been brought under control, or whether the pandemic itself will change health trajectories. Most obviously, the burden of deaths due to COVID-19 has fallen mainly on the elderly and this is likely to reverse much of the progress they have seen in recent decades, at least temporarily. The pandemic has also exposed the underlying health inequalities in the US in a dramatic and powerful way. It is to be hoped that the renewed focus on health inequalities will result in concrete policy actions to address them. The data presented here from Canada and France strongly suggest that health equality is possible in the US, even while economic inequalities remain – it is simply a matter of making health a public policy priority.

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²⁷Crime is not likely to be large factor over the time frame considered here as, over this period, crime was low by historical standards. See <http://www.pewsocialtrends.org/2013/05/07/gun-crime>.

²⁸There can be important exceptions. For example, in the oil sands region of Canada, and in parts of the US where fracking was important, there were pockets with relatively low education and high earnings.

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