Do Robots Cause Deaths of Despair? *

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Abstract

Increasing automation over the last half-century has led to stagnant incomes for individuals without a college education in the United States. With the development of new AI tools that can automate tasks even by high-skilled workers, there is growing anxiety about the societal implications of automation. Job loss and income declines often precede mental health crises in populations. Observers have argued that automation-driven income declines have led to an increase in mortality due to drug overdoses, suicide, and alcoholic liver disease (ALD) in the US - collectively called "deaths of despair." But evidence for whether automation is responsible for these mortality trends remains contested. We compare US mortality trends due to drug abuse, suicides, and ALD with global trends from 2000 to 2019 to uncover potential causes of the increase in deaths of despair. While mortality from suicide, ALD, and drug overdoses have reduced in most parts of the world - including low-and-middle-income countries - the US is the only major country where deaths of despair have increased. A closer look reveals that age-aggregated death rates from ALD and suicide have only increased marginally in the US over two decades. However, deaths due to drug overdoses have increased by over 300%. While our results do not rule out a causal link between automation and increasing mortality, they suggest that an increased supply of opioids is a more likely explanation for the increase in deaths of despair in the US.

Keywords: Automation, Artificial Intelligence, Mental Health, Public Policy

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1 Introduction

Policymakers are increasingly concerned about the connection between technological change, mental health, and societal outcomes. A 2024 report by the International Monetary Fund (IMF) projected that up to 40% of global employment is likely to be impacted by AI; in advanced economies up to 60% of jobs are likely to be affected [1]. Advanced economies are especially at risk since recent AI tools based on large language models have the potential to disrupt even high-skill jobs [2].

One reason to worry about technology-driven unemployment is the impact on the mental health of individuals, especially those with limited educational training. Historically, increased unemployment and declines in income have been followed by mental health crises in populations [3, 4, 5]. Ridley et. al. [6] summarize existing causal evidence on the connection between economic decline and mental health.

A large body of empirical evidence shows that structural changes in the US economy over the past half-century have led to rising mortality among working-class adults without a four-year college degree [7, 8]. This increase in mortality has been attributed to suicide, drug overdose, and alcoholic liver disease - so-called "deaths of despair" [9]. In their 2020 book *Deaths of Despair and the Future of Capitalism* [10], Anne Case and Angus Deaton argue that increased automation coupled with off-shoring of manufacturing jobs due to globalization have been key drivers of this increase in mortality.

Anxieties about the impact of automation on human welfare have surfaced periodically over history. In Chapter 15 of *Capital*, Marx outlined the central problem of automation: "the machine is a mechanism, that, after being set in motion, performs with its tools the same operations as the worker formerly did with similar tools." In his seminal 1930 essay, *The Economic Possibilities of Our Grandchildren* [11] John Maynard Keynes predicted that technological unemployment will accelerate in the 21st century in developed economies. However, he suggested that this unemployment is a temporary phase. Instead, technological advances will lead to a standard of living in developed economies that is four to eight times higher than it was in 1930.

Keynes' prediction was partially right. The GDP per capita in the UK and US is more than four times higher today than it was in 1930. However, he failed to anticipate the distributional aspects of this economic growth. Recent studies have highlighted how automation-driven unemployment and wage reduction since 1970 disproportionately affects workers without a four-year college degree [12]. The rise of AI is likely to accelerate these trends. As Erik Brynjolfsson and Andrew McAfee predict in their book *The Second Machine Age* [13]:

> Technological progress is going to leave behind some people, perhaps even a lot of people, as it races ahead. As we'll demonstrate, there's never been a better time to be a worker with special skills or the right education, because these people can use technology to create and capture value. However, there's never been a worse time to be a worker with only 'ordinary' skills and abilities to offer, because computers, robots, and other digital technologies are acquiring these skills and abilities at an extraordinary rate.

Concerns about the impact of AI on employment and wages have also figured prominently in recent labor movements. One of the central demands of the Writers Guild of America (WGA) strike in 2023 was limiting the use of AI to automate numerous tasks in the entertainment industry. Writers demanded that they get credit for their work even when studios used AI to generate scripts. A Gallup survey in 2023 found that approximately 22% of college-educated workers were worried their job will become obsolete because of technology. It is therefore timely to investigate the role of automation on key social indicators like mortality.

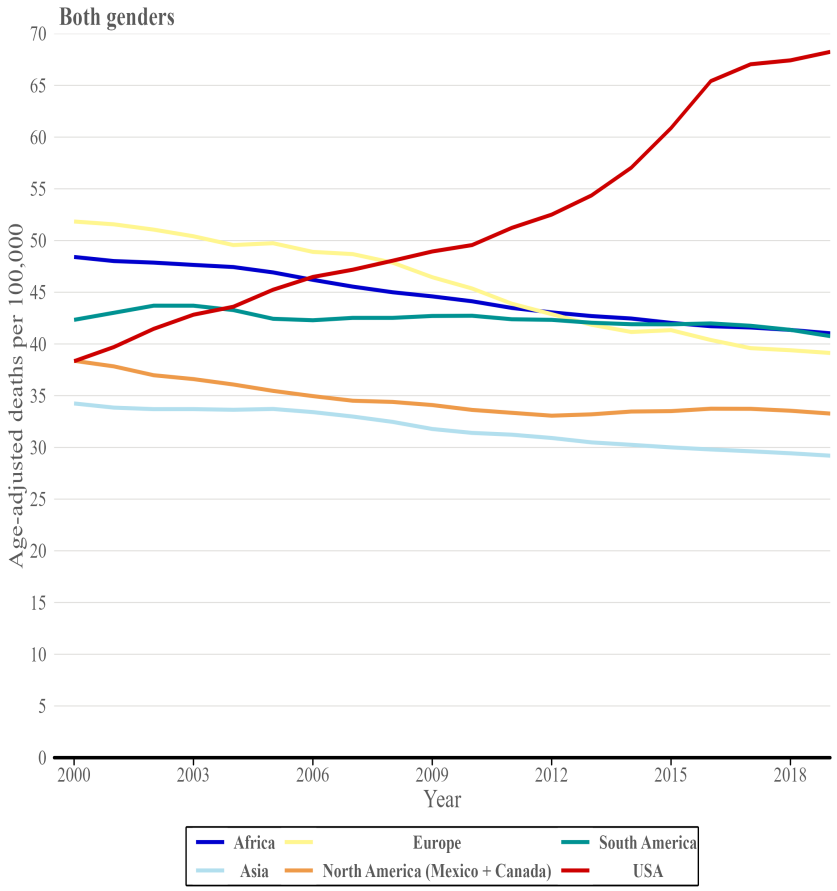


Figure 1: Aggregated deaths of despair (Suicides, Alcoholic Liver Disease, Drug overdoses) over 2000-2019. The y-axis shows the age-standardized deaths per 100,000 people.

Even before recent developments in AI, automation has been a key driver of reduced wages for blue-collar jobs in the US since the 1980s [14]. The median wages of American workers without a college degree have effectively reduced (after accounting for inflation) by approximately 15% since 1980. Since 2010, fewer than 20% of new jobs created were for workers without a college degree. These trends are likely to accelerate as AI is adopted more widely [15].

Identifying potential contributors to the increase in deaths of despair is an important

question for policymakers. Are deaths of despair due to a decline in wages and poor social mobility? Or are they a result of differences in the "drug environment"? [16] Answering this is crucial to develop effective policies to counter AI-driven societal disruption.

Evidence on causes deaths of despair remain contested. While county-level data in the US shows that experiencing economic decline led to higher growth in deaths from drug abuse, the relationship is not strong [16]. The results were consistent with deaths of despair being primarily a result of the drug epidemic, not because of adverse economic conditions caused by automation. More recently, Pierce and Schott [17] used county-level data to show that counties exposed to international trade had increases in deaths from drug abuse, even after controlling for opioid availability and healthcare quality.

The key challenge in establishing a causal link between automation and mortality is finding an exogenous variation in the adoption of automation practices. O'Brien et. al. [18] used a plausible measure of the adoption of robots in different industries at the county level developed by Acemoglu and Restrepo [19]. Combining this measure with proprietary U.S. death certificate data from 1993–2007, they estimate the causal effect of automation on mortality from a range of causes. They find that automation leads to increases in mortality from drug overdose mortality; specifically, automation explains 12% of the overall increase in drug overdose mortality among all working-age adults.

But is increased mortality amongst certain groups of workers truly due to automation? Or can it be attributed to other causes such as increased availability of drugs, particularly opiates? This warrants serious attention. Our goal in this paper is to contextualize deaths of despair globally and uncover clues for what might be driving them. Our original motivation was to investigate if similar trends have been observed in other countries globally. More importantly, it might provide clues to causal mechanisms behind increased mortality rates.

We investigate global trends in deaths of despair between 2000-2019 using newly aggregated global health data. Many countries have witnessed adverse economic conditions over the past quarter century. If economic conditions truly drive deaths of despair, we should observe them in other countries. Indeed there is some evidence that similar trends in increased deaths of despair have occurred in other advanced economies [20, 21, 22].

Our results reveal some striking patterns in deaths of despair across the world. The United States is the only major country where aggregate deaths of despair have risen during 2000-2019. Unpacking different types of deaths reveals clues about drivers of mortality. Age-standardized, suicide and alcohol-related deaths have roughly stayed the same in the US compared to other WHO geographies. However, the US is the only major country where deaths from drug overdose have risen significantly (over 300%) over the last two decades.

Our results indicate that drug availability - especially the availability of opiates like Fentanyl - might be the key driver for the increase in mortality. Note that we do not dismiss the role of automation. However, the data seems to indicate that the availability of drugs might play a bigger role in mortality increase. As far as we know, this paper is the first to analyse deaths of despair from a global lens.

The remainder of the paper is organized as follows. In Section 2 we describe our data, in Section 3 we investigate the drivers of deaths of despair globally and conclude in Section 4.

2 Data

We use data from the Institute for Health Metrics and Evaluation's (IHME) Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) [23]. This is the largest and most detailed dataset on incidence, prevalence, mortality, years lived with disability (YLDs), years of life lost (YLLs), and disability-adjusted life-years (DALYs) for 369 diseases and injuries. The dataset covers 204 countries and territories from 1990-2019 and includes 23 age groups. The GBD 2019 dataset measures age-standardized mortality rates from ALD, suicide, and drug overdose [24].

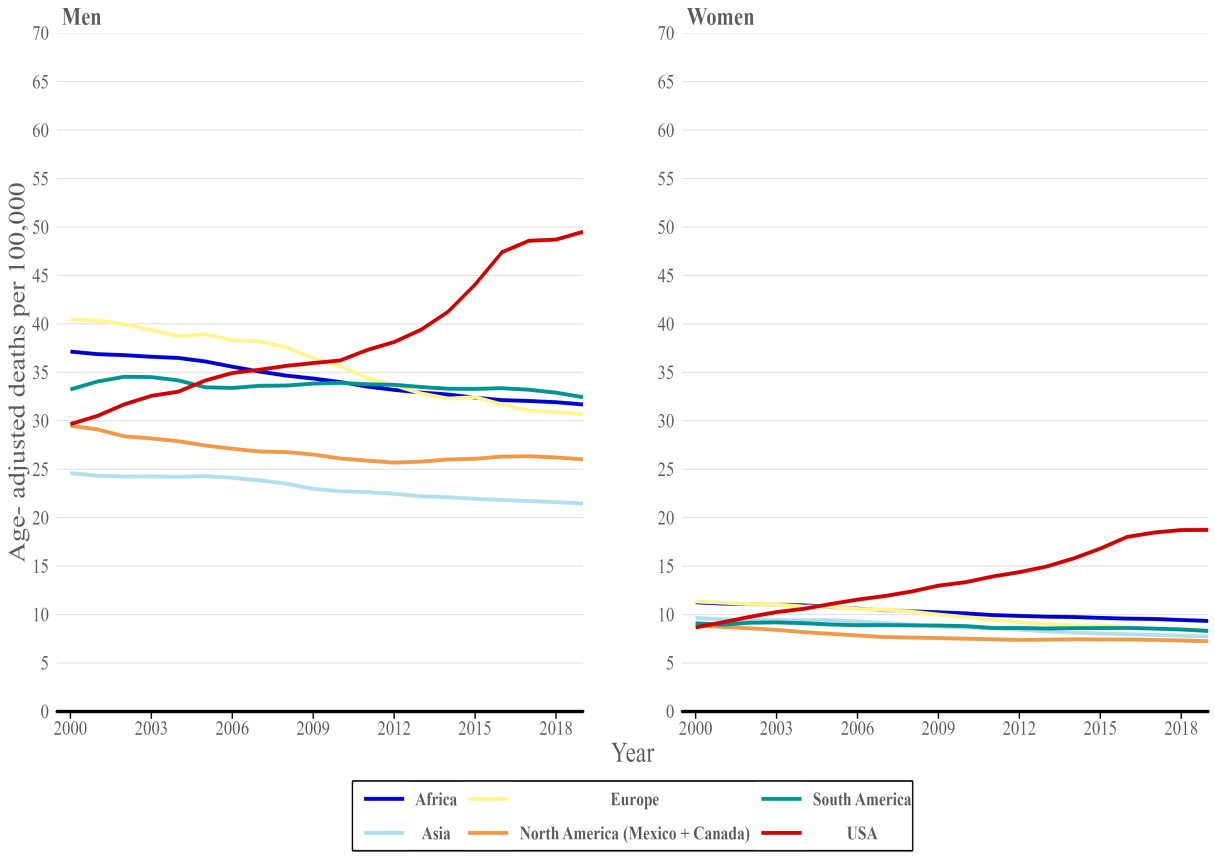


Figure 2: Deaths of despair (Suicides, Alcoholic Liver Disease, Drug overdoses) disaggregated by gender.

The GBD 2019 dataset contains age-standardized mortality rates from ALD, suicide, and drug overdose.[1] Figure 1 shows the aggregate, age-standardized death rates in the US compared to other major WHO regions.[2] The United States witnessed the largest increase in aggregate deaths of despair during 2000-2019. This is strikingly higher than all other continents, that witnessed a decline in aggregate fatalities. The US witnessed a 78% surge

[1]The IHME GBD 2019 dataset can be accessed from https://vizhub.healthdata.org/gbd-results/
[2]https://ourworldindata.org/grapher/who-regions

in the age-standardized mortality rates in this period. In contrast, overall deaths of despair declined by 15% in Africa, 3% in South America, 24% across Europe, 14% in Asia, and 13% in the rest of North America. In the US, mortality rates disproportionately increased amongst men (see Figure 2) consistent with earlier studies. We next look at trends in mortality due to individual causes - drugs, ALD, and suicide - across different regions to unpack the drivers of these trends.

2.1 Suicide

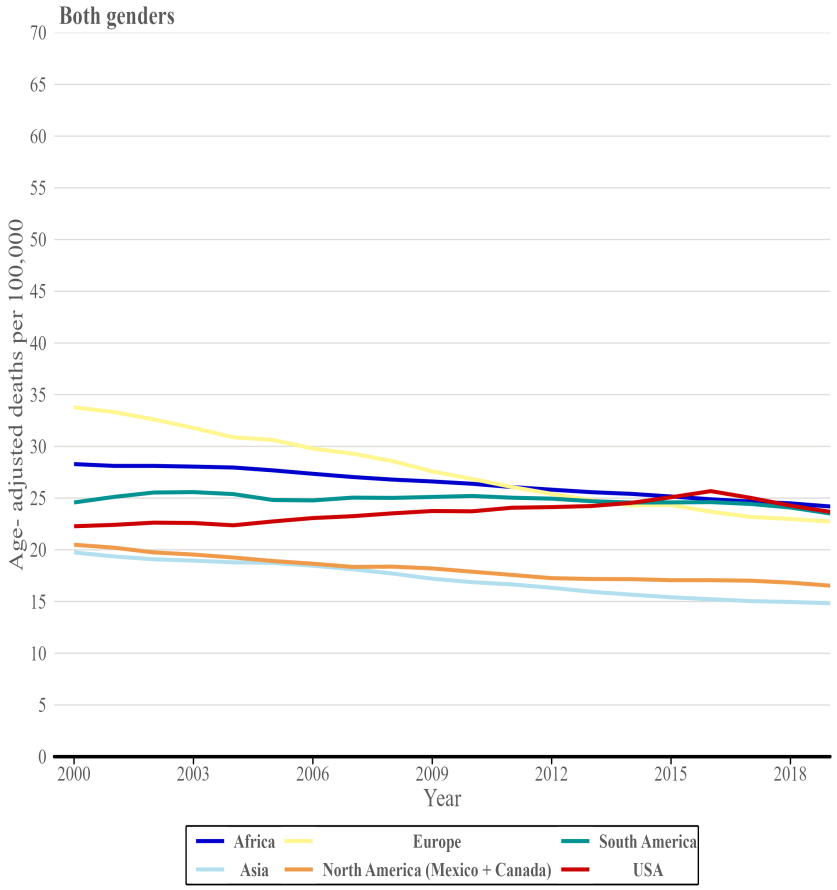


Figure 3: Aggregated age-standardized deaths from suicides. The y-axis shows the age-standardized deaths per 100,000 people.

The WHO estimates that approximately 750,000 people died from suicide in 2019, accounting for 1.3% of all deaths globally. The global age-standardized suicide rate is 9 per 100,000 population, with a majority (∼70%) of suicides occurring in low- and middle-income countries. Moreover, according to the WHO, for every suicide, there are likely 20 suicide attempts that are unsuccessful. Vulnerable groups like refugees, migrants, indigenous peoples, and LGBT individuals often have higher suicide rates [25]. From 2000 to 2019, age-standardized suicide rates in the US increased by 6.2%. In contrast, every other

continent displayed a decline. Europe witnessed a decline of 32.6%, Asia a 24.8% decrease, Africa a reduction of 14.4%, North America a 19.3% decline, and South America a 4.4% decrease (see Figure 3.)

A challenge in comparing suicide rates globally is the heterogeneity in data quality on suicide. Per the WHO, only 80 member countries collect high-quality data for the estimation of suicide rates. Social stigma and anti-suicide laws make this particularly challenging, leading to significant under-reporting or mis-classification.

2.2 Alcoholic Liver Disease

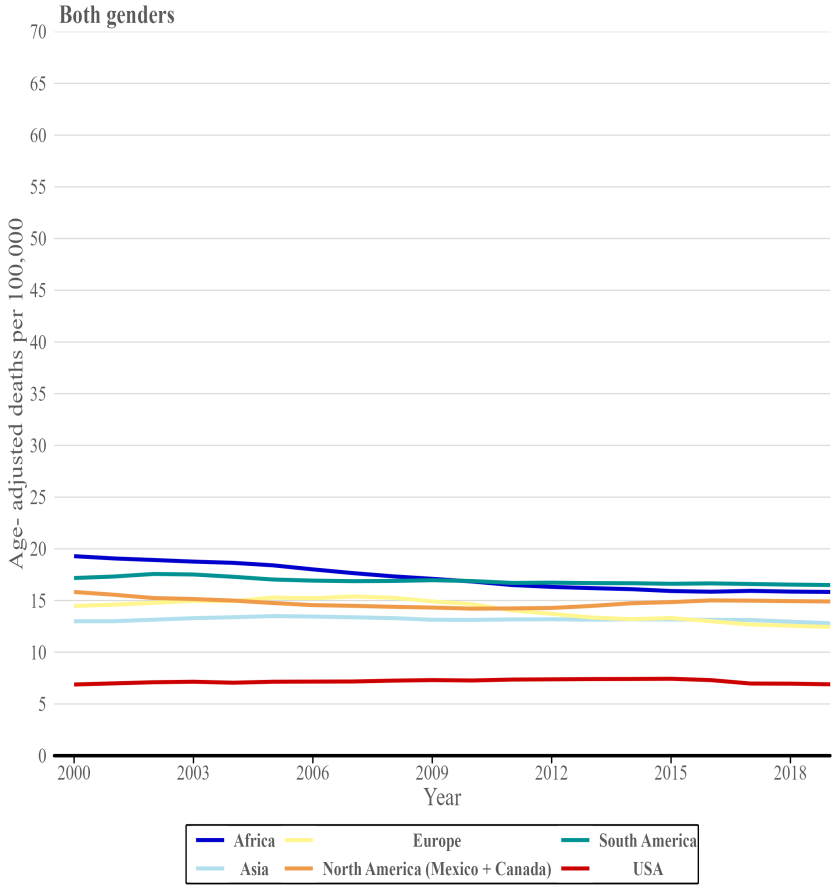


Figure 4: Aggregated age-standardized deaths from alcohol abuse. The y-axis shows the age-standardized deaths per 100,000 people.

In 2023, the WHO issued a statement that even low alcohol consumption is detrimental to health [26]. Alcohol is toxic, psychoactive, and addictive and is classified as a Group-1 carcinogen – the highest-risk group that includes asbestos, radiation, and tobacco. According to WHO, alcohol contributes to approximately 3.3 million deaths annually, accounting for 5.9% of all deaths worldwide. Alcohol abuse often leads to ALD and is projected to contribute to 5.1% of the global burden of disease and injury, measured in disability-adjusted

life years (DALYs). In 2019, alcohol consumption was identified as the second leading risk factor for both cancer-related deaths and DALYs [27].

Since 2000 there has been a consistent increase in deaths and DALYs attributed to cirrhosis and liver cancer resulting from alcohol use over the years. However, when examining the age-standardized death rate from 2000 to 2019, most regions across the world have shown a decline or stability with Africa decreasing by 17.9%, Asia by 1.4%, Europe by 13.9%, North America by 5.8% and South America by 3.9%. The US on the other hand experienced a slight increase of 0.28%.

According to the World Health Statistics report (2023) published by the WHO, the global per capita consumption of pure alcohol in 2019 was 5.5 liters for individuals aged 15 years or older. From 2000 to 2019, Europe and Africa witnessed significant declines in per capita consumption by 17% and 18%, respectively. However, per capita consumption remained stagnant in the Americas, while Southeast Asia and the Western Pacific experienced substantial increases of 112% and 40%, respectively. Despite the overall decline, the European Region still had the highest alcohol consumption rates, with men consuming 14.9 liters per capita and women consuming 4.0 liters per capita. In the Americas, per capita consumption was 11.9 liters for men and 3.3 liters for women, while it was 9.6 liters for men and 2.5 liters for women in the Western Pacific. Eastern Mediterranean exhibited the lowest per capita consumption, with 0.5 liters for men and 0.1 liters for women in 2019.

2.3 Drug Use

According to the 2023 UN World Drug Report, there were 296 million drug users in 2021 (5.8% of the global population in the 15–64 age group.) Cannabis is the most widely used drug however, opioids contribute the most to drug-related mortality. The report estimates that 60 million people used opioids in non-medical settings in 2021. Opioids accounted for nearly 70% of the 128,000 drug-related deaths in 2019.

Between 2000 and 2019, the US witnessed an alarming surge in death rates attributed to drug use disorders, with an increase of 310%. South America also experienced a 29.3%, Africa a 21.1% increase, Europe a 9.9% increase, and Asia a 3.9%. In contrast, the rest of North America observed an 11.1% decline.

The opioid epidemic in the US has been widely documented and combating it is a key policy priority. The crisis has been fuelled by synthetic opioids like Fentanyl and heroin (Centers for Disease Control and Prevention, 2023). In 2021, More than 75% of drug overdose deaths involved opioids [28]. The drivers of the opioid epidemic remain contested; as discussed earlier "demand-driven" arguments attribute it to increased despair amongst low-skilled workers that leads to greater drug abuse. However, "supply-side" factors like ease of production, lax international regulations, and the unpredictable potency of fentanyl in illegal drug markets probably play an equally significant role [29].

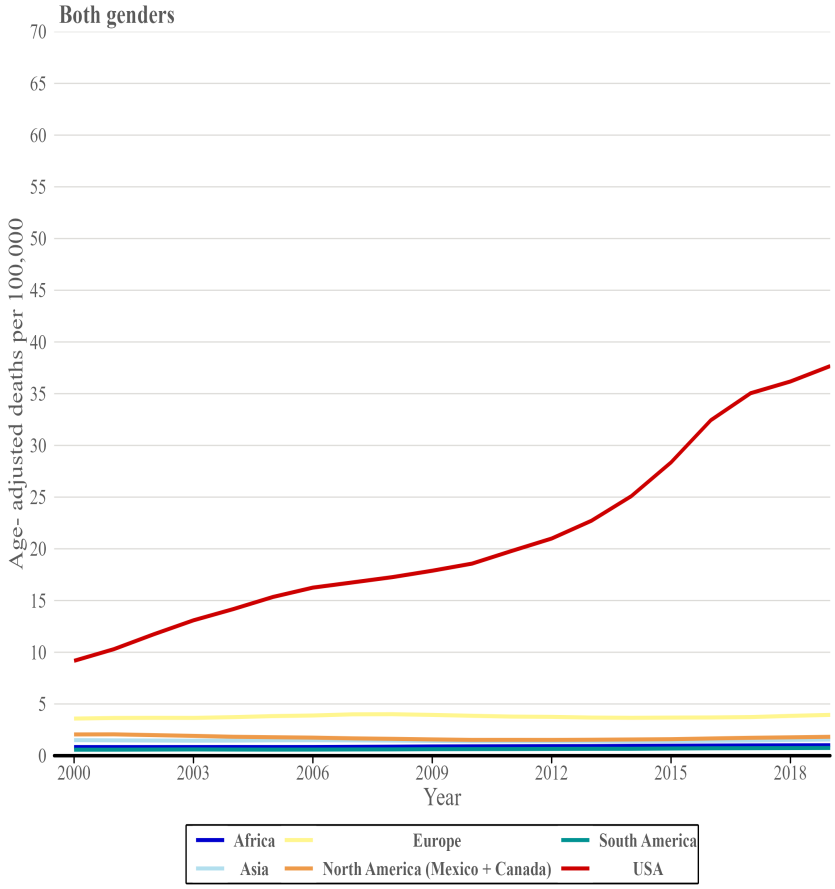


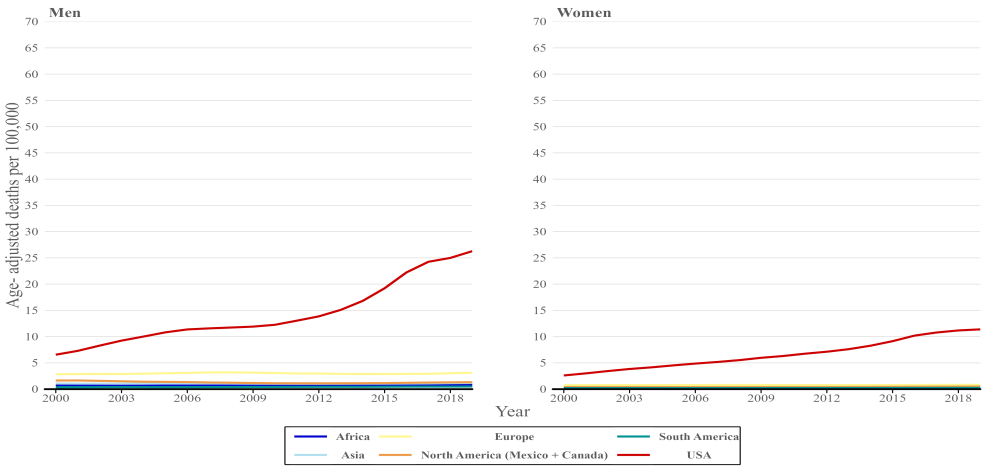
Figure 5: Age-standardized deaths from drug overdoses by gender.

3 Unpacking Drivers of Deaths of Despair

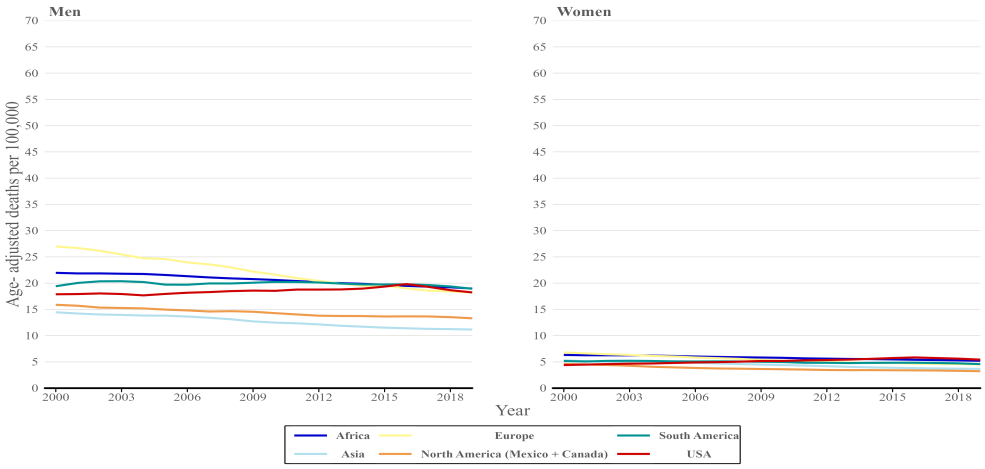
Differences in age-standardized mortality rates for different causes (ALD, drug abuse, suicide) between countries already reveal remarkable differences and provide clues for what drives deaths of despair. First, if deaths of despair are due to automation-driven wage decrease (and consequent mental health challenges), we should expect to see similar trends across all causes in the US. However, it is clear from Figure 6, that deaths of despair in the US are disproportionately due to drug abuse. This seems to indicate that the drug environment in the US plays a more dominant role than other causes.

Second, if wage changes and unemployment drive deaths of despair, we should see similar patterns in other parts of the world. Low-and-middle income countries have strikingly high levels of unemployment and we should observe increases in deaths of despair based on economic factors.[3] Remarkably, deaths of despair seem to have decreased in other parts of the world during 2000-2019. Deaths from suicide and ALD have increased only marginally in the US in this duration. However, the age-standardized mortality from drug abuse has

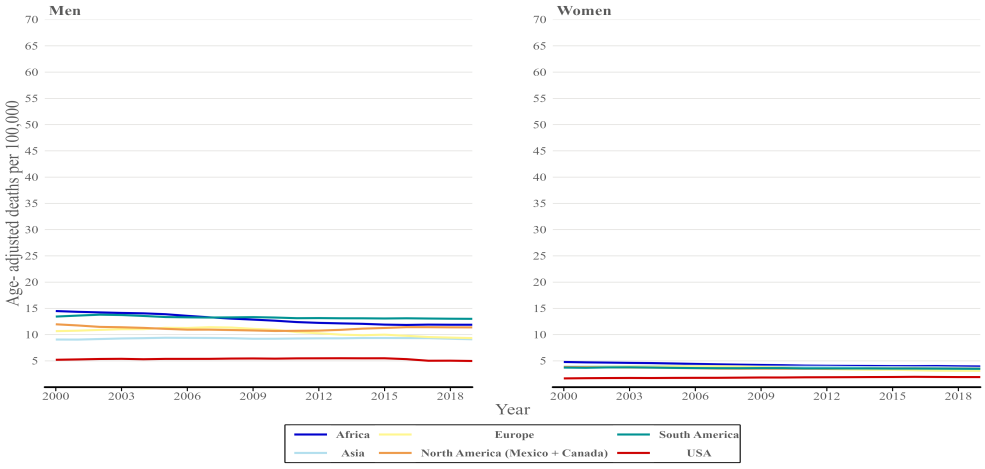
[3]More precisely, deaths of despair should be lagging indicators of economic conditions.



(a) Age-standardized mortality due to drugs



(b) Age-standardized mortality due to suicide



(c) Age-standardized mortality due to ALD

Figure 6: Age-standardized mortality due to ALD, suicide, and drugs disaggregated by gender. The y-axis shows the age-standardized deaths per 100,000 people.

increased by over 300%. The US is a clear outlier in the global data, providing additional evidence that the supply of drugs is the more likely driver for mortality increase as opposed to automation.

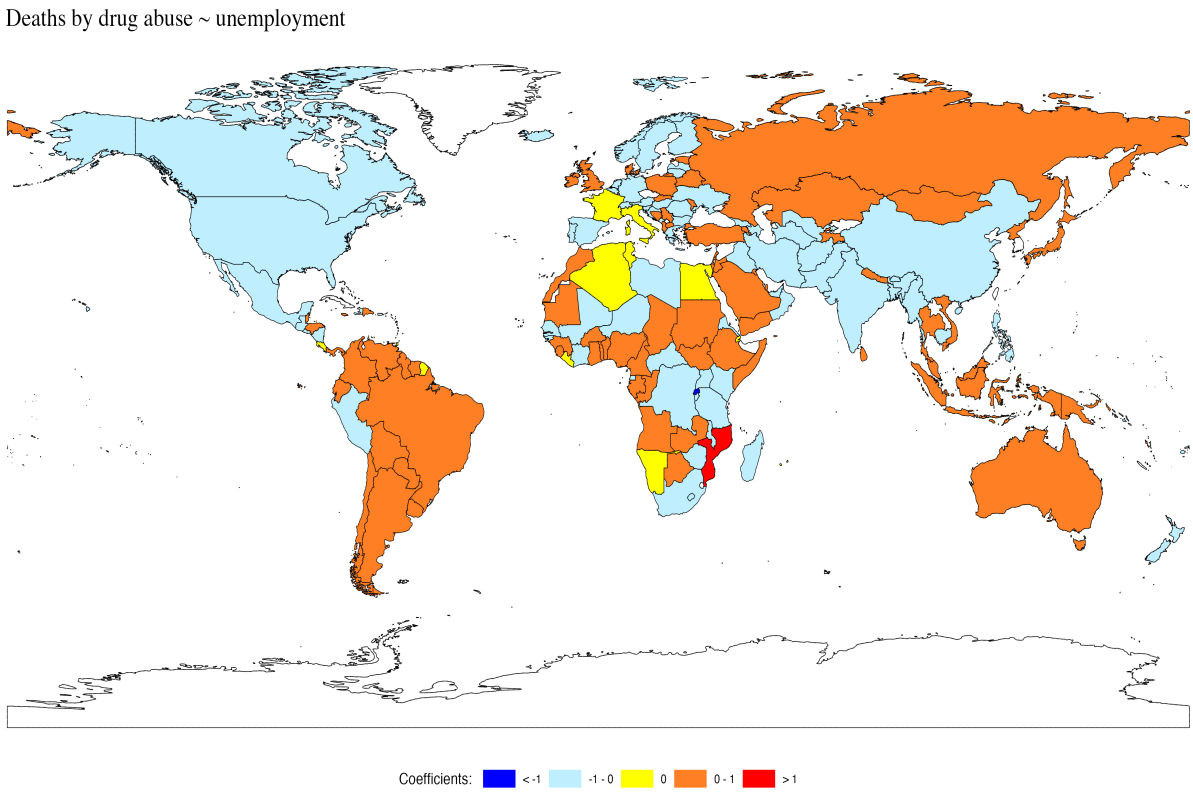


Figure 7: Country level coefficients when deaths from drugs is regressed on unemployment rates as described in Equation 1

To assess the effect of socioeconomic drivers on deaths of despair we use a simple model:

$$\mathbf{Y}_{ict} = \alpha_{ic} + \beta_{ic}\mathbf{X}_{ct} + \epsilon_{ic} \tag{1}$$

where $\mathbf{Y}_{ict}$ is the age-standardized mortality rate per 100,000 due to cause i in country c and year t. We consider three sets of equations corresponding to i =suicide, ALD, drugs. $\mathbf{X}_{ct}$ are a set of socioeconomic variables (GDP per capita and unemployment rate) in country c in year t.

Figure 8 shows the inter-country variation in the coefficients for GDP per capita with drug mortality as the dependent variable. Figure 7 shows the variation in coefficients for unemployment. The US and Brazil stand out as the countries where an increase in GDP per capita has been accompanied by an *increase* in deaths of despair due to drug abuse. Similarly, in the US, a decrease in aggregate unemployment has led to an increase in deaths of despair from drugs.

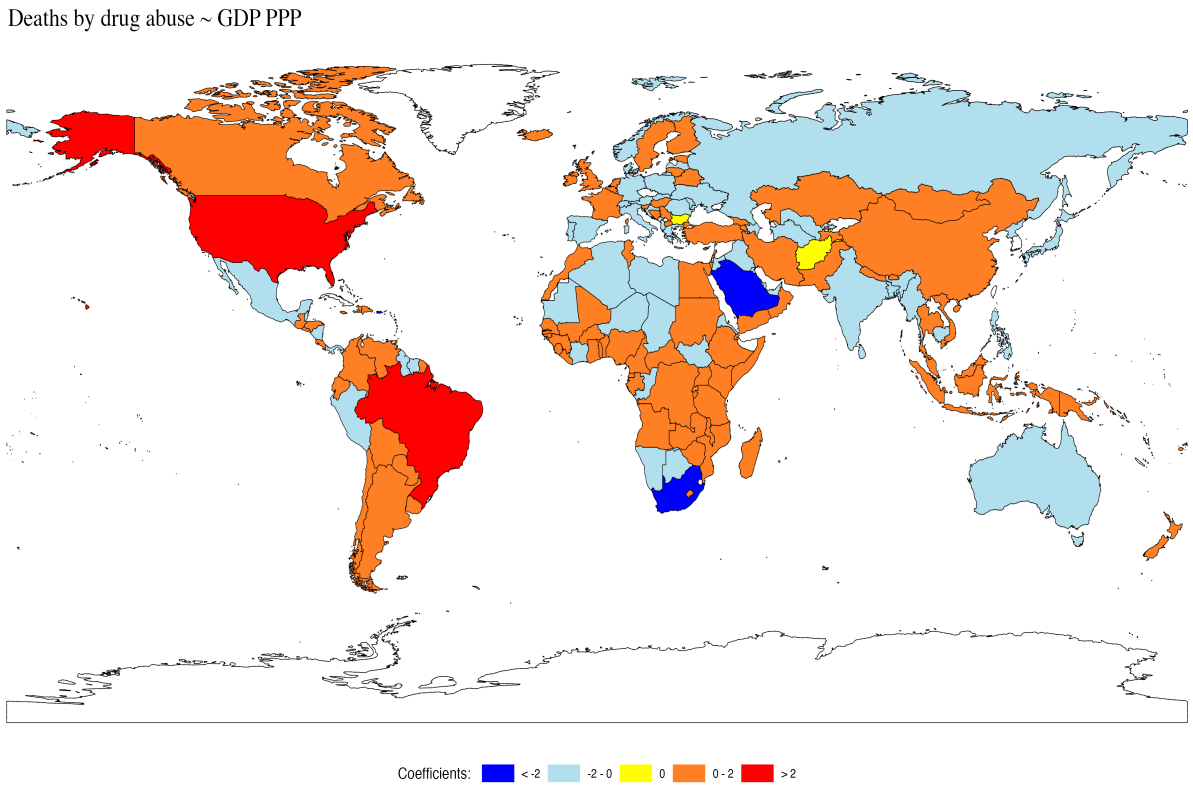


Figure 8: Country level coefficients when deaths from drugs is regressed on GDP per capita as described in Equation 1

4 Conclusion

Increased mortality and morbidity amongst non-college educated middle-aged American men has become a flashpoint in political and policy discussions. Books like *Hillbilly Elegy* have captured the public imagination and recent progress in AI has increased anxieties that AI-driven automation will further accelerate these trends.

However, a look at the global trends in deaths of despair reveals that the story is more complex. It appears that the drug environment (supply of opiates like Fentanyl, ease of production) has been the driver to an increase in mortality from deaths of despair than mental health challenges from reduced wages.

We conclude by noting that our results do not dismiss the role of wage stagnation and inequality on the mental health of workers, especially those without college degrees. However, our analysis seems to indicate that the policy levers that can be most impactful in managing this crisis probably lie in regulating the supply and production of potent opioids.

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