THE RE-EMERGING SUICIDE CRISIS IN THE U.S.:
PATTERNS, CAUSES AND SOLUTIONS

Dave E. Marcotte
Benjamin Hansen

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<u>ABSTRACT</u>

The suicide rate in the United States has risen nearly 40 percent since 2000. This increase is puzzling because suicide rates had been falling for decades at the end of the 20th Century. In this paper, we review important facts about the changing rate of suicide. General trends miss the story of important differences across groups – suicide rates rose substantially among middle aged persons between 2005 and 2015 but have fallen since. Among young people, suicide rates began a rapid rise after 2010 that has not abated. We review empirical evidence to assess potential causes for recent changes in suicide rates. The economic hardship caused by the Great Recession played an important role in rising suicide among prime-aged Americans. We illustrate that the increase in the prevalence of depression among young people during the 2010s was so large it could explain nearly all the increase in suicide mortality among those under 25. Bullying victimization of LGBTQ youth could also account for part of the rise in suicide. The evidence that access to firearms or opioids are major drivers of recent suicide trends is less clear. We end by summarizing evidence on the most promising policies to reduce suicide mortality.

Dave E. Marcotte
School of Public Affairs
American University
4400 Massachusetts Avenue NW
Washington, DC 20016
marcotte@american.edu

Benjamin Hansen
Department of Economics
1285 University of Oregon
Eugene, OR 97403
and NBER
bchansen@uoregon.edu

The Re-Emerging Suicide Crisis in the U.S.: Patterns, Causes and Solutions

Since the start of the 21st Century the United States has been experiencing a major public health threat that has received too little attention and study. Overlooked amid the recent public health crises of the opioid epidemic and COVID-19, the suicide rate has risen by nearly 40 percent since 2000. In addition to the pain caused by the growing numbers of lives lost, the recent increase in suicide mortality is puzzling because suicide rates had been falling for decades at the end of the 20th Century. In this paper, we review important facts about the changing rate of suicide in the U.S. As we will see, general trends do not tell the full story of substantial differences across groups – both in the magnitude and timing of the rise in suicide risk. We also review and assess what is known about causes for the recent changes in suicide rates and summarize evidence on the most promising policies to reduce suicide mortality. We conclude our review of recent changes in suicide, explanations for their causes and evidence about prevention by highlighting pressing open questions for research and policy.

Recent Trends in Suicide in the U.S.

The time-series of the aggregate suicide rate in the U.S. since 1950 displayed in Figure 1 is marked by troughs and peaks. Suicide rates increased from 9.8 deaths per 100,000 population in 1958, reaching 13 per 100,000 in the 1970s. Then, suicide rates started a decades-long downward trend. By the year 2000, age-adjusted suicide rates had fallen back to the near the post-war low, at 10.4 per 100,000. The trend then shifted dramatically, and by 2018 age-adjusted suicide rates were 14.2 per 100,000[1] – the highest recorded in the post-World War II era. This meant that the number of Americans who died by suicide increased by approximately 40% during the first two decades of the 21st Century. By 2019 suicide had become the nation's tenth

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[1] https://www.cdc.gov/nchs/data/databriefs/db433-tables.pdf#1

leading cause of death, claiming the lives of 47,511. In 2020, suicide was no longer among the

top-10 causes of death in the U.S. (COVID was now number 3). Nonetheless, 45,979 Americans

died by suicide in 2020, (https://www.cdc.gov/nchs/fastats/suicide.htm), and the COVID-era

decline in suicide rates ended in 2021 (Curtin et al, 2022).[2]

The rise in the suicide rate in the Unites States is unique in comparison to other

developed nations. In Figure 2, we use data from the Organization for Economic Development

and Cooperation (OECD) to plot changes in age-adjusted suicide rates for large, advanced

economies during the 21st Century. Because rates vary substantially across nations in levels,[3]

each line represents changes in a country's annual suicide rate relative to its rate in 2000. To

illustrate changes in absolute rates, we also present age-adjusted rates in each country for the first

and last year data are available for the series. As is clear in Figure 2, most countries saw their

rates of suicide decline after 2000. Some countries, such as Russia, Japan and Germany saw

large relative (and absolute) declines in suicide rates. Russia's suicide rate in 2000 was among

the highest in the world at 40.2 per 100,000, but fell more than 50 percent by 2019. Similarly,

Japan began the century with a high rate, but saw that fall by about a third. Germany's suicide

rate has fallen by more than 25 percent over the past two decades.

The United States saw the largest increase in suicide rates and is one of only four of these

countries that saw any rise in suicide rates during the period. The only other country that saw a

relative increase in suicide comparable in magnitude to the U.S. was Brazil. But, like other

predominantly Catholic countries the suicide rate in Brazil is low, beginning the period at 5.1 per

100,000. In relative terms, the additional 1.5 deaths per 100,000 from suicide by 2019 was large

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[2] Suicide rates declined globally during the first year or so of the COVID-19 pandemic (Appleby, 2021; Pirkis et al, 2022). However, there is now some evidence that like other chronic conditions, long-COVID may increase risk for suicide (Sher, 2023).
[3] See Marcotte and Zejcirovic (2020) for discussion of the social and cultural determinants of these differences.

in Brazil, but in absolute terms was substantively smaller than the additional 4 deaths per 100,000 in the U.S. at the end of the period. Notably, the suicide rate in the U.K. remained relatively stable during most of the past two decades, but then rose after 2016. Nonetheless, the rise in suicide rates in the U.S. is unique in both persistence and magnitude. The U.S. began the century with an annual suicide rate firmly in the middle of the pack. By the end of 2010s it had the second highest rate, nearly equal to Japan.

By Age:

Suicide rates over time are typically compared using age-adjusted rather than crude death rates. Since suicide rates have historically varied across the life cycle, age-adjusted rates help clarify changes in overall mortality due to changes in underlying risk rather than population aging. A time series of age-adjusted suicide rates conceals quite different changes in underlying risk by age group for recent trends in suicide. Among the most notable changes in the 21st Century has been the substantially different rates of increase in risk by age group from one decade to the next. During the 2000s, age-specific suicide rates increased most dramatically for middle-aged and older adults. In the 2010s, suicide rates for these groups stabilized, while they increased substantially among the young.

In Figure 3, we illustrate how suicide rates changed by age group between 2000 and 2020. Using data from the U.S. Centers for Disease Control and Prevention (CDC) we plot age-specific suicide rates for the years 2000, 2005, 2010, 2015, and 2020. Because suicide deaths are small in number and variable at very young ages, we smooth the age specific rates with a five-year moving average. In Figure 3 we plot rates in 2000 and 2020 with thicker lines, to make clear the patterns at the beginning and end of this period. The other lines illustrate how suicide rates changed every intervening five years. The figure illustrates that between 2000 and 2010 suicide

rates did not increase for those younger than 20 and older than 70. For those between 20 and 70,

suicide rates increased over this period and most notably for those between the ages of 45 and

65. Importantly, much of this increase occurred after 2005 – the period of the Great Recession

For example, among 55 year-olds we estimate the suicide rate increased from 13 to 15 per

100,000 between 2000 and 2005, and then to 19.6 by 2010.

Suicide rates continued to rise after 2010 among those between the ages of 20 and 70.

Then for those in the middle of their working years suicide rates fell after 2015. This delayed

decline for persons about 40 to 70 years old complicates an interpretation of suicide rates driven

by the business cycle, suggesting lagged or lingering effects because of the severity of the Great

Recession. This is an issue to which we will return, below.

The remarkable feature of changes in age-specific suicide rates after 2010 was that this

was the decade in which the problem became especially acute for young people. Among 15-year-

olds, suicide rates almost doubled after 2010 - from 4.1 per 100,000 in 2010 to 6.2 in 2015 and

7.2 in 2020.[4] Suicide rates increased from 11.5 to 14 to 15.6 per 100,000 over the same years

among 20-year-olds. For both ages, suicide rates had declined modestly between 2000 and 2010.

Among persons on their 20s and 30s, suicide rates increased much more substantially in the

2010s than the 2000s. Suicide rates were as high or higher among those in their 20s than among

those in middle age by the end of the 2010s, unprecedented in the post-war era. Suicide rates

among those older than 70 also increased somewhat between 2010 and 2020, after holding

steady or falling in the 2000s.

 In sum, suicide rates among young people changed little during the first decade of the

20th century and then increased substantially after 2010. For the middle-aged, suicide rates rose

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[4] Suicide rates peaked for 15-year-olds in 2018, at 8.7 per 100,000.

most between 2005 and 2015 and then fell afterward. Consequently, the aggregate increase after 2015 seen in Figure 1 was largely driven by increases in suicide rates among the young.

By Gender and Race/Ethnicity:

There have also been differences in recent suicide trends by gender and race/ethnicity. In Table 1, we provide age-adjusted suicide rates in the same years from 2000 to 2020 for the population overall, and then separately by gender, race and ethnicity. The first thing that Table 1 makes clear is that while suicide rates vary substantially by demographic characteristics, they increased for all groups during the 21st Century. In relative terms, suicide rates have risen more for women than men. However, the higher baseline levels among men meant that a smaller relative increase for men resulted in a higher absolute increase in suicide. For women the age-adjusted suicide mortality rate was 4 per 100,000 in 2000. That same year more than four times (17.7) as many men died by suicide per 100,000 population. Suicide rates among women had increased to 5.5. per 100,000 by 2020 – 37.5 percent higher than rates in 2000. Suicide rates among men increased to 21.9 per 100,000 by 2020. For both men and women, the rate of increase was comparable between the 2000s and 2010s.

Suicide rates have also increased for all racial and ethnic groups in the U.S. Unlike patterns by gender, there have been some notable differences in the timing of these increases. Suicide is more common among non-Hispanic Whites and Native Americans than other groups. For these groups, suicide deaths per 100,000 increased respectively from 12.0 and 9.9 in 2000 to 16.8 and 14.6 in 2020. In relative terms, these are both increases of over 40 percent. While these increases were comparable over the 20-year period, these two groups saw quite different patterns by decade. Among non-Hispanic Whites, suicide rates have increased steadily during the 21st Century. For Native Americans most of the century's rise in suicide rates has been recent:

Increasing by 1.1 per 100,000 between 2000 and 2010,[5] but then by 3.6 per 100,000 between 2010 and 2020.[6] This pattern of much faster increases during the most recent decade is even more pronounced among non-Hispanic Blacks and Hispanics. For both groups, suicide rates actually fell in the 2000s. For non-Hispanic Blacks, suicide rates were comparable in 2015 (5.8) to what they had been in 2000 (5.6) – but they increased substantially by 2020. Hispanics, regardless of race, experienced the same late rise in suicide rates after 2015. The sharp increase in suicide among Black Americans has received much attention (Congressional Black Caucus Emergency Task Force, 2019). Among the potential explanations are the harms due to systemic racism and exposure to trauma (Tynes et al., 2019), stigma associated with mental health and help seeking (Lindsey et al., 2010; Planey et al., 2019), and discrimination in health services (FitzGerald and Hurst, 2017; Kugelmass, 2016).

Why Do People Die by Suicide?

Suicide has been a part of the human condition from at least the beginning of recorded history (Barbagli, 2001). The literatures in the social and behavioral sciences attempting to explain suicide are also longstanding. Rather than providing a tour through the various theoretical paradigms used in different disciplines, we will highlight two fundamental features common to all theories/models of suicide, from psychology and public health to sociology and economics: Motive and means. All disciplines recognize that self-harm requires intent and action (or inaction to avoid harm), and theoretical models to explain suicidal behavior have variously focused on different social, psychological, or economic factors to induce suicidal behavior. All disciplines focus on factors that affect life satisfaction as precursors for suicide. This includes

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[5] From 9.9 in 2000 to 11.0 in 2010.
[6] From 11.0 in 2010 to 14.6 in 2020.

factors such social isolation and loneliness (Calati et al. 2019), lack of integration into society (Durkheim, 1897), limited economic means or security (Hamermesh and Soss, 1974), and physical or mental illness, and substance abuse (Miller and Coffey, 2021; Ilgen, 2019).

A second commonality in the conceptualization of the problem of suicide is the focus on access to means that could be used to act on the intent to self-harm. Indeed, this is to the public health model of suicide and prevention. But, access to means for self-harm or the costs of attempting suicide are recognized as determinants of suicide mortality in other disciplines, including economics.

It is also important to recognize that absent changes in motives or means, advances in technology can have effects on suicide mortality, intentionally or not. The vast majority of suicide attempts are not fatal, and most people who survive an attempt will not die by suicide after a subsequent attempt (Owens et al., 2002). So, factors that reduce the lethality of common means of suicide can reduce suicide mortality. A well-known example of such a technological change was the switch in the source of cooking gas in the United Kingdom in the 1960s. During this period, the gas piped into home ovens was switched from that produced from coal to natural gas. The former has a higher level of carbon monoxide and is more lethal when used for suicide attempts. Kreitman (1976) illustrates that as areas were switched to natural gas, the number of suicide deaths from carbon monoxide decreased, with only small increases in suicide from other causes so that the overall mortality rate declined. Other technological changes that were intended to reduce mortality from accidental death also appear to have reduced suicide mortality. About 2 percent of car accident fatalities have been estimated to be suicides (Pompili et al., 2012), and as cars became safer, the rate of mortality from car crashes declined (Rockett et al., 2012). Finally, improved 911 dispatch and advances in emergency medicine have reduced mortality generally.

In the remainder of the paper, we consider possible explanations for recent trends in suicide in the United States. We do not aim to provide a survey of recent literatures in suicide research. Interested readers can find detailed descriptions of theories, empirical challenges and updates on estimates of specific risk factors in Marcotte and Zejcirovic (2020) and Stack (2021). Rather, we assess the potential for the factors examined in these literatures to explain the aggregate and group level trends described above. Our review is similar in some respects to Martinez-Alés, et al. (2022), who call attention to the recent rise in suicide rates in the U.S. They describe changes in suicide rates for vulnerable populations such as racial and ethnic minorities, persons who identify as lesbian, gay, bisexual, transexual, or queer (LGBTQ), or the incarcerated. Martinez-Alés, et al. (2022) review changing risks for suicide without providing a direct accounting of the relative magnitudes of these changes or assessing their importance as components of the trends observed in the U.S. since 2000. This is our intention, below.

What is Driving Recent Suicide Trends?

Why did suicide rates start rising after 2000 in the United States? Suicide rates had been falling as the 20th century ended, coinciding with robust economic growth and the advent and adoption of treatments for depression in the form of serotonin re-uptake inhibitors (e.g. fluoxetine, sold as Prozac).[7] Below, we interrogate suspect explanations for recent increases in suicide rates at aggregate and group levels. Our objectives will be familiar to policy analysts: Assessing the relative importance of candidate explanations of a major public health problem is a necessary step for identifying potential policy responses. The structure of our review and analyses is informed by the framework of factors that affect suicide risk described above. We

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[7] For discussion of the role of the economic expansion, see Ruhm (2000). See Kessler et al. (2005), Ludwig and Marcotte (2005) and Ludwig et al. (2009) on the role of antidepressants.

first assess factors related to motive - assessing the evidence that any health, social, economic, or cultural changes might have changed sufficiently to explain recent trends. We then assess the role of changing access to means or lethality of suicide attempts in the aggregate or for certain groups.

Mental Illness

Among the most important risk factors for suicide is mental illness, and especially major depression (Brown et al., 2000). Because suicide is sufficiently rare and data on the events that precipitated individual suicides are not systematically measured, acute risk factors for suicide are typically difficult to identify. The closest available evidence of this type comes from government registers data in countries like Denmark. Using data from the employment, income, marital and health records of Danes between 1980 and 1994, Mortenson et al. (2000) confirm predictions from population-based studies that those who died by suicide were more likely to have recently lost jobs, had lower incomes, and were unmarried. However, the most important predictor of suicide among Danish adults was a previous admission to a hospital for psychiatric treatment, and in the week after hospital discharge suicide mortality risk was especially high (Mortenson et al., 2000).

Because mental illness is such an important risk factor, recent trends in suicide could be shaped by changes in the prevalence of mental illness in the population, or by changes in access to or efficacy of treatment. In the U.S., among the best sources of evidence on the prevalence of mental illness in the general population comes from the National Survey of Drug Use and Health (NSDUH) an annual survey of approximately 70,000 residents (aged 12 and older) of all 50 states with detailed questions about mental health and health services utilization. Rather than relying on reported history of diagnosis from a health care provider, NSDUH measures

respondents' history of mental health using a modified version of the Composite International Diagnostic Interview (CIDI), a structured diagnostic interview derived from the Diagnostic Interview Schedule to be used by trained interviewers who are not clinicians (Robins, et al. 1988). Responses to these questions are used to diagnose the prevalence of various psychiatric disorders, including major depression.

In Table 2, we report the percent of respondents who experienced an episode of major depression as identified by the CIDI in the 12 months prior to interview, by age. These estimates come from NSDUH surveys beginning in 2004 for adolescents and in 2009 for adults. These data were collected over a longer period for adolescents, who are at higher risk for depression. The prevalence of a major depressive episode remained mostly stable through the year 2011 for all age groups. However, beginning in 2012 the likelihood a young respondent had recently experienced major depression started to climb, dramatically. The percent of adolescents with major depression rose from 8.2 in 2011 to 15.7 by 2019 – an increase in the relative risk by 1.9 for this group. The relative increase was even larger among young adults aged 18 to 25, with the percent of respondents suffering from depression effectively doubling from 5.2 to 10.3 over the same period. Among respondents between the ages of 26 and 49, prevalence of major depression increased over this period, but less dramatically. In 2019, 6.1 percent of respondents in this age group had a recent episode of major depression, and 1.2 times higher than in 2011. The likelihood of having depression did not increase at all over the period for those over 50.

In addition to collecting diagnostic information, the NSDUH interviewers also asked questions about receipt of treatment or counseling for mental health issues. In Table 2 we also report the percent of respondents who received mental health treatment or counseling in the previous 12 months among those who had an episode of major depression. Again, the question is

asked beginning in 2004 for adolescents. While the percentage of young respondents experiencing a major depressive episode increased substantially after 2011, the likelihood of having received treatment or counseling among those with major depression changed more modestly or not at all over the same period (Goodwin et al., 2022). Among adolescents, 38.4 percent of those with major depression reported counseling or therapy in 2011, and this increased to 43.3 percent by 2019. For young adults aged 18 to 25 over this period, the receipt of therapy or counseling went from 47.9 to 50.9 percent. Persons older than 26 were more likely to receive treatment overall, but saw no substantial changes over the same period.

The rise in the rate of serious depression without a commensurate increase in treatment means that the number of people (especially young people) at risk for suicide increased during the 2010s. Recall the changes in rates of suicide by age between 2010 and 2020, shown in Figure 3: Suicide rates among the youngest age groups increased sharply during this period, while they changed little or declined among middle-aged and older persons. Does the fact that suicide increased precisely for the groups with the largest increase in untreated depression mean that changes in underlying mental health in the population are behind the recent suicide epidemic?

One way to assess whether the rise in untreated depression was sufficiently large to explain the increase in suicide rates over this period is to construct a counterfactual: What would suicide mortality have been in 2019 if suicide rates of depression had not changed from what was observed in 2011? Since the NSDUH is population representative, the estimates in Table 2 imply that of the 25.1 million residents of the U.S. between the ages 12 and 17, 2.05 million experienced a major depressive episode in 2011 and 23.05 million did not. Estimates of the

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percent of suicide decedents who suffered from depression range from 50 to 100 percent.[8] If we take the lower bound here, and half of the 1,096 deaths by suicide among 12-17 year olds in that year had occurred among the population with major depression, this would be a rate of 26.6 suicides per 100,000 for teens suffering from major depression, and 2.4 suicides per 100,000 teens without depression.

In 2019, the NSDUH estimates of depression prevalence suggest that 3.9 million Americans between the ages of 12 and 17 experienced a major depressive episode in 2019, and 21.1 million did not. If the rate of suicide had not changed for depressed and non-depressed 12-17 year olds between 2011 and 2019, then 1,547 adolescents would have died by suicide in 2019. In fact, 1,580 died from suicide that year. The same exercise with 18-25 year olds yields a similar conclusion: Nearly all of the increase in suicide mortality among young-persons could be due to the rise in the number of adolescents moving into the group at higher risk. That is, even if suicide rates among teens with (and without) depression had not changed, the substantial increase in the prevalence of depression among young people during the 2010s was so large it could explain nearly all of the increase in suicide mortality among those 25 and under.

Declining mental health and mental illness have direct effects on suicide risk and are what public health researchers call a proximal cause – one having a downstream or close effect in a system (Krieger, 2008). An obvious question is what distal factors (further upstream) are indirectly affecting suicide risk by harming mental health? There are a variety of candidate explanations. For example, religious beliefs and practice have long been known to be associated with lower risk for suicide (Stack, 1983), and the proportion of Americans identifying with a

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[8] The 50 percent figure is from a frequently cited fact sheet from the American Association of Suicidology. *Post mortem* assessments are nearly impossible, but estimates in the public health and medical literature put the figure much higher (e.g. Shahtahmasebi, 2013)

religion or attending religious services have declined.[9] Though religion is associated with lower

suicide risk, a recent meta-analysis found that this relationship is driven by social support and

other personal and community factors linked to participation in religious activities (Lawrence,

2016). Perhaps this suggests different distal factors - social isolation and loneliness. Social

isolation, loneliness, and living in rural areas are related to depression and suicide risk (Shaw et

al., 2021; Wang et al., 2018).[10] The relationships between distal factors like these and suicide are

difficult to isolate because they are intertwined. For example, rural areas are more isolated but

are also poorer, have less access to health care and higher rates of gun ownership (Kegler et al.,

2017). We discuss these various risk factors below.

Economic Factors

Research on the impact of economic factors on suicide is extensive. As Marcotte and

Zejcirovic (2020) review, this includes studies of the roles of unemployment, income, and

inequality on suicide rates across countries or states. Much of the focus has been on the impact of

unemployment, because of the direct effect of job loss and unemployment on income, and

broader effects on social connections or anomie. The empirical evidence of a positive

relationship between unemployment and suicide rates is long-standing (Platt, 1984; Ruhm, 2000;

Chen et al. 2012). In the U.S., Ruhm (2000) estimated that a one percentage point increase in

state unemployment rates is associated with a 1.3 percent increase in state suicide rates. Classen

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[9] The proportion of Americans who identify as non-religious (atheist, agnostic or "nothing in particular") increased from 16 percent to 29 percent between 2007 and 2019 (Pew Research Center, 2021a). A Gallup poll asking about religious services at churches, synagogues, mosques or temples found the proportion of Americans attending such services declined from 70 percent in 1998 to 47 percent in 2020 (Jones 2021a).
[10] The number of Americans living alone, and time spent alone are increasing, but evidence that loneliness is rising is sparse (Luhmann et al., 2023), in partly because we have few measures over time.

and Dunn (2012) find evidence that unemployment spells of long duration (more than 15 weeks) are especially linked to suicide.

The link with unemployment naturally raises the possibility that the rise in suicide rates in the 21st Century may be partly due to the economic fallout of the Great Recession. The financial meltdown from late 2007 through mid-2009 was the worst global economic downturn since the Great Depression. Gross domestic product had been growing at 2.7 percent in 2007 in advanced economies. By 2009 it was falling at an annual rate of 3.4 percent. GDP per capita at the global level fell by 2.9 percent in 2009, the largest decline in the post war era (Kose and Ohnsorge, 2020). In the U.S., the national unemployment rate doubled during the great recession – from 5 percent in December 2007 to 10 percent in October 2009.[11] As we saw above, during the 2000s, suicide rates increased most dramatically for adults between the ages of 40 and 60. This is the population in the middle to later stages of their working careers when job loss leads to the largest earning loss, and for whom the Great Recession had the greatest effects on well-being (O'Connor, 2017).

For all these reasons the recession and its fallout likely led to higher suicide mortality. A first approximation suggests that the increase in suicide during the recession could have been due in no small part to rising unemployment and declining economic well-being. If we apply the estimate from Ruhm (2000) of a 1.3 percent increase in suicide for each 1-point increase in the unemployment rate, a five-point increase in aggregate unemployment would predict a 7 percent increase in suicides. While this estimate was among all age groups, we can compare it to the 14 percent increase in suicide rates among those between the ages of 40 and 60 between the start and end of the Great Recession. Even if the age groups are not directly comparable, it appears

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[11] https://www.bls.gov/charts/employment-situation/civilian-unemployment-rate.htm

that up to 50 percent of the increase in suicides among prime-working aged adults could have been driven by the worst economic downturn in a generation. Related, several papers have examined the question of whether the Great Recession created "excess" deaths from suicide. Excess deaths are those above and beyond what would be expected based on previous trends. The consensus of this literature is that there were approximately 5,000 more deaths from suicide between 2007 and 2010 than would have occurred if the trends from the earlier part of the decade had continued (Reeves et al., 2012; Chang et al., 2013; Phillips and Nugent, 2014). Together, this evidence suggests that the economic hardship caused by the Great Recession played an important role in the substantial increase in suicide mortality among prime-aged Americans in the first decade of the 2000s.

There are several factors that raise doubts about the overall importance of economic factors, however. The first is a complication inherent how to interpret analyses of excess deaths. Baseline forecasts from aggregate trends differ from population-weighted trends of various demographic groups that experienced different pre-trends. Harper and Bruckner (2017) illustrate that allowing for pre-trends to differ by gender and age-group leads to the conclusion that there were no excess deaths from suicide during the Great Recession. A second complication is that aggregate (and group-specific) trends were rising before the economic downturn of the late 2000s. Another challenge to the possibility that changing economic conditions explain the rise in suicide during this century is the fact that suicide rates kept rising during the economic expansion between 2010 and 2020. Beyond the fallout of the Great Recession, it is possible that suicide patterns are related to longer-term economic transformations due to trade-liberalization or to decades-long increases in inequality. Case and Deaton (2020) make the case linking

economic changes that have hurt prospects for working-class Americans to an increase in

mortality due to deaths of despair: suicide, drug overdose, and alcohol abuse.

Opioids:

The geographic pattern and trends in these "deaths of despair" examined by Case and

Deaton tie recent trends in suicide mortality to the opioid epidemic of the past two decades. The

rise in opioid abuse and deaths in the U.S. has been devastating: Opioids now make up the

majority of drug overdoses (Ruhm, 2017) and are responsible for 1.5 times more deaths than

motor vehicle crashes (Rudd et al., 2018). Recent trends in opioid abuse and mortality could be

related to rising suicide rates for several reasons. First, overdose deaths can be either

unintentional or intentional, so these causes of death may be difficult for medical examiners to

differentiate. Second, they are often entwined with common antecedents, including the economic

and social factors discussed above, as well as physical disability and chronic pain (Ilgen, 2019).

Further, in a study of those using opioids for non-cancer related pain management using

Veterans Health Administration records, Ilgen et al. (2016) show that higher dosages were

associated with a greater risk of subsequent suicide mortality. Of course, it is difficult to sort out

the effects of opioid use on suicide risk separate from the individual and community-level factors

that affect the use or abuse of opioids and coincidental risk factors for suicide. Indeed, these

interconnected relationships permeate the "despair" described by Case and Deaton.

Nonetheless, there is suggestive evidence that trends in opioid mortality and suicide are

somewhat distinct, even if intertwined. First, while opioids can be used as a means for suicide,

opioid mortality has grown most dramatically during what has been labelled the "third wave" of

the epidemic (U.S. CDC, 2022, Ciccarone, 2019). The first wave began at the turn of the century

with the overuse and abuse of prescription opioid painkillers (e.g. oxycodone), and the second

wave began around 2009 when heroin supplanted these prescription drugs as regulatory agencies and manufacturers took action to monitor sales and make pain pills more difficult to crush and use recreationally (Ciccarone, 2019; Evans, Lieber and Power 2019). Overdose deaths began rising most rapidly when the third wave began in 2013 with the spread of synthetic opioids including fentanyl (O'Donnell et al., 2017). Fentanyl has been so deadly because of its potency and because it can be combined with other drugs making dosages hard for recreational users to gauge. As a result, fentanyl has been implicated in localized spikes of overdose deaths (West et al., 2021) and increases in mortality for users of other drugs with which it is laced (Nolan et al., 2019).

The importance of fentanyl makes the story of opioid mortality more difficult to link to suicide. Suicide rates had been rising steadily well before the deadly third wave of the opioid epidemic began. The rapid rise in opioid deaths occurred when potency was rising quickly, making unintentional overdose more likely. Further, in retrospective interviews of 1,500 survivors of opioid overdoses and suicide attempts, Maloney et al. (2009) identified distinct characteristics between the two groups - with the former reporting a substantial history of substance abuse but not mental illness, and the latter reporting recent episodes of mental illness.

The common antecedents connection with opioid mortality also does not appear to explain recent changes in suicide. Among the factors shaping recent patterns in suicide was the Great Recession of the late 2000s. But that period saw slow growth in opioid deaths. Indeed, Case and Deaton (2020) make the case that income and unemployment are "false trails" in trying to understand opioid deaths. To provide further insight into the context in which opioid deaths and suicide rose during the past two decades, we compare changes in suicide rates (by age and gender) in states where opioid mortality rose especially fast, to those in states where overdose

deaths rose the least. If opioid deaths and suicide were driven by the same factors, we would expect that they would increase together.

To further assess the connection between deaths from opioids and suicide, in Figure 4 we plot the change in suicide rates for states with the highest increases in opioid overdose deaths compared to states with the lowest increases. We distinguish between age/gender groups because the opioid epidemic has been especially deadly for men, and for those between the ages of 25 and 45.[12] For any age/gender group, the x-axis measures the increase in suicide rate in states where opioid mortality grew most rapidly between the first 5 years (2000-2004) and the last 5 years (2015-2019) of our panel. The y-axis measures the increase in suicide rates for the same age/gender group in states where opioid mortality grew least.[13] Low-growth states are those that saw opioid mortality rates increase by less than 20 per 100,000 between 2000 and 2019. High-growth states had increases in opioid mortality of more than 30 per 100,000. We also plot a 45-degree line, referencing equal increases in suicide in states with high and low opioid epidemics. For example, the data point for 34–44-year-old women is on the 45-degree line, as suicide rates for increased about 2 per 100,000 in states with high opioid mortality growth and in those with low growth of opioid deaths.

If suicide mortality grew fastest in states most affected by rising opioid deaths, the data points would mostly lie below the 45-degree line. That is not the case. For nearly all age groups and for both men and women suicide rates grew just as fast or faster in states least affected by the opioid epidemic as in states most affected. While there is no doubt that the suicide and opioid epidemics in the U.S. have coincided to devastating effect, the link is sufficiently loose to conclude that these public health crises have some distinct antecedents.

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[12] U.S. CDC: https://www.cdc.gov/nchs/hus/topics/drug-overdose-deaths.htm
[13] Our panel ends in 2019 here because we do not have data on opioid mortality for 2020.

Bullying and Victimization:

While bullying has long been a source of stress for youth in K-12 schools, changes in technology, the ever-expanding amount of time and attention spent on-line and the advent of cyber-bullying has drawn new public attention to this risk factor for depression among youth and suicide. The association between bullying and suicidal behavior is well documented, especially among young persons. In a meta-analysis of 47 studies, Holt et al. (2015) report substantial correlations between being either a victim or perpetrator of bullying and suicidal behavior: The cross-study average odds ratio for bullying victimization and suicidal behavior was 2.94 (95% CI, 2.36–3.67), and the average odds ratio for bullying perpetration and suicidal behavior was 2.62 (95% CI, 1.51–4.55). In short, those who are bullied or bully are two to three times more likely to have considered or attempted suicide compared to those who report being neither the perpetrator or victim of bullying.

The good news is that there is little evidence that bullying is increasing. A study of 4th and 12th graders between 2004 and 2015 found that the prevalence of bullying in schools declined over that period (Waasdorp et al. 2017). A recent meta-analysis of bullying trends in the U.S. similarly finds that face-to-face bullying has not increased (Kennedy, 2021). However, using the YRBS data we estimate that overall rates of bullying have increased modestly since 2017. In 2017, about 18 percent of high school students reported being victims of bullying while in school in the past year, with just under 15 percent reporting being bullied on-line. By 2019, these figures had increased to 20 and 16 percent, respectively. Consistent with Wassdorp et al. (2017) and Kennedy (2021), we find no significant changes in the rate of victimization from in-school or on-line bullying between 2009 and 2017. The lack of clear trends early in the decade

calls into question the possibility that bullying has played a major role in explaining the recent rise in suicide rates among young persons. Moreover, Rees, Sabia, and Kumps (2022) find expansion of anti-bullying legislation appears to have had at least slowed the uptick in youth suicides and reduced bullying victimization.

This is not to say that bullying does not merit attention in the future. Indeed, Hansen and Lang (2011) find youth suicides consistently drop by over 20 percent in summer months, when school related incidents of bullying necessarily fall. Bacher-Hicks et al. (2022) use Google Trends data and similarly find a decline in bullying-related searches in the summer and coinciding decreases in and youth suicides. Hansen et al. (2022) study historic cross-sectional differences in school start times and recent variation driven by school closures and re-openings during the pandemic. They find that where schools start in early August, youth suicides rise in August, while areas where schools open in September see youth suicide increase in September, not August. Hansen et al. (2022) also find that as schools closed due to the pandemic, there was a coinciding decline in youth suicide – Teen suicide rates fell in 2020 in March rather than in June, typical in previous years. Finally, where schools reopened in the fall of 2020 youth suicides rose relative to areas where schools remained remote. This evidence suggests there are pathologies in the social environments of schools that increase suicidality for a vulnerable part of the population. However, these factors appear to be stable over time even as youth suicide trends have changed.

A population at especially high risk for bullying and suicide are young persons identifying as lesbian, gay, bisexual, transgender or queer (LGBTQ). LGBTQ youth are much more likely to be victims of bullying, and this victimization substantially increases suicide risk. Johns et al. (2020) use data from the YRBS surveys to assess recent trends in victimization and

suicide risk among high school students by self-reported sexual identity. They find that between 2015 and 2019, the percent of LGBTQ students who reported being victims of bullying at school fell from 34.2 to 32 percent, and 28.8 percent of LGBTQ youths reported being bullied electronically in 2015, compared to 26.6 in 2019. These are alarmingly high levels of victimization. If there is a silver lining, it does not appear that the problem is getting worse. During the same period, Johns et al. (2020) find that the percent of non-LGBTQ students reporting bullying at school fell from 18.8 to 17.1 percent, and electronic bullying remained effectively unchanged at 14.1 percent for this group. Likewise, Liang et al. (2023) find that anti-bullying policies appear to be most effective for reducing bullying victimization among gay and lesbian youth. Despite those silver linings, the levels of suicide risk remaining substantially elevated.

This high rate of victimization is a substantial risk factor for suicidal behavior and death for LGBTQ youth. Using cross-sectional survey data Remafedi, et al. (1998) estimated that rates of attempted suicide among adolescents were seven times higher among males identifying as gay compared to heterosexual males, and about 25 percent higher among lesbians than heterosexual females. In a recent study of data from the National Violent Death Reporting System (NVDRS), Clark et al. (2020) used narrative summaries of medical examiner records and law enforcement reports of suicide antecedents gathered from family or friends of the deceased, suicide notes or diaries, and decedents' social media, text or email messages. They find evidence that 20.7 percent of LGBTQ youth who died by suicide were victims of bullying, compared to 4.4. percent of non-LGBTQ decedents.

The prevalence of victimization in the LGBTQ community and as an antecedent for suicide suggests that bullying trends could have played a role in the rising rate of suicide among

adolescents. Though Johns et al. (2020) report no increase in risk for bullying among LGBTQ high school students, the number of Americans identifying as LGBTQ is rising. Likewise, Liang et al. finds Jones (2021b) reports that the percent of respondents to the Gallup daily tracking survey who "personally identify as lesbian, gay, bisexual or transgender" increased from 3.5 in 2012 to 5.6 percent in 2020. Further, 15.9 percent respondents under 25 identified as LGBTQ, as did 9.1 percent of those between the ages of 25 and 40 (Jones, 2021b).

Even if there were no rise in rates of bullying victimization among LGBTQ youth, these changes in the likelihood that youth identify as LGBTQ could have increased bullying overall, compositionally – since more young persons are now in the group with the highest rate of victimization. To assess the impact of this compositional shift, we estimate how many more young people died by suicide because of being at greater risk for bullying as members of the LGBTQ community. We limit our analysis to 2015 to 2019, the years for which Johns et al. (2020) use the BRFSS to estimate the proportion of youth identifying/not-identifying as LGBTQ, along with bullying prevalence among both groups. Their estimates imply that in 2019, of the 41.2 million Americans between the ages of 15 and 24, approximately 1.4 million more young people identified as LGBTQ than would have if the rate youth identify as LGBTQ had not changed after 2015. Applying the higher rate of bullying victimization among gay and lesbian youth from Johns et al. (2020), [14] and the estimate of relative suicide risk for victims of bullying from the meta-analysis of Holt et al. (2015),[15] we estimate that this growth in the LGBTQ population at high-risk bullying led to 48 more suicide deaths among young men and 12 more suicides among young women. So, the growing size of the LGBTQ population between the ages of 15 and 24 at high risk for bullying victimization could explain 48 of the additional 426 suicide

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[14] 32 percent among LGBTQ youth compared to 17 percent among non-LGBTQ peers.
[15] We use Holt et al.'s (2020) estimated odds ratio of bullying victimization on suicidal behavior of 2.94.

deaths among young men in 2019 compared to and 2015; and 12 of the additional 29 suicide

deaths among young women over the same period. These are small but not trivial fractions of the

rising number of suicide deaths in this short period.

Social Media and Technology

Time spent on connected devices has received special attention as a gateway for suicide

risks such as depression and bullying. An article in the Atlantic entitled, "Have Smartphones

Destroyed a Generation," is representative of the discomfort adults have about the growing role

of on-line interactions in the lives of young people, at the expense of in-real-life experiences

(Twenge, 2017). There is evidence that screen time (including television) is associated with

depressive symptoms for adolescents and adults, even if direction is unclear (Madhav et al.,

2017; Boers et al. 2019).

Perhaps the most important source of data on social media and child well-being is the

Adolescent Brain Cognitive Development (ABCD) Study coordinated and funded by the U.S.

National Institutes of Health (NIH).[16] ABCD investigators at 21 sites across the U.S. collect data

on brain development, health and behavior of nearly 12,000 children. Among the early findings

from the ABCD has been that child psychopathology and intra-family conflict are the strongest

predictors of suicidal ideation among adolescents, but screen time on the weekends is also

associated with elevated risk (Janiri et al. 2020). Using the ABCD two-year follow up, Arnon et

al. (2022) report much higher rates of suicidal behavior among adolescents who had been victims

of cyberbullying. Sorting out the role of cyberbullying is complicated by the fact that victims

also reported higher levels of other risk factors such as family conflict and internalizing and

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[16] https://abcdstudy.org

externalizing psychopathology. Controlling for other risk factors, Arnon et al. (2022) find that the victims of cyberbullying were 1.8 times more likely to have reported suicidal thoughts, plans or attempts. Perpetrators of cyberbullying appeared to be at no elevated risk for suicidality. Being a target or perpetrator of offline peer aggression were both associated with suicidality (OR, 1.5 [95% CI, 1.1-2.0] for both).

As we saw, there is little evidence cyberbullying has recently increased total victimization. Still, this evidence that social media use may directly harm the mental of youth and young adults is concerning. Indeed, even the timing of the rise of social media stands out as coincident with the increase in suicidality beginning in the mid 2000s. In 2004, Facebook began on a single college campus (Harvard University). It shortly expanded to all college students (those with .edu email address), and then was available to high students the next year, and shortly thereafter in 2006 was open to the general public (for all of those aged 13+). While there were social media platforms before (e.g. MySpace), none achieved the scale and rapid growth of Facebook. Following Facebook's success, other social media platforms emerged including Tumblr, Twitter, Instagram, Reddit, SnapChat, and TikTok.

The rapid growth of social media engagement began after the rollout of Apple's first I-Phone in 2007 and the IPhone3G in 2008 with mobile internet speeds achieving benchmarks that allowed social media platforms to flourish on mobile devices. Google's Android operating system was introduced in 2008 as well. While mobile operating systems had been available since 1999 with WindowsMobile and Blackberry, these other mobile platforms had failed to significantly change personal media consumption. The large screens and touch centric interfaces of smartphones, along with developer friendly marketplaces for applications brought mobile computing to the masses. In the Pew Research Center's first survey on the question in 2011, 35

percent of U.S. respondents reporting owning a smartphone. A number that grew to 85 percent by 2021 (Pew, 2021b). In Figure 5, we use the Pew data and show that both global social media usage skyrocketed in the second half of the 2000s.

The pattern of increased social media usage happens to coincide with increases in suicide. Meta-analyses on social media use and mental health conclude the bulk of evidence suggests those who spend more time on social media have trouble sleeping, are more likely to experience depression, and may see increases in the risks of other mood disorders (Cunningham et al. 2021; Keles et al., 2020). However, the nature of the potential causal relationships is complex. Social media use may disrupt sleep cycles (Woods and Scott, 2016), and thereby increase anxiety and depression. Social media may also shape identity formation, a key process during adolescence. Social comparison theory suggests that individuals base their feelings of self-worth on those around them, and this is potentially magnified on social media due the natural expansion of potential comparison groups. On the other hand, social media could offer new support groups to those who could not find them locally before. Whether or not there is a causal relationship instead of a spurious one requires more careful analysis to limit confounding factors and potential reverse causality.

Several recent studies offer new evidence beyond the many correlational approaches that find those who use social media have worse mental health. Allcott, Braghieri, Eichmeyer, and Gentzkow (2020) study the social welfare of social media use. To this end, they enlisted participants who were paid to desist from their use of social media for four weeks. They found the four-week experimental period increased the likelihood subjects would cease social media use permanently. Moreover, those in the treated group saw reduced political polarization and improved self-assessment of mental health. While the sample size was too small to have power

to detect impacts on mental health, the findings provided causal evidence social media may decrease mental health. Braghieri, Levy, and Makarin, (2022) study the effect of social media use on mental health. Using a national dataset on the mental health of college students and a generalized difference-in-differences approach using Facebook's staggered roll out, they find that Facebook availability increased time spent online, and reduced mental health and lowered student achievement. They point to negative social comparisons as key driving factor.

Two other studies focus on the effect of high-speed internet access. Dante et al. (2022) study the expansion and roll out high speed internet in Italy. Using local hospitalization reports, they find expansions to high-speed internet increases admissions for mental health diagnoses but only for younger cohorts. Both men and women see increased episodes of depression, anxiety and drug abuse, and younger women see higher rates of sleep and eating disorders. Guo (2022) studies the expansion of mobile high-speed internet in British Columbia, proxied through Google Trends keywords related to social media applications. She finds mobile high-speed internet increases social media use and increases diagnoses of mental illnesses including depression, especially for teen girls.

The bulk of this evidence highlights that for all the promise these new technologies offer, they may exacerbate underlying mental health conditions and could be contributing to the rise in teen suicides and worsening mental health (George, 2019). The causal impact of social media use on suicidal behavior is difficult to establish, so an important avenue for future research would be the use of credible research designs to shed light on the risks posed by the extent and patterns of social media use on suicidal behavior among teens and others.

Guns:

Recent trends in suicide could also be affected by changes in access to means for self-harm. Guns are a central focus because they are especially lethal when used in a suicide attempt (Elnour et al., 2008; Connor et al., 2019) and because guns are the primary driver of suicide mortality in the United States (Ajdacic-Gross, 2008). Globally, the most common method of suicide is hanging/suffocation in higher income countries and poisoning in lower income countries, but the U.S. stands alone in the use of guns as the most common method used in suicides (Ajdacic-Gross, 2008; Kolves et al., 2018).

While guns are especially deadly, determining whether increasing access to guns has played a role in the increase in suicide during this century is difficult. One piece of evidence casting doubt on the role of guns as a primary factor is that the rate of gun ownership has been declining. Using data from national surveys and administrative data, the RAND Corporation estimates that the proportion of households with a gun declined from about 45 percent in 1990 to 32 percent in 2015 (Schell et al., 2020). But, even as the proportion of households with a gun has declined, the U.S. Bureau of Alcohol Tobacco and Firearms reports that number of guns manufactured and sold in the United States has increased in the past two decades.[17]

There is no doubt that within the U.S., suicide rates are high where guns are common (Miller et al., 2015). This association is long established and part of the explanation for why suicide rates are highest in western states such as Alaska, Montana and Wyoming.[18] There is also good evidence that restricting access to guns can reduce suicide. As we will discuss below, suicide prevention can be effective because suicide attempts are often impulsive. The introduction or extension of waiting periods or licensing requirements for the purchase of

[17] https://www.atf.gov/resource-center/data-statistics
[18] https://www.cdc.gov/nchs/pressroom/sosmap/suicide-mortality/suicide.htm

handguns has convincingly been shown to reduce mortality from suicide by gun, even if effects on gun homicide are less clear (Ludwig and Cook, 2000; Griffin et al., 2018). So, while the availability of guns has not increased for the average person, easy access to guns for suicidal persons could be part of the explanation for rising suicide rates in the U.S.

While waiting periods and other restrictions on handgun purchases have reduced gun suicide deaths, the effects have been modest at best because they limit gun access only at the extensive margin – making it harder for a suicidal person to purchase a gun while providing no protection from guns already accessible. The rise in suicide rates over the last two decades could be driven not by new guns, but higher rates of suicidal intent among a population where guns have been previously available. To provide some insight into the role that guns have played in the recent increase in suicide, in Figure 6 we examine how the gun suicide rate has changed over the past two decades, compared to the rate of suicide from all other methods. Using mortality data from the U.S. CDC, we present suicide rates by method in 2000, 2010, and 2020, by age group. Among the youngest age group, the evidence that guns played a role in the overall suicide rate is mixed: During the 2000s, gun suicide rates among 15-24 year olds fell while rates of suicide from other causes rose. This was the period when many states were expanding gun purchase restrictions, limiting access to firearms most for young adults who would need to purchase a gun (Siegel et al., 2017). However, gun suicide rates went up markedly for the youngest age groups during the 2010s, the decade when overall rates for these groups grew fastest. While children cannot purchase guns, they may have access to firearms stored unsafely. Lang (2013) finds that background checks for guns (a proxy for new gun purchases) is not associated with increase in adult suicide but is associated with higher rates of teen suicide. Likewise, Kivisto finds higher rates of gun ownership are associated with higher rates of teen

suicide, but that child access protection (CAP) laws holding parents responsible if they fail to store their guns safely are associated with modest reductions in youth suicide.

While the evidence is suggestive for the youngest age groups, among those between the ages of 25 and 64, suicide rates from methods other than guns rose faster than gun suicide rates. Among those between the ages of 25 and 34, gun suicide rates increased from 6.1 to 8.4 per 100,000 between 2000 and 2020. But non-gun suicide rates increased from 5.9 to 9.9 per 100,000 over the same period. Among those between the ages of 35 and 44, guns appear to be even less of a factor. Gun suicide rates increased from 7.1 to 7.6, and hardly changed at all during the 2000s, when this group saw a rapid overall increase in suicide.

To be sure, gun suicide rates rise with age, a distinct pattern not apparent for suicide rates from other methods. Among those over the age of 65, gun suicide rates are much higher than rates from other methods – nearly 200 to 300 percent higher. Gun suicide rates among the oldest age group barely changed between 2000 and 2020 (from 9.2 to 9.5 per 100,000), while suicide rates from other methods increased (from 3.2 to 4.9 per 100,000). So, among the elderly, access to guns does not appear to have been behind the modest increase in suicide since 2000.

In sum, guns are an especially deadly means for suicide attempts, and more suicides in the U.S. are caused by gunshot wound than any other cause. However, guns do not appear to play an outsized role in the increase in suicide rates observed in the U.S. during the 21st Century. Access to guns has played a role in the recent rise in suicide rates among the youngest Americans, but less so for those older than 25.

Preventing Suicide

While understanding and explaining trends in suicide are primary objectives for medical and social science researchers, the paramount goal for policy makers, clinicians and for all of us is preventing suicide. The factors driving recent trends can structure how we think about the most promising avenues for prevention. As we reviewed, the most substantial sources for recent changes in suicide are those that have affected motive – including declining mental health and well-being, especially among youth. Victimization also appears to be a persistent problem. Among prime age and older adults, economic conditions remain important factors. How can prevention efforts interrupt the risks imposed by the social and economic conditions that drive these motives?

Reducing Motive:

As we have seen, chronic mental illness is among the most substantial risk factors for suicidal behavior – including thinking, planning, attempting and death by suicide (Windfuhr and Kapur, 2011; Bolton et al., 2015; Safe States Alliance, 2017). Acute or recent episodes of mental illness are associated with an especially high risk of suicide attempts and mortality (Randall et al., 2014). Consequently, public health guidance such at the U.S. Centers for Disease Control and Prevention's *Suicide Prevention Resource for Action* focuses on the need to expand access to effective treatment for mental illness as a key component of any strategy to prevent suicide.

Much progress has been made in expanding health insurance coverage as part of the Affordable Care Act (ACA) and federal incentives for states to expand Medicaid coverage. Simon et al. (2017) use BRFSS data and find significant increases in insurance coverage and utilization of preventative health care among low-income adults in states that were induced by the ACA to expand Medicaid compared to other states. Other studies have found that low-

income adults in states that expanded Medicaid were less likely to delay health care (Miller and Wherry, 2019), more likely to have received treatment for substance abuse disorders (Maclean and Saloner, 2019), and have better access to mental health care (Winkelman and Chang, 2018). Other parts of the ACA also increased access to mental health through dependent age coverage requirements (allowing all children to remain on their parents health care until age 26).

Another way to expand access to mental health care is to improve parity between insurance coverage for mental/behavioral health and other physical health conditions. There is good evidence that expanding access to insurance coverage for mental health services reduces suicide risk. For example, Klick and Markowitz (2006) and Lang (2013) study mental health insurance mandates. Lang (2013) estimates that the passage of state laws requiring insurance companies to include mental health coverage at parity with coverage for physical health services, leads to reductions in suicide mortality of approximately 5 percent.

Federal law to achieve parity for mental health coverage began with the 1996 Mental Health Parity Act, mandating that group health insurance plans do not restrict lifetime benefits for mental health care more than for physical or other health care.[19] In 2008, the federal government expanded this effort to require group health insurance plans to offer access to mental health and substance abuse treatment that is comparable to covered treatment for physical and other health services,[20] and the Affordable Care Act extended this to individual insurance plans. Nonetheless, a recent Kaiser Family Foundation (2022) report concludes that parity in group insurance coverage for mental health remains uneven across the country. This is due in good measure to the differences in definitions of what is medically necessary, the size of provider

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[19] https://www.congress.gov/bill/104th-congress/house-bill/4058/
[20] https://www.congress.gov/bill/110th-congress/house-bill/6983

networks, and variations in state laws and enforcement of federal requirements.[21] Similarly, coverage for mental health and substance abuse in individual health insurance plans and Medicaid varies across states. Relatedly, Jacome (2020) finds increases in negative outcomes such as arrests when children age out of mental health coverage provided through Medicaid.

One reason to be skeptical that efforts to expand coverage alone would be effective in reducing suicide risk is that the vast majority of persons in the U.S. are already covered by some form of health insurance subject to a parity requirement. Using the American Community Survey, we estimate that 91.4 percent of Americans report they had some form of health insurance in 2020. The most common source was employment-based private health insurance (54.4 percent) with another 10.5 percent covered under individual plans with private insurers. Approximately 34.8 percent of Americans were covered via a public health insurance plan, with 17.8 percent enrolled in Medicaid.

Though overall rates of health insurance are high, there are reasons why expanding health insurance coverage could be effective for reducing suicide risk. First, in 2021 approximately 27.5 million Americans under 65 remained uninsured (Tolbert et al., 2022). Further, Keisler-Starkey and Bunch (2021) estimate that 14.9 percent of Americans between the ages of 19 to 25 were uninsured in 2021. Among those 26 to 34 the rate of uninsurance was 13.5 percent. As we saw above, suicide rates have been rising especially fast for these groups.

Beyond expanding health insurance coverage at the margins, an important avenue for expansions in mental health care to affect suicide risk is through providing better access. In large metropolitan areas, the substantial increase in demand for mental health services during the COVID pandemic led many service providers to refuse insurance payments (Peterson, 2021).

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[21] See https://www.paritytrack.org/reports/ for state-by-state comparisons of implementation of mental health parity requirements.

Obviously, the inability to find a mental health service provider accepting insurance reduces access (Fullen et al., 2021). In rural areas, the problem has been made worse by the inability to access any provider (Thomas et al., 2009) and a greater stigma associated with mental illness (Brenes et al, 2015). The COVID 19 pandemic also increased the use of telehealth as a modality for delivering mental health services, in all areas of the country. While there is real interest among clinicians and researchers in the prospect that accessing health care virtually will expand access and reduce untreated mental illness and suicide (e.g. Myers 2019), the evidence on this remains unclear.

In sum, during the past few decades policies that expanded coverage and improved mental health parity in health insurance plans have been effective in improving access to health care including care for mental health and substance abuse. This has improved population health on several dimensions, including reducing suicide risk at the margin. An important lever here has been the ACA inducing states to expand Medicaid. In 2023 North Carolina became the 40th state to do so. A recent Kaiser Family Foundation report estimates that 1.9 million low-income individuals would qualify for health insurance it the remain 10 states similarly expanded their Medicaid programs.[22] Another important margin for reducing suicide risk by expanding access will be to improve access to mental health services among the insured. Parity laws have helped here, but the availability of covered providers remains an important limitation.

A second strategy to diminish motive for suicide is to prevent or interrupt bullying. As we saw, anti-bullying laws can reduce suicidality in the aggregate. Though this is reassuring, there is much we need to learn about the effective design and implementation of laws to prevent bullying and to protect youth from victimization (Hatzenbuehler et al., 2015). At present, anti-

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[22] https://www.kff.org/medicaid/issue-brief/how-many-uninsured-are-in-the-coverage-gap-and-how-many-could-be-eligible-if-all-states-adopted-the-medicaid-expansion/

bullying laws and policies vary along many dimensions. State anti-bullying laws differ in how bullying is defined and what behaviors constitute it (Sacco et al., 2012). In some places, a single incident involving threats or disparagement suffices, while other states require a demonstrated pattern of abuse to meet the standard of bullying (NASEM, 2016). Anti-bullying laws also differ on whether vulnerable groups are listed as deserving special protection: For example, laws in Massachusetts and Vermont recognize vulnerability based on a variety of characteristics such as race, gender identify and disability, while Ohio and Texas are silent on whether personal characteristics are germane to the risk or consequences of bullying (NASEM, 2016).

One source of guidance on how bullying prevention efforts might be structured comes from the U.S. Department of Education (DOE), whose Office of Civil Rights addressed the topic in guidance to school administrators as part of its requirement to enforce anti-discrimination in education on the basis of race, gender and disability under Titles I, IX, and VI of the Elementary and Secondary Education Act.[23] The DOE suggests a number of components be included in state laws or local (e.g. school district) policies, including providing a clear definition of bullying and explicitly prohibiting such behavior. The DOE also makes clear that expedient and transparent reviews of accusations of bullying are vital.

There is a large literature in public health and prevention providing logic models and some empirical evidence for specific anti-bullying efforts. At present, there is no clear answer on what works best (NASEM, 2016). Most of the studies that have attempted to synthesize findings (including meta-analyses) point to the importance of working on many levels – the individual (bully and victim), the school, family(ies), and community. Among interventions of this type is the Olweus Bullying Prevention Program that attempts to modify individual student behavior and

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[23] https://www2.ed.gov/about/offices/list/ocr/letters/colleague-201010.pdf

school climate by working with all students and staff in the schools, parents and community members, along with supplemental interventions targeted at identified bullies and victims.[24] There are numerous other proprietary anti-bullying interventions and curricula, with no clear evidence on what works best (Ttofi and Farrington, 2011; Jimenez-Barbero et al, 2016). Nonetheless, there is agreement that reducing bullying is not accomplished by zero-tolerance policies that prohibit bullying without regard to context or focus only on the bully and victim (NASEM, 2016). Rather, one benefit of broader strategies to prevent bullying appears to be that they help build relationships between students and teachers and school staff that can reduce the incidence and harm of bullying (Bradshaw et al., 2013). This aligns with the recommendation of the CDC to reduce suicide risk by promoting healthy connections (CDC, 2022).

Guidance from the CDC is also useful in thinking about another factor shaping motive for suicide – economic hardship. Suicide risk is exacerbated by the loss of employment or housing, so federal, state and local policies that lessen the hardship due to these losses can be protective (CDC, 2022). This includes expanding access or uptake of unemployment insurance benefits (Kaufman et al, 2020; Cylus et al, 2014, Moore et al., 2017) and income transfers including the Earned Income Tax Credit (Lenhard, 2019; Rambotti, 2020). In addition, policies to reduce housing insecurity appear to have the downstream effect of reducing suicide risk (Reeves et al, 2016). Providing rental assistance to those at risk of losing their homes and intervening to address homelessness have both been found to reduce depression and suicide mortality (Denary et al., 2021; Montgomery et al., 2020; Aquin et al. 2017). While policies aimed at providing income and housing security cannot serve as first line policies in the effort to prevent suicide, it

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[24] https://olweus.sites.clemson.edu

is clear that subsequent reductions in mental health problems and suicidal behavior and mortality should be counted as ancillary benefits to any investments in such programs.

Restricting Means:

A different strategy for reducing suicide is to focus on restricting access to places or tools for self-harm. There is a substantial body of research on the impact of suicide prevention barriers installed on human-made structures and natural cliffs (Beautrais, 2007). A recent example is a review of many such suicide prevention barriers on bridges and cliffs installed over decades in Australia that finds substantial reductions in suicide mortality (Bandera et al., 2022). While such barriers on iconic structures can be controversial, they do reduce suicide mortality both by preventing attempts and by diverting some intent on suicide to employ other, less lethal means. For example, Whitmer and Woods (2013) estimated that the suicide-prevention barriers installed on San Francisco's Golden Gate Bridge saved dozens of lives per year *even if* all those prevented from jumping attempted suicide by other means. This is partly because such barriers are often installed at "suicide magnets" that have proven to be especially lethal. It is also because restricting access to a lethal means does reduce suicide mortality: As Yip et al. (2012) review, restricting access can result in some "means substitution," but for a large share of those at risk they prevent a suicide attempt. This is especially the case for women, those in developed countries, and those planning to use methods other than poison (Yip et al, 2012).

Though restricting access to sites where suicidal persons could jump to their deaths saves lives, in the United States such deaths accounted for only about 2.3 percent of suicide deaths in 2020.[25] During the same year, guns were used in 53 percent of all suicide deaths and

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[25] Authors' calculations using CDC data https://wonder.cdc.gov/ucd-icd10.html

strangulation from hanging another 27 percent. For different reasons, it has been more difficult to restrict access to ligatures and guns in the U.S. While it is possible to confiscate belts and ropes that might be used for strangulation in institutions such as hospitals, it would be impractical and non-sensical to restrict such access in the population. In the case of guns, there is evidence that restricting new gun purchases could reduce suicide mortality (e.g. Ludwig and Cook, 2000; Luca et al., 2017; Rodriguez Andres et al., 2011; Duggan et al., 2011; Miller et al, 2006). However, it appears to be politically impossible to restrict access to guns in the current U.S. environment. One feasible inroad for protecting the suicidal from accessing guns is in the form of extreme risk protective orders, also known as "Red Flag Laws." These laws provide a mechanism for family members or law enforcement to petition a court with evidence that a person is at risk of harm to themselves or others because of firearms in their possession. A judge can file an extreme risk protection order prohibiting the subject in question from purchasing and possessing guns, or requiring them to turn in their guns to local law enforcement for a set period of time (or until an additional review is conducted). Much of the research on Red Flag Laws focuses on legal issues, rather than protective effects. There are a few promising studies that attempt to study effects compared changes in suicide mortality rates after versus before the implementation of a Red Flag Law (Swanson et al., 2016; Kivisto et al., 2018, and Heflin, 2022). For example, Heflin (2022) estimates that overall suicide rates decline by about 6 percent in states implementing new Red Flag Laws. Likewise, Child Access Protection (CAP) laws which impose sanctions and punishments on parents who fail to store their guns safely have been found to reduce youth suicide risk and the presence of weapons in schools (Kivisto et al., 2021; Anderson and Sabia, 2018; Anderson, Sabia, and Tekin, 2021).

Crisis intervention:

Rather than addressing underlying risk factors, a different strategy for suicide prevention is to intervene in a period of crisis. Suicidal persons sometimes communicate their intentions or reach out to others in their moment of crisis. Crisis hotlines are a first line of suicide prevention for the acutely suicidal (Gould et al., 2007). There is a well-developed literature describing the role of crisis hotlines in suicide prevention, as well as their characteristics and features (e.g. Gould and Kalafat, 2009). In structured settings such as the military, or among police, fire and ambulance services, crisis intervention could also include "postvention" services for members of the organization that were identified as in crisis and survived (Witt et al., 2017). Principal goals of intervention services such as hotlines are to reduce callers' immediate crisis or suicidal state, and to provide referral to mental health care. Research on the effectiveness of hotlines subsequently assesses proximal effects (the reduction on crisis or suicidal state) and distal effects (access to treatment and improved health). Assessing impacts is made difficult by a number of factors, including anonymity, stigma, and concern about the risks of a non-therapeutic intervention from researchers. Some research circumvents this problem by focusing on response. For example, Gould et al. (2016) found that counselors on the National Suicide Prevention Hotline were able to get the majority of callers at imminent risk of suicide to collaborate on a plan for intervention and were permitted by nearly 20 percent of callers to send emergency responders. Further, studies that have been able to conduct follow up interviews with suicidal persons who called crisis hotlines generally find that callers report reduced levels of crisis and suicidal state subsequent to the intervention (Ramchand et al. 2017; Hoffberg et al., 2020).

The biggest open question in crisis intervention services for preventing suicide in the United States is how effective the new, national 988 emergency number will be. In the summer

of 2022, 988 was designated as a national 3-digit dialing code to connect callers with the National Suicide Prevention Lifeline.[26] 988 can also be reached via SMS text and chat. At this time, it is too early to evaluate whether 988 will provide the same reductions in proximal suicide risk and referral to care. The easy to access number is promising, but if 988 diverts those in crisis to engage with prevention services via text or chat there is concern that these modalities are less effective (Gould et al., 2021).

Finally, although social media use may be a driver of suicidality, there has been steady progress in tools to detect suicidality based on textual analysis of social media posts. Of course, for all of the potential promise offered by individual level histories of texts, photos and media, the classification problem remains challenging. There are substantial cross-sectional differences in how individuals use language and there is also substantial heterogeneity in the language the same person uses over time. Even with massive amounts of text and ever-expanding computational power, separating signal from noise poses a daunting task.

Conclusions

The 20th century ended with decades of progress in the effort to reduce suicide. This progress stopped and then abruptly reversed after 2000. From the perspective of just a few years into the 21st century it might have seemed that recent progress had just stalled. It is now clear that suicide rates had begun a decades long rise, with the sharpest rates of increase since 2006. It is also clear that the age distribution of suicide has changed: Young people make up a larger share of the rising national rate. This means that the life-years lost to suicide are growing faster than the suicide rate itself. Just as worrisome, the rate of suicide among women and racial and

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[26] https://988lifeline.org/current-events/the-lifeline-and-988/

ethnic minority groups have recently increased disproportionately. Since the mid-2010s, suicide rates among Black and Hispanic Americans have risen sharply. These patterns raise many questions and underscore the importance of understanding the root causes of these increases. In this article we describe the prior literature on potential causes of suicide, and explore which, if any seem most consistent with this overlooked epidemic.

Part of the story has been an epidemic of untreated mental illness, evident both in suicide rates and major depressive episodes. Given that major depressive episodes are a key predictor of suicide ideation, attempt and completion, the role of access to quality mental health care should be the first line of defense to reduce suicide. Indeed, laws which have expanded access to mental health care through parity requirements have shown promise. However, changes in insurance coverage are not a compelling mechanism for the increases in suicides over the last decade. The Affordable Care Act decreased the number of people without insurance to a negligible fraction through expansions to Medicaid, the creation of health care exchanges with subsidies, and allowing young adults to stay on their parents' insurance until they are 26. If reductions in suicide are to be accomplished by expanding treatment of the growing number of Americans suffering from major depression and other serious mental illnesses, this will require expanding access and use of treatment among the insured. This could include increasing the number of health providers that serve insured patients for mental health treatment. It could also include efforts to encourage treatment among those suffering from major depression but uncertain or unwilling to seek mental health care.

While gun ownership in the United States is responsible for our exceptionally high rate of gun suicide, we show that for most age groups recent increases in suicide are driven at least as much by non-gun suicides as by death from gunshot. The exception is for very young people,

whose recent increase and large increase in suicide appears to have been exacerbated by access to guns. There is promising evidence that red-flag laws and other types of warning systems could reduce suicide risk. Among children, access to firearms is less likely to be interrupted by a red-flag law. There is some evidence that child access protection laws can reduce harm for children. We know too little about whether expanding or strengthening these laws could materially reduce suicide mortality among adolescents. While there is evidence that policies that make it marginally harder to purchases guns (like waiting periods) may be effective, policy discussions about expanded gun control, can have a perverse effect of increased weapon stockpiling due to loss aversion – even if these discussions lead to no real change in law.

The opioid crisis stands out as a potentially important part of the story. The public health shock that is the opioid epidemic has coincided with the rise in suicides, at least at the national level. But, as we show, changes in suicide rates in states which have seen the steepest increases in overdoses are essentially identical to the changes in suicide rates in states with the smallest increases in suicides. This suggests that even as the different epidemics of opioids and suicide have some common antecedents, they are distinct threats to public health.

The role of macro-economic cycles on suicide is well documented. As we saw, suicide rates increased in the Great Recession most for prime aged adults, and these increases were in line with evidence from previous changes in unemployment. Economic factors do not readily explain changes in suicide rates during the 2010s, however. Nonetheless, in 2023 the threat of future recessions stands out as a source of concern, as central banks raise interest rates in efforts to combat inflation and increase risks that economies across the world sink into recessionary periods.

Closer to home, it is clear that bullying victimization in schools is a key predictor of suicidality among adolescents. It remains unknown if or how bullying has contributed to the upwards trend in youth suicide. While aggregate bullying rates have not increased in recent years (2009 to 2019), we only began tracking bullying in 2009 in large nationally representative surveys like the Youth Risk Behavior Surveillance System (YRBSS). Further, patterns of suicidal behavior reported by teens in the YRBSS appear to differ from measures from other sources. For example, the number of teens who reported attempting suicide changed little between 2009 and 2019 (Xiao et al., 2021), even as suicide mortality and the number of teens treated for non-fatal suicide attempts in emergency department increased sharply (Burstein et al., 2019). This clouds our understanding of trends in suicide. Changes in access to cellphones, the internet, and social media may have changed the intensive margin of bullying in ways surveys (which focus on extensive margin questions) fail to capture.

We end our discussion of these patterns of suicide mortality and prevention with a puzzle. A challenge for researchers hoping to better identify the potential roles of the factors described above in explaining the rise in suicide is that many of these changes occurred in other developed countries over the same period, though no other country saw suicide rates rise like the U.S. did. For example, the Great Recession was global, and most countries experienced major economic disruption. All countries have access to recent technological changes and social media. Other countries have seen increases in prescription and illicit opioids, even if not at the scale seen in the U.S. (OECD 2019.) An especially relevant comparison is Canada, which has seen a rapid increase in mortality from fentanyl, but no commensurate rise in suicide (Public Health Agency of Canada, 2022). And, though there is no doubt that the U.S. is an outlier with respect the number of guns possessed by residents and used for suicide, the rise in suicides in the U.S.

occurred without an expansion of the number of gun-owning households. Even as more can be learned about the relative roles of each of these factors within the U.S., good comparative studies are needed to help us understand how these patterns comport with quite different patterns of suicide in different countries.

Moving forward, there are several open questions around whether recent changes in technology can limit suicide risk. There is a growing body of research suggesting internet access and social media lead to worse mental health. This is particularly true for young people, the group which has shown the both the steepest increases in suicide risk in recent years and has at the same time the highest rates of social media and internet use. It remains to be seen what policies are effective (if any) at reducing this as a risk factor. Machine learning and textual analysis could help to identify those most at risk who are using social media, but these have yet to be widely adopted by tech companies, even as they have been at the cutting edge of using those tools for their core business aims.

Finally, 988 is now a nationally recognized communication standard for those in extreme mental distress, automatically connecting those who call with mental health crisis counselors through a wide variety of communications (text, phone and the internet). We know that crisis intervention via telephone hotlines can reduce immediate risk, and lead to treatment. There is evidence that awareness around 988 is growing, but it remains to be seen whether this new crisis intervention resource can help mitigate the suicide epidemic.

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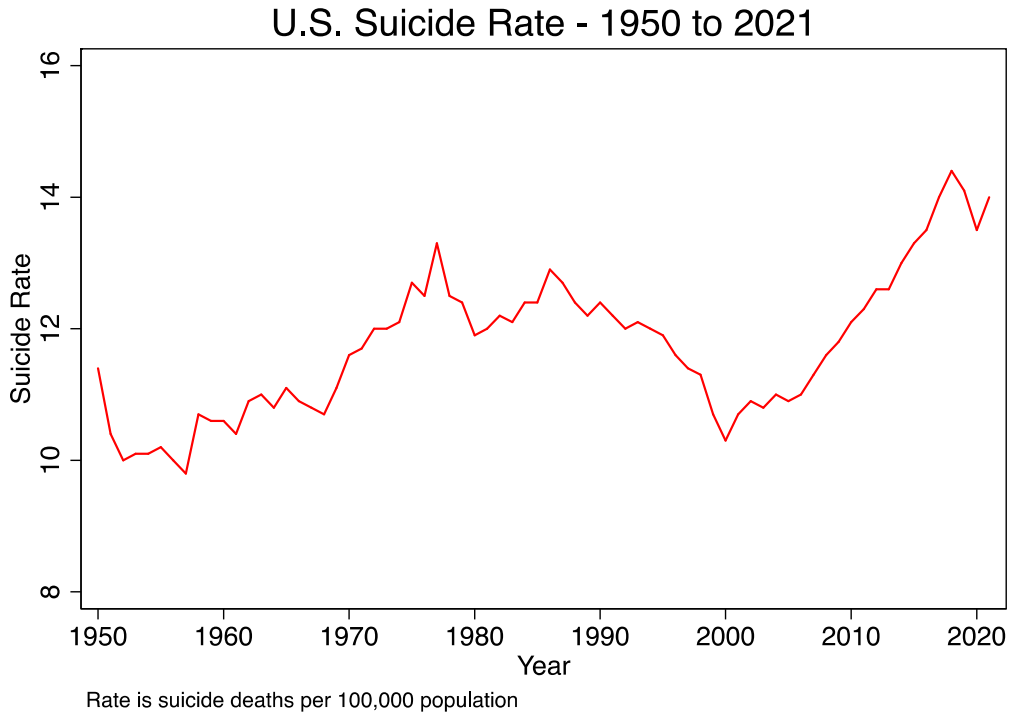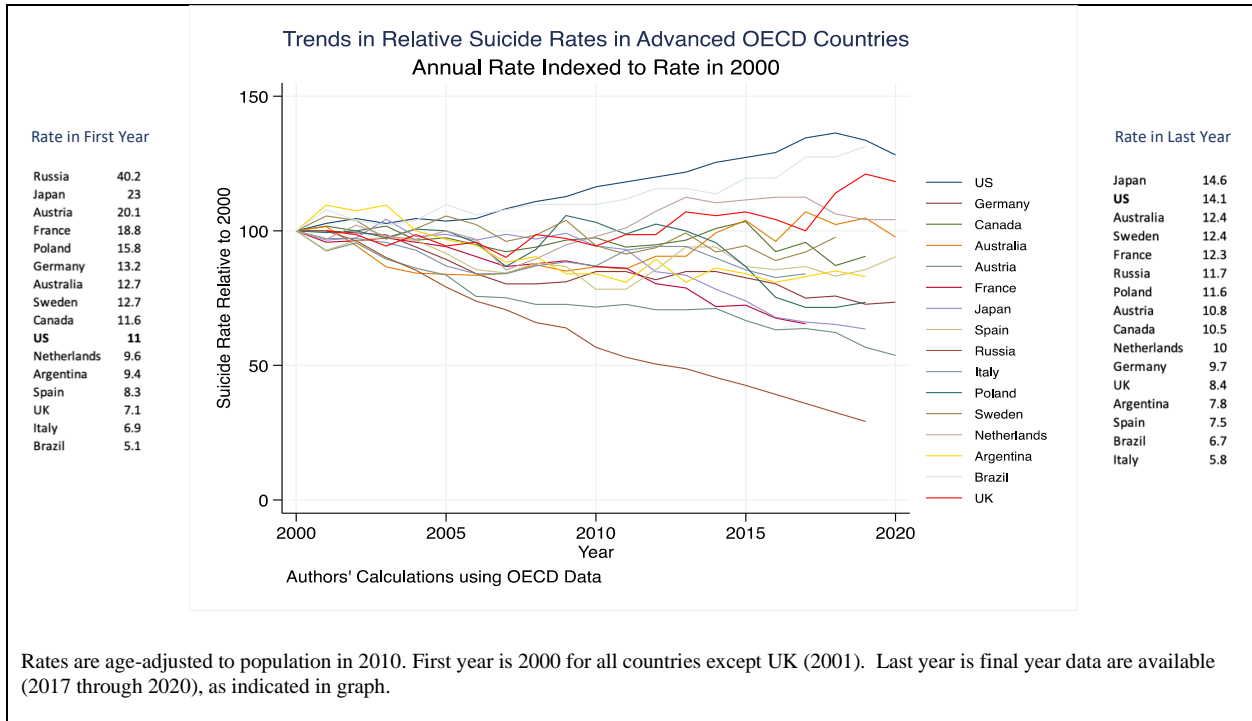
Figure 1

U.S. Suicide Rate - 1950 to 2021

Rate is suicide deaths per 100,000 population

Figure 2

Trends in Relative Suicide Rates in Advanced OECD Countries
Annual Rate Indexed to Rate in 2000

Authors' Calculations using OECD Data

Rate in First Year

Russia	40.2
Japan	23
Austria	20.1
France	18.8
Poland	15.8
Germany	13.2
Australia	12.7
Sweden	12.7
Canada	11.6
US	**11**
Netherlands	9.6
Argentina	9.4
Spain	8.3
UK	7.1
Italy	6.9
Brazil	5.1

Rate in Last Year

Japan	14.6
US	**14.1**
Australia	12.4
Sweden	12.4
France	12.3
Russia	11.7
Poland	11.6
Austria	10.8
Canada	10.5
Netherlands	10
Germany	9.7
UK	8.4
Argentina	7.8
Spain	7.5
Brazil	6.7
Italy	5.8

Rates are age-adjusted to population in 2010. First year is 2000 for all countries except UK (2001). Last year is final year data are available (2017 through 2020), as indicated in graph.

Figure 3

Age-Specific Suicide Rates
2000 to 2020

Authors' calculations using U.S. CDC Data

Figure 4

Changes in Suicide by Age/Gender
High vs. Low Opioid Growth States
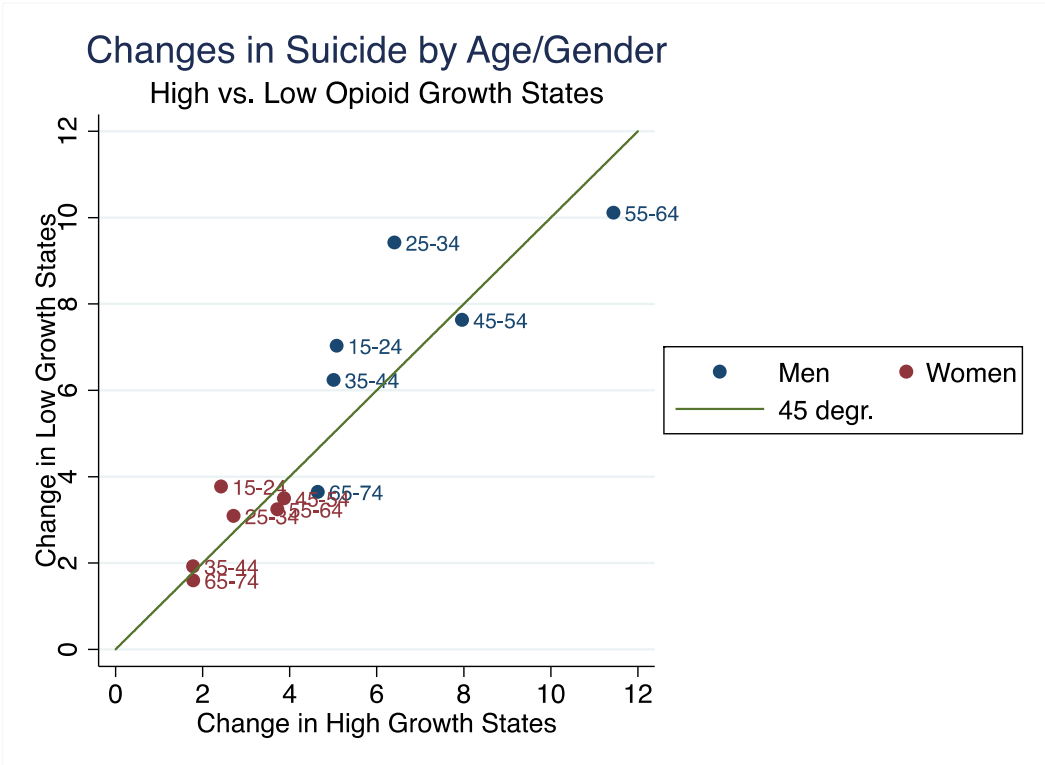
Each data point measures population-weighted changes in suicides per 100,000 population between 2000-04 and 2015-19 for an age/gender group in high-opioid growth states (x-axis) and in low-opioid growth states (y-axis).

Low growth states (< 20 deaths per 100k) were: Arkansas, Georgia, Hawaii, Idaho, Iowa, Kansas, Maryland, Minnesota, Mississippi, Montana, Nebraska, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah and Wyoming.
High growth states (> 30 deaths per 100k) were: Arizona, Connecticut, Delaware, Florida, Indiana, Kentucky, Louisiana, Maine, Massachusetts, New Hampshire, New Jersey, New Mexico, Ohio, Pennsylvania, Rhode Island, South Carolina and Tennessee.

Figure 5 Social Media Use in the U.S.: 2005-2020
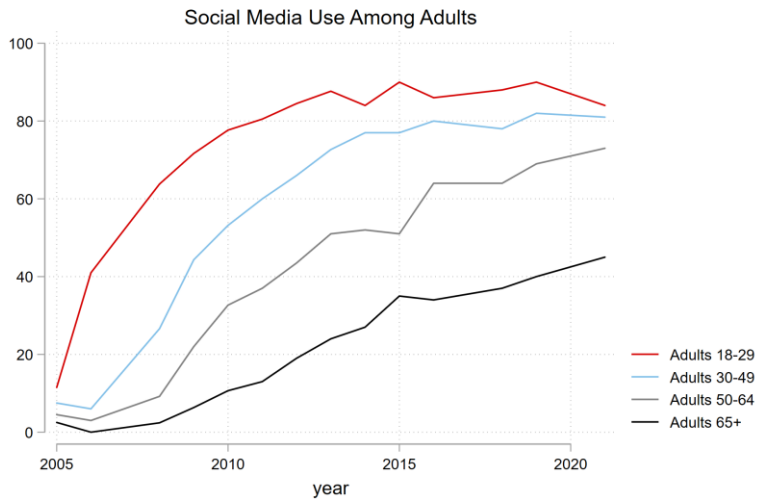
Authors' calculations from Pew Research Center annual survey data.
Each time series shows percent of adult respondents in age group reporting
use of any social media platform.

Figure 6
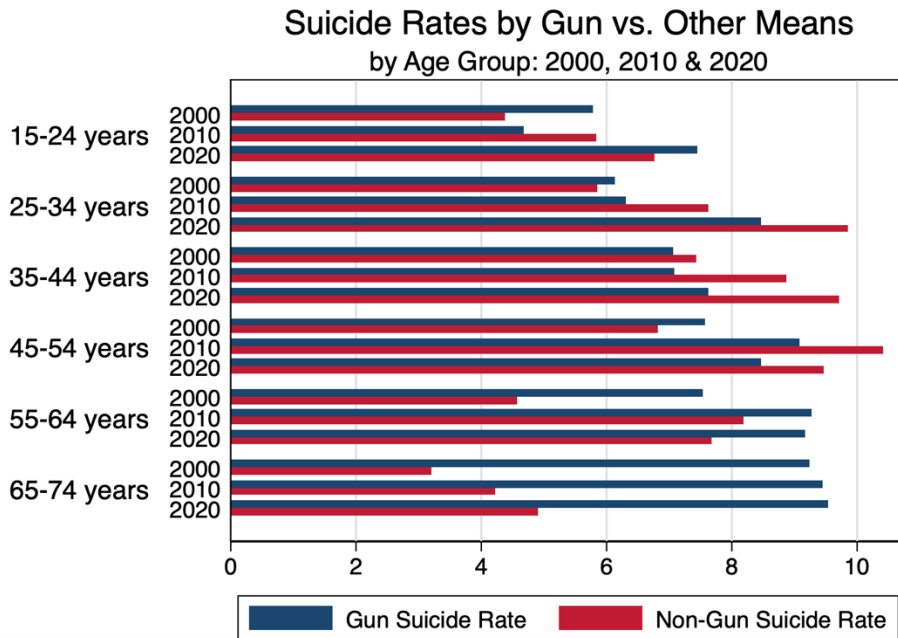
Authors calculations using National Vital Statistics reporting data from the U.S. Centers for Disease Control and
Prevention. Rates are deaths from gun/non-gun suicide per 100,000 population by year and age group.

Table 1

Age-Adjusted Suicide Rates by Gender and Race/Ethnicity from 2000-2020

Population	2000	2005	2010	2015	2020
All	10.4	10.9	12.1	13.3	13.5
By Gender					
Males	17.7	18.1	19.8	21.0	21.9
Females	4.0	4.4	5.0	6.0	5.5
By Race/Ethnicity					
White, non-Hispanic	12.0	13.0	14.9	17.0	16.8
Black, non-Hispanic	5.6	5.3	5.4	5.8	7.7
White, Hispanic	6.2	5.9	6.2	6.6	8.0
Black, Hispanic	-	1.6	1.8	2.1	3.2
Asian/Pacific Islander	5.2	5.0	6.2	6.5	7.0
Native American	9.9	11.0	11.0	12.6	14.6

Source: CDC Underlying Cause of Death: https://wonder.cdc.gov/ucd-icd10.html Accessed June 15, 2022

Table 2

Estimated Prevalence of Major Depressive Episode in past year and Treatment from NSDUH: by Year and Age Group

| Outcome | | | | | | | | | Year | | | | | | | |
Age Group	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Major Depressive Episode (MDE)																
12-17 years old	9.0	8.8	7.9	8.2	8.3	8.1	8.0	8.2	9.1	10.7	11.4	12.5	12.8	13.3	14.4	15.7
18-25 years old						5.2	5.2	5.2	5.8	5.7	6.0	6.5	7.0	8.5	8.9	10.3
26-49 years old						4.8	4.7	5.2	5.1	4.9	4.6	4.9	4.7	5.0	5.3	6.1
50+ years old						2.6	3.5	2.9	3.4	3.2	3.5	3.0	3.0	2.8	2.9	3.2
Percent with MDE, receiving treatment																
12-17 years old	40.3	37.8	38.8	39.0	37.7	34.6	37.8	38.4	37.0	38.1	41.2	39.3	40.9	41.5	41.4	43.3
18-25 years old						47.0	48.7	47.8	49.8	50.8	49.5	46.8	44.1	50.7	49.6	50.9
26-49 years old						64.8	68.1	68.1	68.8	66.7	67.9	67.4	67.4	67.3	64.4	68.9
50+ years old						73.8	78.4	80.0	76.8	81.3	80.8	80.9	77.3	79.7	78.9	76.5

Source: Substance Abuse and Mental Health Services Administration. (2021). *Key substance use and mental health indicators in the United States: Results from the 2020 National Survey on Drug Use and Health* (HHS Publication No. PEP21-07-01-003, NSDUH Series H-56). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/