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Deaths of Despair and the Incidence of Excess Mortality in 2020

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Abstract

Weekly mortality through October 3 is partitioned into normal deaths, COVID, and nonCOVID excess deaths (NCEDs). Before March, the excess is negative for the elderly, likely due to the mild flu season. From March onward, excess deaths are approximately 250,000 of which about 17,000 appear to be a COVID undercount and 30,000 non-COVID. Deaths of despair (drug overdose, suicide, alcohol) in 2017 and 2018 are good predictors of the demographic groups with NCEDs in 2020. The NCEDs are disproportionately experienced by men aged 15-55, including men aged 15-25. Local data on opioid overdoses further support the hypothesis that the pandemic and recession were associated with a 10 to 60 percent increase in deaths of despair above already high pre-pandemic levels.

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I. Introduction

The spread of COVID-19 in the United States has prompted extraordinary, although often untested, steps by individuals and institutions to limit infections. Some have worried that “the cure is worse than the disease.” Economists Anne Case and Angus Deaton mocked this as a “pet theory about the fatal dangers of quarantine.” They concluded in the summer of 2020 that “a wave of deaths of despair is highly unlikely” because, they said, the duration of a pandemic is measured in months whereas the underlying causes of drug abuse and suicide take many years to accumulate (Case and Deaton 2020). With the extraordinary social distancing continuing and mortality data accumulating, now is a good time to estimate the number of deaths of despair and their incidence.

As a theoretical matter, I am less confident that demand and supply conditions were even approximately constant as the country went into a pandemic recession. To focus ideas, take the demand and supply for non-medical opioid use, which before 2020 accounted for the majority of “deaths of despair.”¹ I acknowledge that the correlation between opioid fatalities and the unemployment rate had been only weakly positive (Council of Economic Advisers February 2020, Ruhm 2019). However, in previous recessions the income of the unemployed, and the nation generally, fell. In this recession, personal income increased record amounts while the majority of the unemployed received more income than they did when they were working (Congressional Budget Office 2020).² Many normal, non-lethal, consumption opportunities disappeared as the population socially distanced whereas alcohol and drug abuse is something that can occur in isolation. Patients suffering pain may have less access to physical therapy during a pandemic.

¹ Deaths of despair are often defined as deaths involving drug overdose, suicide, or alcohol abuse.

² “Irrational” demand can be particularly sensitive to income effects (Becker 1962, Council of Economic Advisers February 2020). At pre-pandemic prices, \$330 per week was enough to finance one morphine-gram equivalent of heroin (including fentanyl mix) for all seven days, which would be an extraordinary amount of opioid consumption (Mulligan 2020).

On the supply side, social distancing may affect the production of safety.³ A person who overdoses on opioids has a better chance of survival if the overdose event is observed contemporaneously by a person nearby who can administer treatment or call paramedics.⁴ Socially distanced physicians may be more willing to grant opioid prescriptions over the phone rather than insist on an office visit. Although supply interruptions on the southern border may raise the price of heroin and fentanyl, the market may respond by mixing heroin with more fentanyl and other additives that make each consumption episode more dangerous (Mulligan 2020, Wan and Long 2020). Mortality is part of the full price of opioid consumption and therefore a breakdown in safety production may by itself reduce the quantity consumed but nonetheless increase mortality per capita as long as the demand for opioids is price inelastic. I emphasize that these theoretical hypotheses about opioid markets in 2020 are not yet tested empirically. My point is that mortality measurement is needed because the potential for extraordinary changes is real.

II. Data used in this paper

The Multiple Cause of Death Files (MCOF) (National Center for Health Statistics 1999-2018), contain information from all of the death certificates in the United States. However, the public 2020 edition of those files is not expected until early 2022. We use the MCOF 2015-2018 files to project 2020 deaths by age, sex and week as follows. First, the MCOF deaths are aggregated by year, 11 age groups, sex, and month of death.⁵ Log of daily average deaths is regressed on full interactions between month, sex, and age group, as well as a linear year trend fully interacted with sex and age group. The year 2020 fitted values for the regression are, exponentiated, projections for monthly deaths by demographic group. The monthly projections are transformed to weekly projections by fitting a sixth-order polynomial in day of the year accounting for the fact that monthly and weekly data are each time aggregates of days. Both the

³ Of course the mortality statistics show that non-medical opioid consumption is less than 100 percent safe. Nevertheless, safety is a matter of degree that can be affected by market participants.

⁴ Referring to the additional drug overdoses in 2020 in San Francisco, the Executive Director of the Drug Users' Union concluded that "There is a lot more isolation, a lot more people using alone." (Thadani 2020).

⁵ The eleven age groups are less than 1 year, 1-4 years, eight ten-year intervals from 5-14 to 75-84, and 85 years and over.

monthly and weekly projections show a clear seasonal that is age- and sex-specific. The elderly have greater mortality in the winter while working age men have greater mortality in the summer.

The time trends are about 1.7 percent per year, reflecting population growth and population aging. However, note that the time trends are significantly greater for ages 25-44 for both men and women, largely reflecting a time trend in deaths of despair.⁶ In other words, our measure of “excess mortality” only reflects mortality that is above the upward trend.

I measure actual deaths from a CDC file for 2020 that begins in week five (the week beginning January 26, 2020) and aggregates to week, sex, and the same eleven age groups cited above. In order to minimize underreporting, I only use the data in this file through week 40 (the week ending October 3). Both actual COVID-19 deaths and actual total deaths are reported in this file. I define excess deaths to be the difference between actual total deaths and projected deaths. Non-COVID excess mortality is the difference between excess deaths and COVID deaths, with a minor correction for COVID underreporting that is discussed below. Appendix A graphs my weekly time series of COVID and non-COVID excess deaths for each of the 22 demographic groups.⁷

CDC has another file with more years, but only 6 age groups and no breakdown by sex. I use this file to make comparisons between 2019 and 2020. The CDC also has its own estimate of excess deaths. Rather than adopting their methodology, this paper has its own with attention to the estimation of additional deaths of despair.

The Cook County Illinois and San Diego County California Medical Examiner’s Offices maintain public microdata files of the deaths it has handled and whether opioids was involved. I use the records spanning the period January 2015 through June 2020 (SD County) or September 2020 (Cook County).

⁶ The upward time trend for ages 25-44 is approximately 5,000 deaths per year.

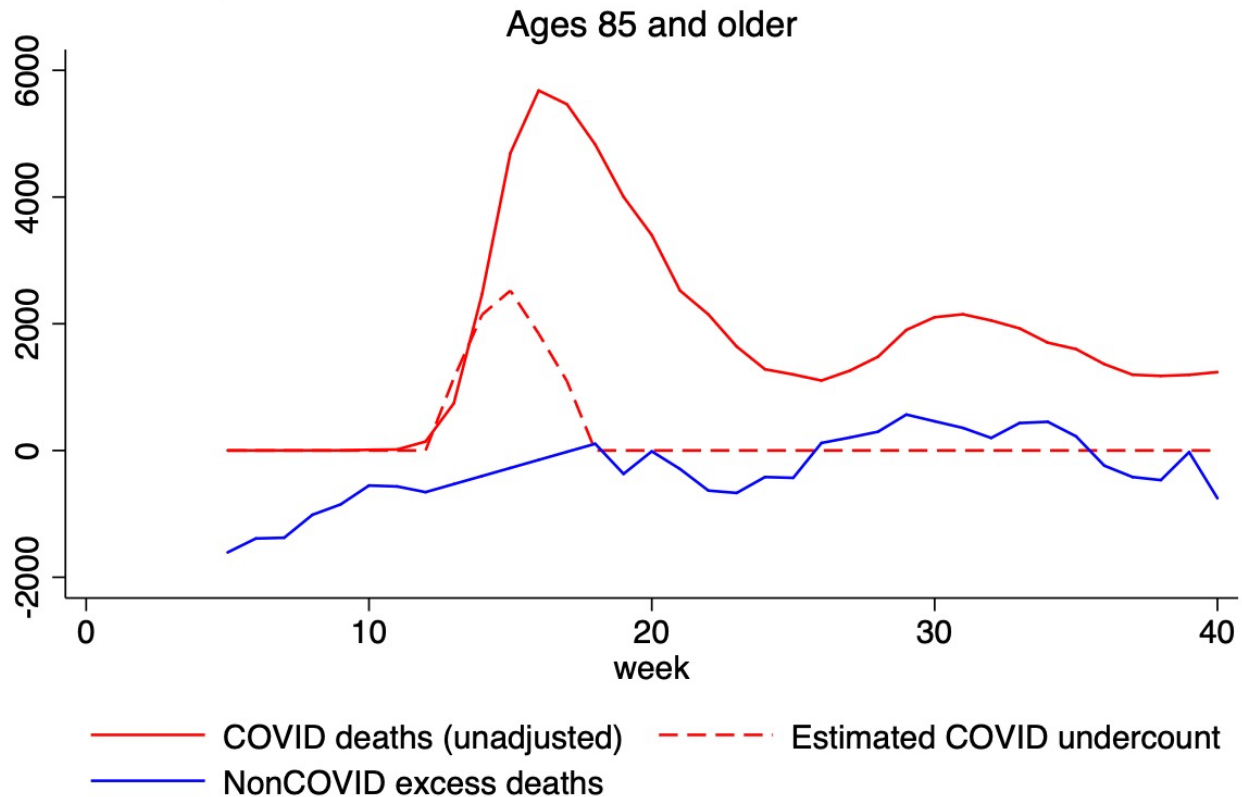
⁷ The CDC data dispel the myth that COVID deaths have been largely offset by fewer contemporaneous deaths from other causes. For weeks 5 through 40, there were 2.24 million deaths in 2020 as compared to our projection of 2.00 million, a difference of 241,000. Alternatively, compare the 2.24 million to 1.95 million deaths in the same period in 2019 (from a separate CDC file).

III. Evidence from the elderly that COVID deaths are measured accurately

Historically, flu deaths have been significantly underreported (Foppa and Hossain 2008), which raises concerns that COVID deaths would be underreported too. On the other hand, others are concerned that the definition of a COVID death is overly broad – “deaths with COVID” versus “deaths from COVID” and that the 2020 CARES Act’s financial incentives are affecting COVID death accounting. Specifically, the CARES Act created a 20 percent add-on payment for Medicare reimbursements that involved COVID, which began administratively on April 21 (American Hospital Association 2020, Centers for Medicare and Medicaid Services 2020).

The elderly are particularly interesting in this regard because COVID is lethal for them whereas, at least historically, deaths of despair are rare. Figure 1 graphs weekly time series for COVID deaths (unadjusted for any COVID undercount), an estimate of the undercount, and non-COVID excess deaths for ages 85 and older. Note that excess deaths are negative and approaching zero before late March (as they also are for ages 55-74 not shown), which reflects the mild 2019-20 flu season that would taper off at that time of year.

Figure 1. 2020 weekly excess deaths by cause



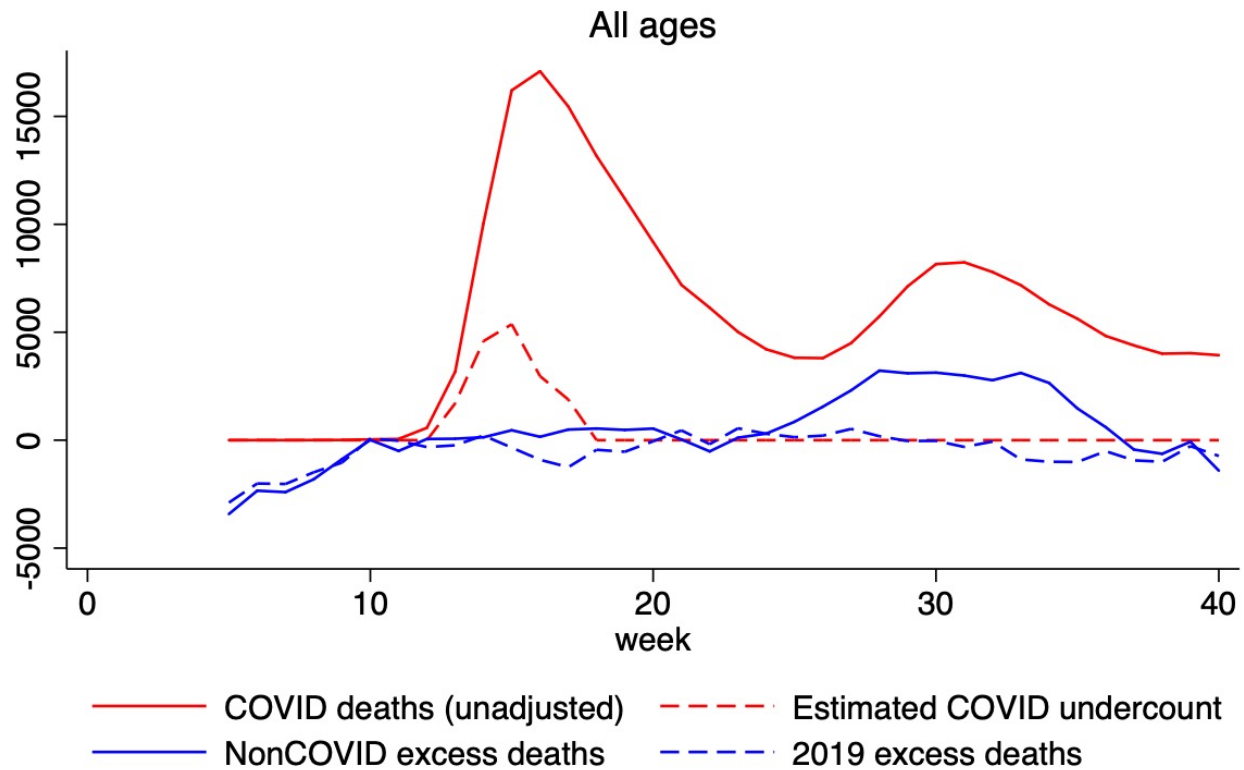
Net of official COVID deaths, actual deaths track projections after April (weeks 18 and following) while COVID deaths are significant, which suggests that COVID deaths are accurately recorded during that period. However, actual deaths spike above COVID deaths in late March and early April, at least among older people. This is the period when official COVID deaths began to grow were spiking but before CMS began administering add-on payments. I therefore linearly interpolate the gap between nonCOVID deaths and projected deaths for weeks 13-17.⁸ I refer to the difference between the measured gap and the interpolated gap as a COVID undercount.

Figure 2 displays the aggregate version of Figure 1, with a comparison to 2019. 2019 excess deaths are also essentially zero, except during flu season when they are negative due to the mildness of the 2018-19 flu. My point estimates are 16,705 nonCOVID excess deaths (hereafter, NCEDs) in 2020 weeks 5 through 40 (the weeks shown in Figures 1 and 2), which is

⁸ Zinberg (2020) also notes the undercounting of COVID deaths during March and April.

34,642 more than the same period in 2019. Excluding the flu season, defined as weeks prior to 10, the 2020 total NCEDs is 27,562.

Figure 2. 2020 weekly excess deaths by cause

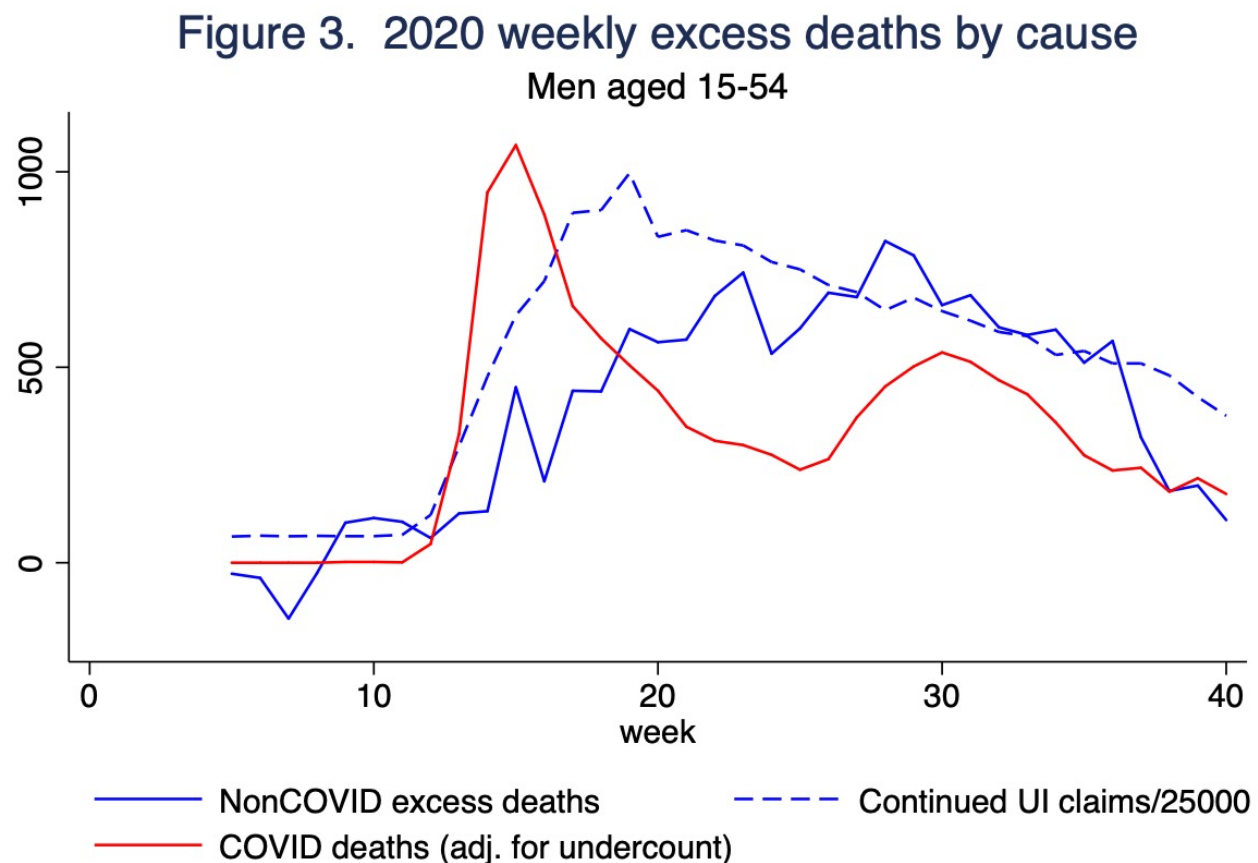


Note: 2019 excess deaths are from the same model, which is estimated from 2015-18 MCOD files.

IV. Deaths of despair in the past predict NonCOVID excess mortality in 2020

The aggregate weekly series in Figure 2 suggest that there were about 30,000 additional deaths in 2020 through October 3 that are not directly caused by COVID-19. If these were deaths of despair, they would be a significant addition to 2018 when they were about 66,000 for

the entire year.⁹ To begin to assess the characteristics of 2020 NCEDs, Figure 3 isolates men aged 15-54 (hereafter, “working age”). The flow of NCEDs builds over time, quickly passing COVID deaths. They remained above 500 per week for about four months. In order to compare the weekly timing of their excess deaths to a weekly measure of economic conditions, Figure 3 also includes continued state unemployment claims scaled by a factor of 25,000 in order to show together with deaths.



A total of about 14,000 NCEDs are shown in Figure 3 together with 12,000 COVID deaths. The time patterns are similar for sub-age groups, except that the youngest groups have few COVID deaths. 2,300 of the 14,000 NCEDs are for ages 15-24, and 2,000 for ages 25-34,

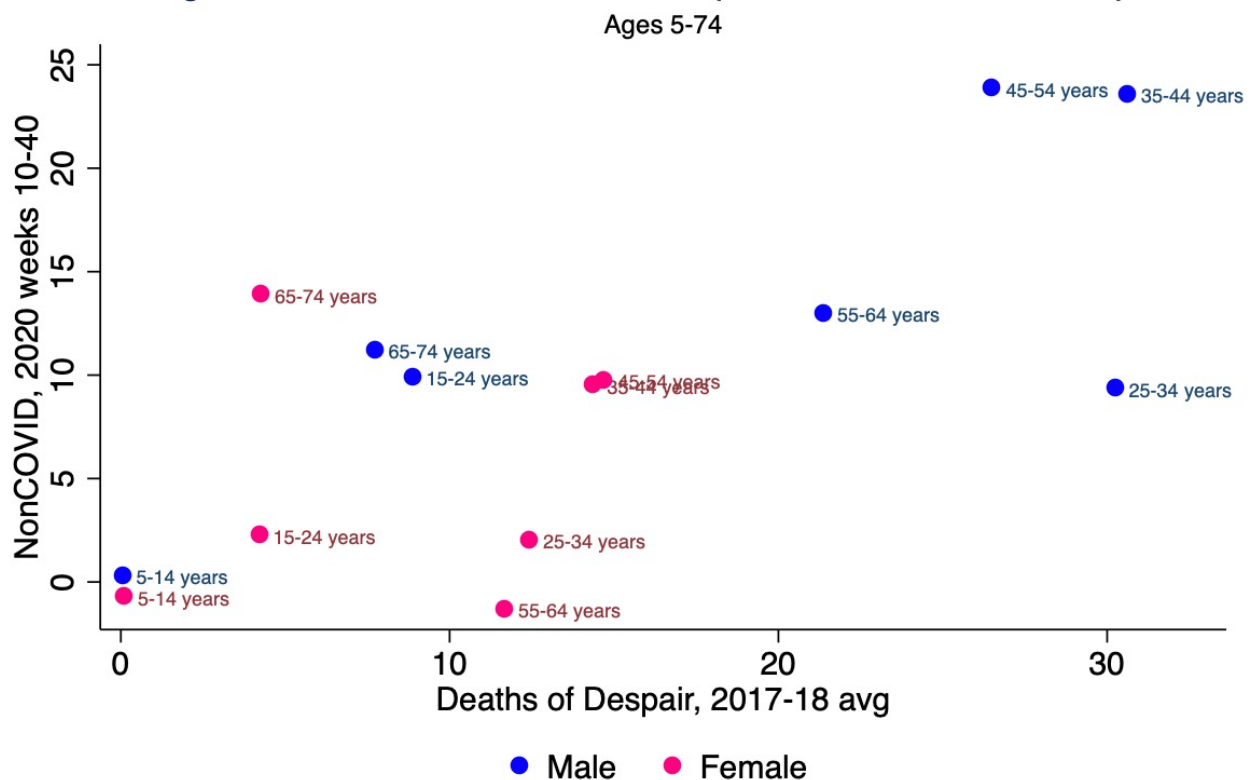
⁹ Following Ruhm (2019), I total deaths of despair from the MCODE files by counting all death certificates with UCOD code X40, X41, X42, X43, X44, X60, X61, X62, X63, X64, X85, Y10, Y11, Y14, Y13, Y14, or Y352.

where official COVID deaths are only 240 and 1,100, respectively. This is another reason to doubt that these measures of NCEDs are capturing a significant number of unmeasured COVID deaths.

A similar time pattern is observed for working-age women, albeit on a lesser scale. Working-age women have about 5,000 NCEDs and 5,700 COVID deaths over this period. Beginning in week 10, NCEDs for persons aged 55-74 years old total 14,000, with slightly more than half of these male. The time patterns for these groups are also similar to Figure 3, except that their NCEDs never exceeds COVID deaths.

Figure 4 is a scatterplot of deaths of despair (DSA) in the past versus NCEDs in 2020. Each series is expressed at a 31-week rate (weeks 10 through 40) per 100,000 population. Mortality rates from DSA were highest in 2017 and 2018 for men aged 25-54. As compared to other groups, they also have high MCEDs in 2020. Younger men and men aged 55-74 were more similar to women in terms of DSA mortality rates in the past, and are similar to women in terms of current mortality from NCEDs although the female rate is somewhat lower.

Figure 4. 2020 Excess Deaths compared with Deaths of Despair



Cause-specific deaths are expressed at a 31 week rate per 100K population. Deaths of Despair involve drug overdose, suicide, or alcohol.

Recall that NCEDs are deaths in excess of those projected from the recent past. A positive correlation in Figure 4 therefore potentially reflects that high DSA groups pulled further ahead of other groups in 2020 in terms of their mortality rates from DSAs. Fitting a regression coefficient to the 14 points in Figure 4 yields a regression coefficient of 0.54 with an intercept near zero. To the extent that NCEDs are also DSAs, the pandemic has been a time when roughly one DSA was added for each two DSAs in prior years. In other words, a group with 10 DSAs per week in the past may prove to have 15 DSAs per week during the pandemic weeks of 2020.

V. Local-government estimates of 2020 Deaths of Despair

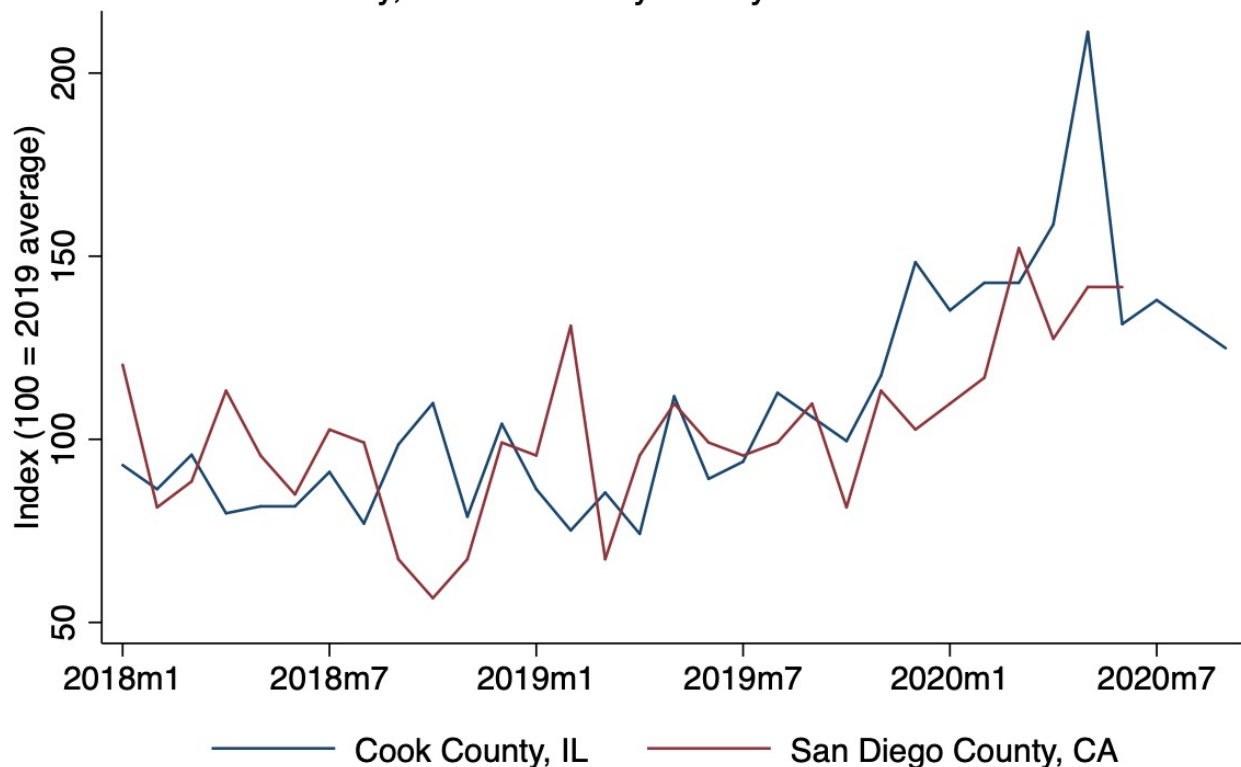
A few localities have publicized their death rates from drug overdose including comparisons with the same time in 2019. The local data may not be representative of the nation, and comparisons over time can be difficult during a time when residents are moving out of cities.

With data through August 2020, the City of San Francisco reports a 59 percent increase in accidental drug overdose deaths from 2019 (Knight 2020). Because about a third of that timeframe predates the pandemic recession, the pandemic itself could potentially be associated with an even greater increase. San Francisco also reports that 80 percent of its overdose deaths are men and 86 percent are among persons aged 25-64, which are both similar patterns to my national estimates of nonCOVID excess mortality.

The Cook County Medical Examiner's Office had 225 deaths involving opioids in May 2020, which followed 169 in April. These two observations are the highest ever, with the next highest being December 2019's count of 158. April through September averaged 159, as compared to 149 for the first three months of 2020 and 104 for the same period in 2019. In other words, monthly opioid fatalities reached new highs already in late 2019 and were even higher for part of the pandemic. Men are about three-quarters of the opioid deaths, which is about the same fraction as before the pandemic. The age distribution of opioid-involved fatalities is also similar.

San Diego monthly deaths involving opioids averaged between 24.2 and 26.7 during the years 2015-18. The monthly average reached 28.3 in 2019, with a peak of 37 in February of that year. From March 2020 through June 2020, monthly deaths ranged from 36 to 43. Each month had a total that exceeded even the highest month between March 2019 and February 2020. Their average of 39.8 exceeds the 2019 average by 41 percent. Figure 5 shows the monthly time series for the two counties expressed as an index defined to be 100 for the 2019 average.

Figure 5. Fatal opioid overdoses
monthly, as recorded by county medical examiners



The CDC reports twelve-month moving sums of deaths from drug overdose. Each new sum involves dropping the month from 13 months ago and inserting the most recent month. During the nine months before the pandemic, each new moving sum averaged 680 deaths more than the previous. In March 2020, the new sum was 1,511 above the previous sum. April's sum was 2,146 above that. May's sum was 3,388 above April's.¹⁰ These data are consistent with my

¹⁰ CDC (2020). Their estimate are provisional.

findings that NCEDs had accumulated into the tens of thousands between March and September of 2020.

The same CDC data through May 2020 show that synthetic opioids such as fentanyl are driving the increases. Given that men have a larger share of fentanyl-overdose deaths than prescription-opioid-overdose deaths, this suggests that men would be disproportionately represented among 2020 NCEDs.

VI. Conclusions

Mortality in 2020 significantly exceeds what would have occurred if official COVID deaths were combined with a normal number of deaths from other causes. The demographic and time patterns of the non-COVID excess deaths (NCEDs) point to deaths of despair rather than an undercount of COVID deaths. The flow of NCEDs increased steadily from March to June and then plateaued. They were disproportionately experienced by working aged men, including men as young as aged 15 to 24.

NCEDs are negative for elderly people before March 2020, as they were during the same time of 2019, due to mild flu seasons. Offsetting these negative NCEDs are about 30,000 positive NCEDs for the rest of the year, after accounting for an estimated 17,000 undercount of COVID deaths in March and April. If deaths of despair were the only causes of death with significant net contributions to NCEDs after February, 30,000 NCEDs would represent at least a 45 percent increase in deaths of despair from 2018, which itself was high by historical standards. At the same time, I cannot rule out the possibility that other nonCOVID causes of death or even a bit of COVID undercounting (beyond my estimates) are contributing to the NCED totals.¹¹

One federal and various local measures of mortality from opioid overdose point to mortality rates during the pandemic that exceed those of late 2019 and early 2020, which themselves exceed the rates for 2017 and 2018. These sources are not precise enough to indicate

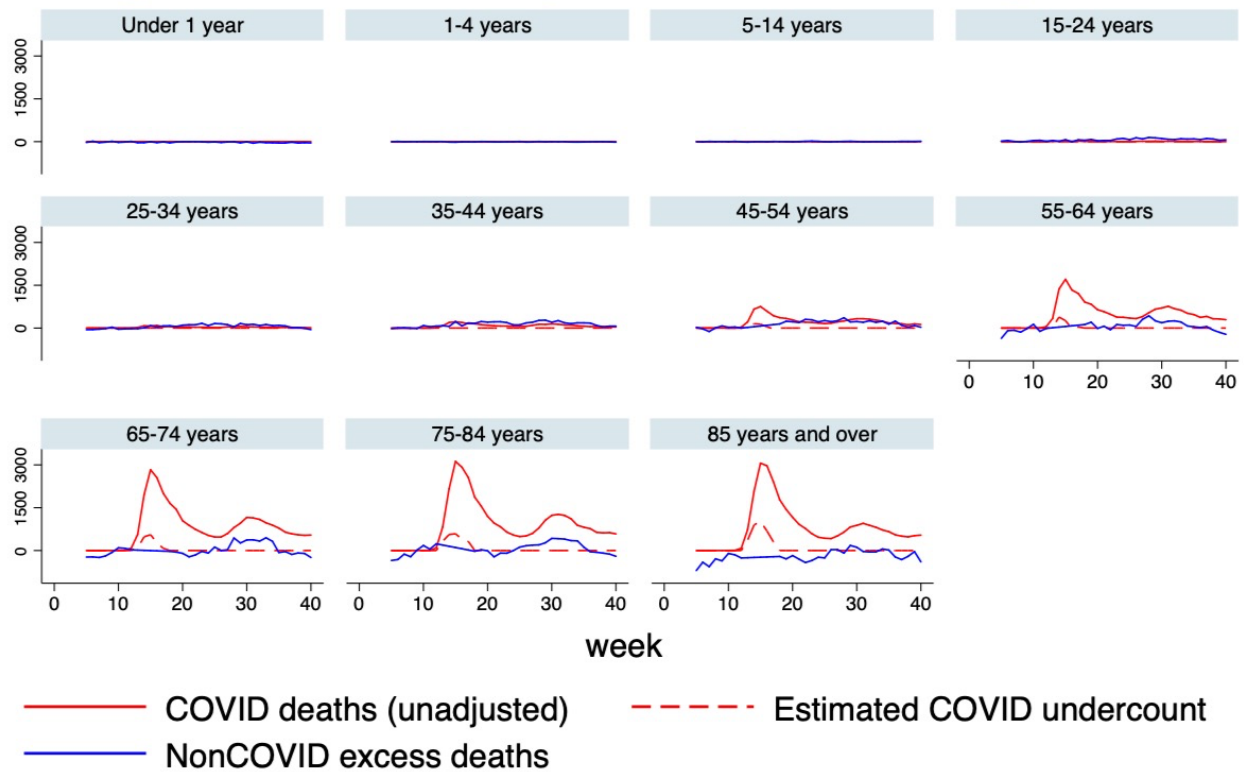
¹¹ Zinberg (2020) and others have noted that the pandemic shutdown of treatment of chronic non-emergent conditions resulted in deteriorating medical conditions, some of which may have resulted in death.

whether rates of fatal opioid overdose during the pandemic were 10 percent above the rates from before, 60 percent above, or somewhere in between.

Presumably social isolation is part of the mechanism that turns a pandemic into a wave of deaths of despair. However, the results in this paper do not say how much, if any, comes from government stay-at-home orders versus various actions individual households and private businesses have taken to encourage social distancing. The data in this paper do not reveal how many deaths of despair are due to changes in “demand” such as changes in a person’s income, outlook, or employment situation versus changes in “supply” such as the production of safety and a changing composition of dangerous recreational substances.

VII. Appendix: Weekly Time Series by Demographic Group

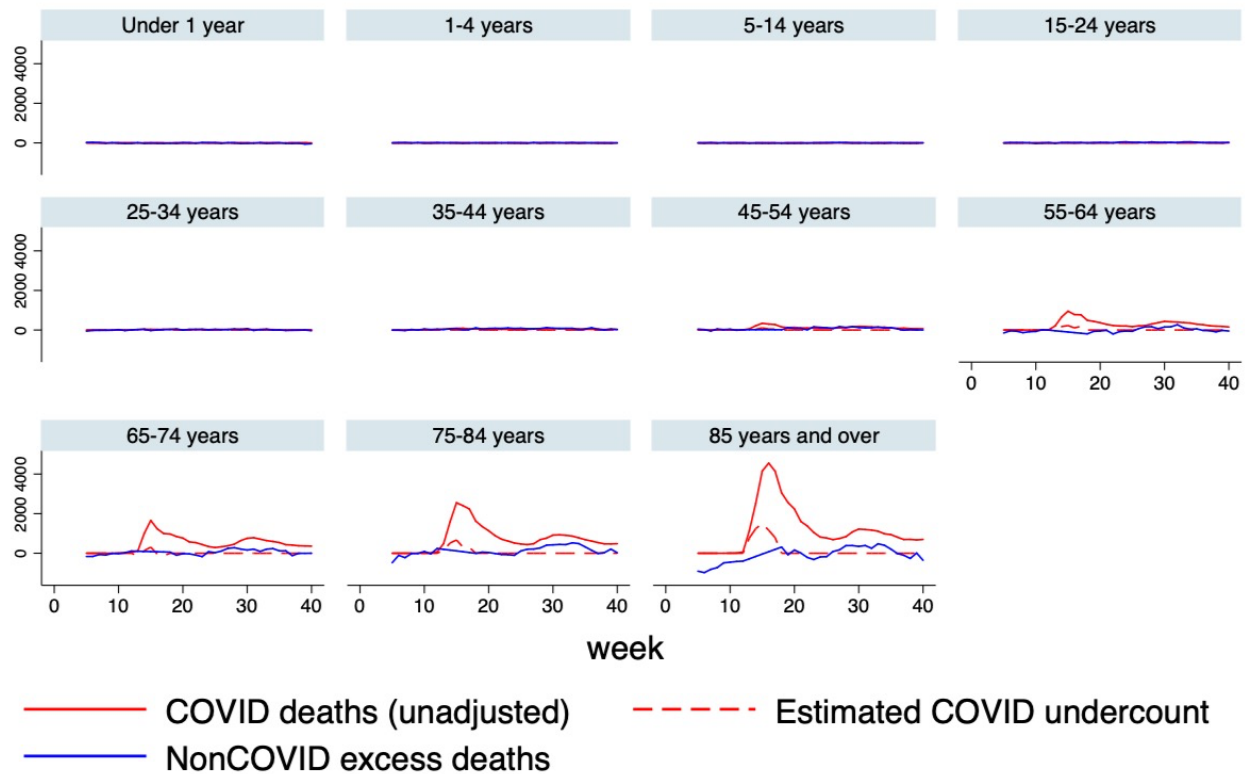
Figure A1. 2020 weekly excess deaths among males



Graphs by age group

Note slightly different vertical scale for males and females.

Figure A2. 2020 weekly excess deaths among females



Graphs by age group

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