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## COVID-19, mortality, and nursing homes: A literature and data review and policy discussion

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# **COVID-19, Mortality, and Nursing Homes: A Literature and Data Review and Policy Discussion**

Mark J. Warshawsky  
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AEI Economics Working Paper 2022-02  
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# **COVID-19, Mortality, and Nursing Homes: A Literature and Data Review and Policy Discussion**

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February 11, 2022

## **Abstract**

It is well established from research studies and basic data analysis that there is an exponential relationship between age and the infection to fatality ratio for COVID-19. Hence, the high mortality of the pandemic has been concentrated among the elderly. The close living arrangements of nursing homes exacerbated that tendency, and mortality from COVID was initially very high there. The vector of infection often came from staff. In the absence of vaccines and effective medical treatment and natural immunity, various non-pharmaceutical interventions were imposed by governments on general society and nursing homes. The evidence on their effectiveness is modest and mixed, although they seemed to have had at least temporary reducing effects. But the price of these socially isolating interventions was high on other causes of death, including in nursing homes. Hence, with the availability of effective vaccines, and more recently boosters, it was essential to the reduction of national mortality that quick and complete treatment focus be on the elderly, nursing home residents, and their caregivers. Although there has been substantial progress here, especially seen with reduced mortality at nursing homes, spikes still occur, and vaccine hesitancy gaps remain. So more needs to be done, especially for boosters and especially for staff, as the US now discusses and implements the return to normalcy. A targeted mix of mandates and incentives and culturally aware effective outreach are appropriate for these groups.

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<sup>1</sup> My thanks to Kieran Allsop for excellent research assistance, and to Joe Antos, James Capretta, and Kevin Dayaratna for helpful conversations.

Policy discussions regarding COVID-19 in the US, and in other countries, are now moving away from a crisis pandemic stance and towards a return to more normal conditions in education, travel, business, and government. In the US in particular this would mean that President Biden would not renew his declaration of national emergency when it ends on March 1, 2022. This seems appropriate for most segments of society now that vaccines, boosters, and effective disease treatments are available, and natural immunity is developing. But it still is worth pausing to evaluate whether more can be done to protect the most vulnerable segments of our society at risk from COVID-19 and those hardest hit at the beginning of the pandemic – the elderly, and, especially, residents in nursing homes.

### **Brief Review of Relevant Literature**

In a meta-analysis of 27 studies covering 34 geographical locations in developed countries, Levin et al. (2020) use seroprevalence analyses and death data to estimate the infection fatality rate, that is, the ratio of fatalities to total infections of COVID-19. The underlying studies were completed before September 2020, prior to the advent of vaccines and many advances in COVID-19 treatments. In particular, the researchers focus on calculating an age-stratified infection fatality rate (IFR) to inform policymaking for the pandemic. They find an exponential relationship between age and the IFR. For children and young adults, the IFR is very low (e.g. 0.002 percent at age 10, and 0.01 percent at age 25), but it rises to 0.4 percent at age 55, 1.4 percent at age 65, 4.6 percent at age 75, 15 percent at age 85, and exceeds 25 percent for ages 90 and older. The researchers highlight that the COVID-19 IFR of 0.75 percent for the age 55 to 64 age group compares to a 0.013 percent annual auto fatality risk in the US.

The meta-regression results conducted by Levin et al. indicate that about 90 percent of the variation in population IFRs across geographic locations is a result of differences in their age distributions. Although it is true that this study did not consider other demographic factors or comorbidities, the researchers claim that the addition to mortality risk from those considerations are quite modest relative to age and gender. The conclusion reasonably drawn by the authors was that public health activity should focus on limiting infections among vulnerable age groups.

Direct reports of COVID-19 deaths in the US through the Centers for Disease Control and Prevention (CDC) based on information from death certificates may have been too low at the beginning of the pandemic, because of delays by the CDC in February 2020 in the development of testing materials and hence in the diagnosis of the disease. Moreover, despite specific instructions from the CDC on the correct completion of death certificates by medical professionals, there are also errors and incompleteness in the information entered, estimated by the CDC at 30 percent of all death certificates. The direction of bias, if any, however, in terms of reporting underlying or contributing causes of death is unknown. More broadly, policymakers are interested in the total impact of the pandemic on mortality, including from the consequences of policy and other behavioral reactions, such as avoidance of various types of health care owing to fear of infection, capacity stresses in the health care system, mental and other feedbacks from shut-downs and social isolation, and sudden poverty from recession. Hence, analysts sometimes use an alternative measure, excess mortality, to gauge the impact of the pandemic. It is generally presumed that this measure will be larger than direct reports, although that does not necessarily have to occur.

The concept of excess mortality is simple – subtract a baseline estimate of deaths according to trends and conditions other than the pandemic, from actual counts in a specific time period. It is possible to

make the measure more specific towards particular demographics, geographic locations, and causes of death, for example. The challenge here is in the baseline estimates, where assumptions have to be made and techniques applied. Ruhm (2021) conducted a particularly careful measurement of excess mortality in the US over the period March 2020 through February 2021. He made adjustments for large volatility in historical changes due to the flu in January, and for the conversion of weekly to monthly data. Ruhm regresses on linear and quadratic time trends over recent years, chooses the regressions with the smallest errors, and applies a back-casting reliability criterion with good results. On this basis, he is also critical of other studies' measures of excess mortality in the US from the pandemic claiming they are somewhat inflated.

Ruhm finds that there were 646,000 excess deaths in the period assessed, a 22 percent increase over the baseline estimate without the pandemic.<sup>2</sup> COVID-19 deaths, as directly reported by the CDC, with COVID-19 either as the underlying cause (90 percent of cases) or a contributing cause, are about 83 percent of the total excess deaths, or about 536,000. Actual-to-baseline death ratios were similar among age groups, just above 1.2, except for the group less than age 25 where the ratio was lower. Men had slightly higher ratios than women. The largest number of deaths were among the elderly. Of most importance to this analysis' main topic, almost all excess deaths of seniors (65 and older) were attributed to COVID-19, compared to monotonically decreasing shares at younger ages, indicating a larger role to other causes or misreporting at younger ages. Among ethnic and racial groups, non-Hispanic Whites had a lower ratio of actual-to-baseline deaths than the other racial and ethnic groups. Similarly, COVID-19 reported deaths were a higher share of excess deaths for Whites and were lowest among Blacks and other non-Whites. Among non-COVID-19 causes of death, heart disease had a lower actual-to-baseline ratio, although still above 1, than diabetes or Alzheimer's disease; the ratio for the latter cause, of most relevance to nursing homes, was 1.09. There were no excess cancer deaths and reductions were estimated in lower respiratory disease and flu mortality. By contrast, fatal drug overdoses and homicides had very high ratios – almost 1.30 – likely reflecting poor social conditions during the pandemic arising from isolation and unemployment. Surprisingly, traffic fatalities were up, perhaps related to an increase in heavy drinking even as miles driven fell, and suicides were down.

Dayaratna and Vanderplas (2021) conducted a careful study of the impact on COVID-19 cases and deaths of broader social isolation behavior and policies at the beginning of the pandemic. They used Google mobility data and changepoint analysis to examine the reaction of the public to the pandemic and state lockdown orders during the first several months of 2020. Most, but not all, states instituted shelter-in-place orders, nearly all prohibited large gatherings, and all closed schools, gyms, and bars, but at different times. They found that states that issued shelter-in-place orders had a slightly higher prevalence of people staying at home than states that did not. Mobility to grocery stores, workplaces,

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<sup>2</sup> It is worth noting that the under-reporting problems and society-wide consequences of policy and other population-wide behavioral actions are more significant in many other countries, especially those with less developed public health systems or where political issues arise, than in the U.S. According to one study, Sanmarchi, et al. (2021), many countries particularly in Latin America, Eastern Europe and Asia had high ratios of observed to projected deaths in 2020, and/or low percentages attributed to directly measured COVID deaths. Russia, in particular, had a 1.24 ratio of observed to projected deaths but only 16 percent were reported as COVID. Researchers widely note that it is difficult or not possible to conduct this type of analysis for India and China, where reported COVID deaths are implausibly low.

and retail declined dramatically both with and without lock-down orders, in mid-March, with an estimated changepoint on March 15 for states without orders and March 16 for states with orders (both before the earliest date of a state shutdown order, in California, March 19). Mobility remained depressed through April, picked up during the summer and fall, and then declined again in the winter months.

Dayaratna and Vanderplas used survival analysis to assess the impact of policies and behavioral changes, measured by changepoints, on the time to reach maximum per capita levels of case growth and specific rates of mortality through August 2020, relative to the date of a state's first COVID-19 case. They found that the more quickly a state issued shelter-in-place orders and restrictions on gatherings the longer it took them to reach set levels of case growth. But the impact of non-state population behavioral changes was larger and more statistically definitive, because, as noted above, the behavioral change occurred quicker. Regarding death rates per million, the analysis showed that the policy changes were effective in delaying deaths, with statistical significance, and were even more impactful than behavioral changes. Moreover, the effectiveness of behavioral changes lessened with time, perhaps as the pandemic shock wore off, but the effectiveness over time of policy changes remained constant. The researchers explain the difference in results between cases and deaths by invoking the fact that deaths were concentrated among the elderly, especially in nursing homes, and that the special policy measures applied to nursing homes, described below, might have had an impact on mortality in addition to that of policy measures or behavioral isolation for the general community. But even shelter-in-place orders do not stave off eventually reaching the higher death thresholds so there exists an element of policy invariance over time. Barro (2020) found that school closings, prohibitions on public gatherings, and quarantines in large U.S. cities during the Spanish flu flattened the mortality curve, but did not have an impact on overall deaths.

In a more recent literature review and meta-analysis of the effects of lockdowns on COVID-19 mortality, Herby et al. (2022) conclude that lockdowns lead to only a modest reduction in mortality. They review about 30 difference-in-difference studies of advanced countries and US states on the first wave of the pandemic, where the counterfactual is Sweden, which employed relatively few lockdown techniques. There is a range of findings, from significant reductions in mortality to increases, but many studies show little significant impact. More specific analysis of stringency index studies find a precision-weighted average reduction of only 0.2 percent in mortality, of shelter-in-place studies find a reduction of 2.9 percent, and among various specific measures taken, like border closures, school closures, limited gathering, only business closures showed a large negative impact on mortality – 10.6 percent – which the authors attribute to the closing of bars and restaurants.<sup>3</sup>

In research focused specifically on COVID-19 and other deaths in nursing homes in 2020, Cronin and Evans (2021) calculate that, as of September 2020, there were 74,000 COVID-19 deaths of residents in nursing homes (and some assisted living facilities), representing 39 percent of aggregate national COVID-19 mortality. They further calculate that the fatality rate from COVID-19 for the non-nursing home population age 65 and older was roughly 208 per 100,000 through that time period, but was 5,600 per 100,000 for nursing home residents. Cronin and Evans regress the number of COVID-19 deaths in a nursing home from May 2020 through September 2020 on quality measures collected by the Centers for Medicare and Medicaid Services (CMS), the number of beds, and various nursing home demographic

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<sup>3</sup> This review largely did not cover the issue of mask mandates, which arose after the beginning of the pandemic.

and location characteristics, using state fixed effects. They find that homes with the highest quality rating had 34 percent fewer COVID-19 deaths than the poorest quality homes. Further, better staff to patient ratios reduced COVID-19 deaths and each of these effects became stronger with time. In testing for the mechanisms of this achievement, the researchers find indicators that higher quality homes were more closely following CMS COVID-19 guidelines such as limiting visitors, encouraging staff to stay home when ill, cleaning thoroughly and frequently, closely monitoring and frequently testing residents and staff for the virus, isolating those who are symptomatic, and cancelling communal dining and group activities. While higher quality homes were no better at preventing an initial resident or staff case, they did reduce the spread of cases among residents. In addition, higher quality homes had fewer staff and PPE shortages and were more likely to test exposed staff.

But Cronin and Evans also find that high-quality homes had more non-COVID-19 deaths, such that their success in reducing COVID-19 deaths was completely undone in total deaths. They infer that this was caused by the severe isolation measures taken, which had a particularly harmful effect on patients with Alzheimer's disease. As mentioned above, there were indeed significant excess Alzheimer's deaths during the first year of the pandemic. Another possible interpretation of these results is that family can play an important role in the welfare of their relatives even while they reside in a nursing home through active observation, direct care, and companionship. Higher quality homes are potentially chosen by families more concerned and involved with their relatives, but home lock-downs prevented the operation of this virtuous loop.

Chen et al. (2021) concentrate on a particular additional factor in the spread of COVID-19 among nursing homes early in the pandemic – staff members and contractors working in multiple nursing homes. Using device-level geolocation data from smartphones in 22 states, they found that 5.1 percent of smartphone users who visited a nursing home for at least one hour also visited at least one other facility during an 11-week study period in early spring 2020, even after visitor restrictions were imposed. They construct network measures of connectedness and estimate that nursing homes, on average, share connections with 7.1 facilities. Controlling for demographic and other factors, they find that home quality does not matter, but that a home's staff network and its centrality within the greater network strongly predict COVID-19 cases. The researchers attribute 49 percent of nursing home cases to cross-facility staff movement.

The contradiction between the results in Chen et al. (2021) on the one hand, and Cronin and Evans (2021) on the other, on the role of nursing home quality in the transmission of the COVID-19 virus and deaths can possibly be explained by the time period of analysis. Early in the first weeks of the pandemic it is likely that nursing homes of all types were caught unprepared and needed time to adjust, versus through the summer months of 2020 where severe adjustments had been made, more quickly and thoroughly by high-quality homes. It is also possible that while higher quality homes do not do better in terms of number of cases, they are more successful in terms of reducing the number of deaths, perhaps through a quicker recognition and response to cases as they arise. Also, it is possible, and even likely, that there is more misreporting with cases than with deaths. Indeed, the Ruhm (2021) study finds that reporting of COVID-19 deaths among the elderly was quite accurate.

Across both studies we see a critical role for the staff and contractors at nursing homes in terms of the transmission of disease, prevention of death, and the quality of care. This is particularly important, given the heightened vulnerability of residents, who are frail and mostly elderly, and therefore,

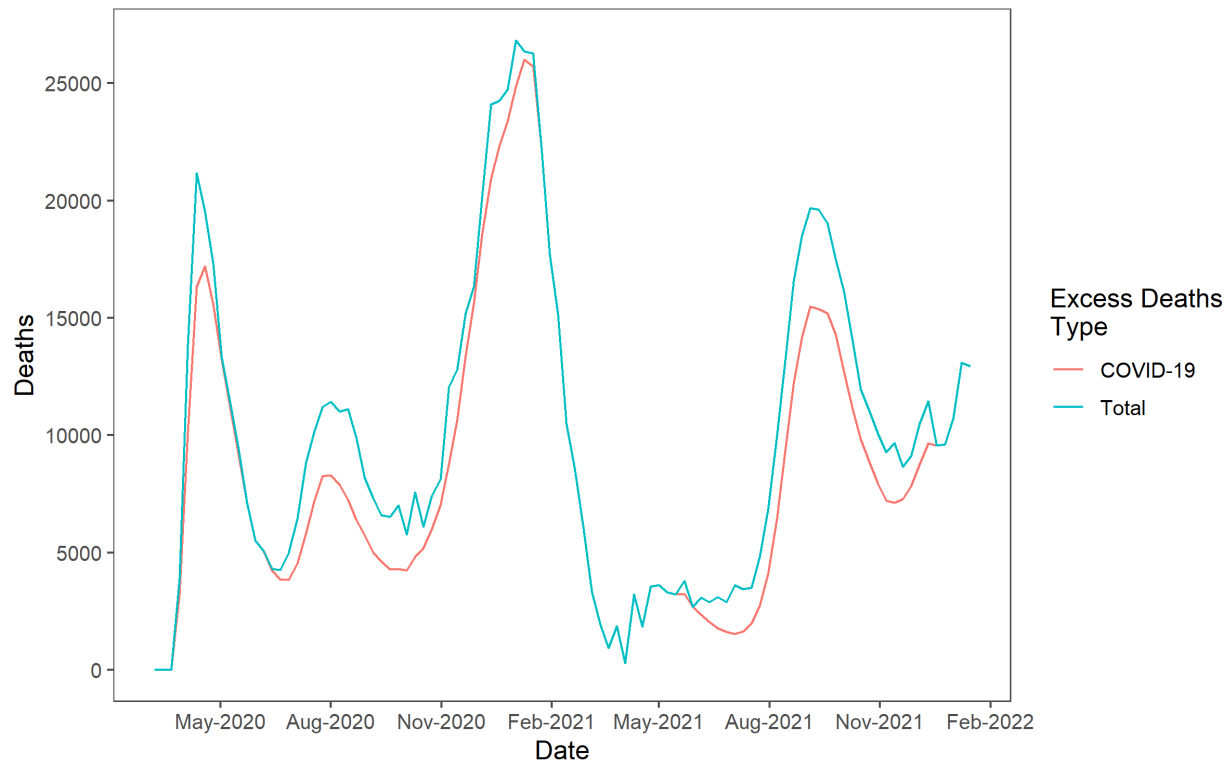
according to the Levin et al. (2020) study, subject to very high COVID-19 IFRs. It seems improbable though to design a non-pharmaceutical policy that hermetically seals off nursing homes from the community, as might be suggested by the Chen, et al. and Levin, et al. studies, without severe adverse consequences to the physical and mental health of residents and their families. This is shown in the Cronin and Evans study and the experienced excess mortality for Alzheimer's disease estimated in the Ruhm study. In addition, there would be challenges from severe isolation measures to hiring and keeping high-turnover nursing home staff, who can also work in home care or child care. This leads to calls for more universal social distancing policies, but the Dayaratna and Herby (and Barro) studies question their differential effectiveness over increasingly long periods or even at all. Therefore, the critical role of vaccines, and more recently, boosters, especially for the elderly and nursing home populations and staffs, is apparent.

### **CDC Data on COVID-19 from March 2020 to January 2022**

Most formal studies, even those published recently, pertain to the first year, even the first months, of the pandemic. Time series data collected by or reported through the CDC, however, is complete through recent weeks, and contains the further development of the course of the COVID-19 disease and its variants, policies, and, especially, the introduction of the vaccines and boosters in 2021. The CDC data covers various demographic groups, vaccination statuses, and other factors, including nursing home data (since June 2020) provided by the CMS. This analysis focusses on reported COVID-19 deaths or excess deaths, because the interpretation of number of cases has to change frequently and substantially with the availability and penetration of various testing technologies, their error rates, and disease variants. By contrast, albeit with imperfections, COVID-19 deaths are measured, reported, and understood more consistently over time, and represent the most severe manifestation of the pandemic. Hospitalizations, although another important metric, are closely correlated with deaths. Vaccination and booster rates in the various populations under study are also examined as critical to current policy. Due to a lag in data reporting, the time period analyzed here ends at January 15<sup>th</sup> 2022.

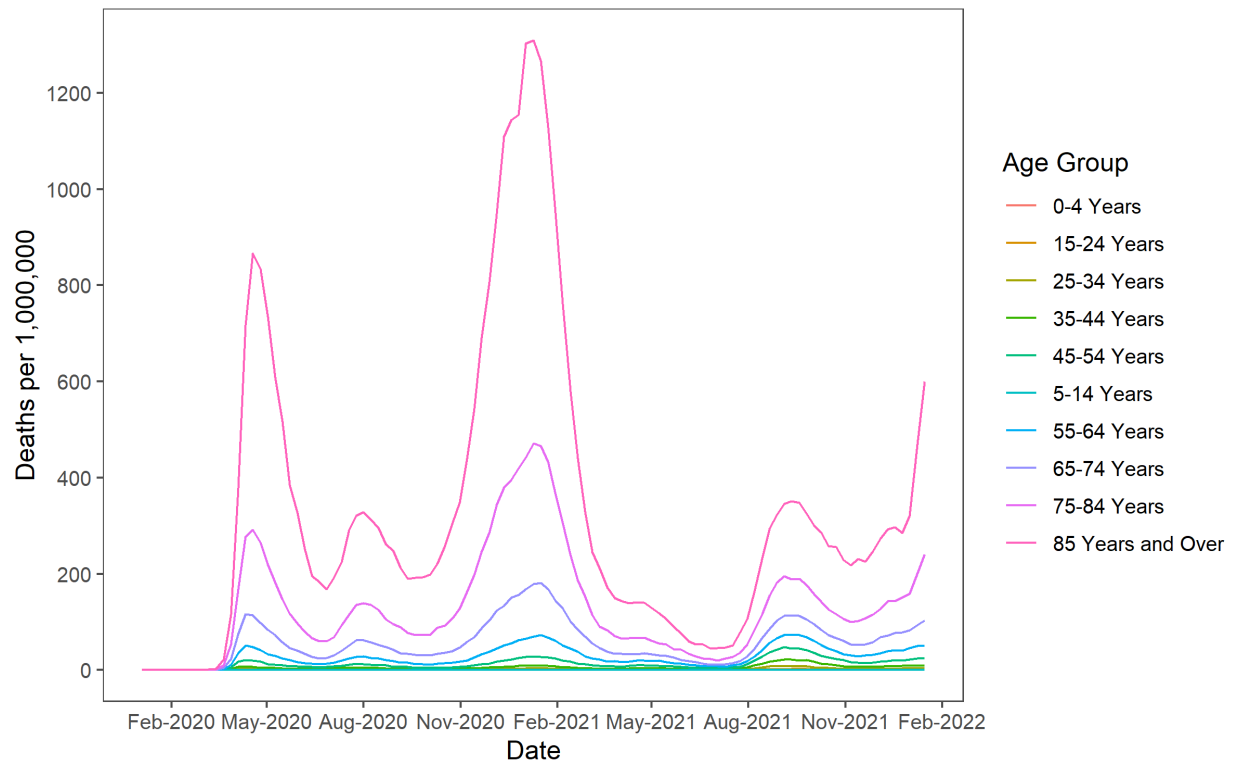
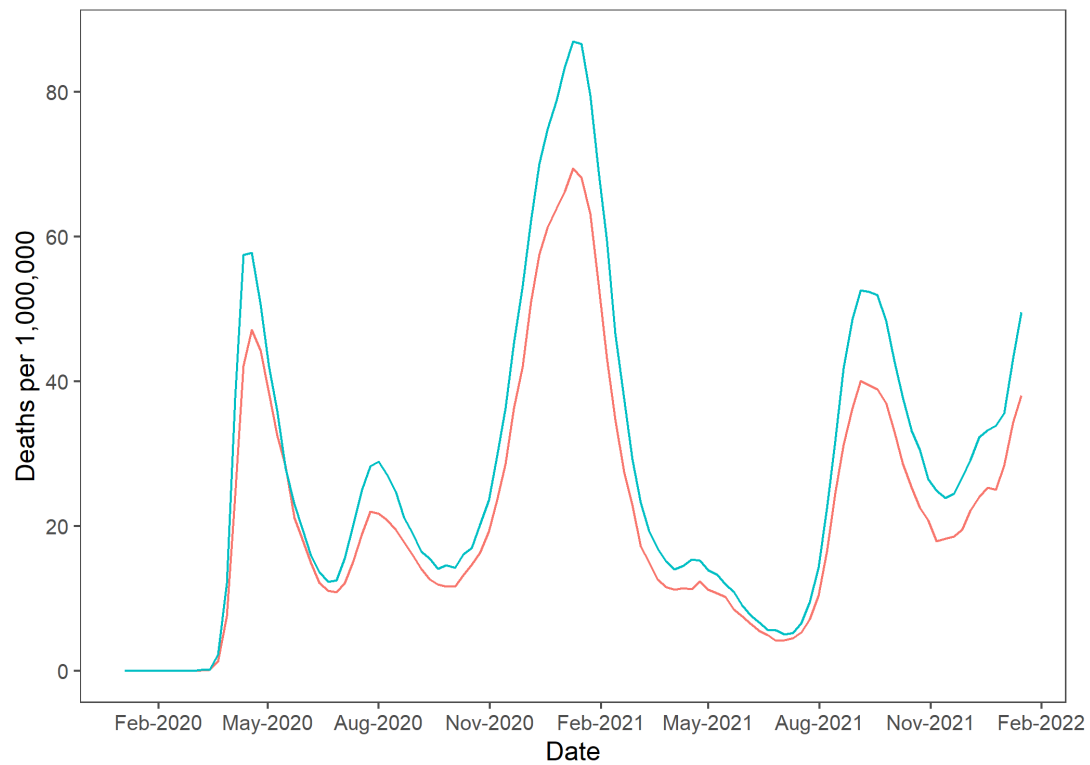
Exhibit 1 shows the number of weekly reported COVID-19 deaths and excess deaths in the US, as calculated by the CDC, from March 2020 through mid-January, 2022. We see the spikes in excess deaths in early spring 2020, late summer 2020, winter 2020-21 (peaking at over 26,000 a week), fall 2021, and winter 2021-22, following the Omicron variant spread. As expected, excess deaths exceed reported COVID-19 deaths, but the overage in early months was more likely due to misreporting of COVID-19, whereas later overages, particularly noticeable in late summer 2020 and fall 2021, were more likely caused by subsidiary effects of pandemic behavior and policies, given that death reporting likely improved over time. The introduction of vaccines coincides with the near disappearance of COVID-19 deaths in spring 2021, while the fall and winter 2021 surges are particularly disappointing in that regard; for example, in January 2022, there were over 13,000 excess deaths a week.



**Exhibit 1: Weekly Total and COVID-19 Excess Deaths**

The following three exhibits show reported COVID-19 deaths per one million people for various demographic groups over the period January 2020 until January 2022. Exhibit 2 shows rates for various age groups.<sup>4</sup> The vulnerability of the older population is vivid, with the age 85 and older and the age 75 to 84 groups being hit hard, especially in the spring 2020, winter 2020-21 (weekly COVID-19 mortality rate for the 85+ group at that time was 0.13 percent) and fall 2021 and winter 2021-22 spikes. Exhibit 3 shows the male-female differential; men have had consistently somewhat higher COVID-19 mortality than women since the beginning of the pandemic. Exhibit 4 shows mortality rates for various racial and ethnic groups. It shows that the identity of the group with the highest COVID-19 mortality rate has changed over time. In the spring 2020 spike, non-Hispanic Blacks had the highest mortality rate, while in subsequent spikes, American Indian and Alaska Natives, Native Hawaiians and Pacific Islanders, Hispanics, and non-Hispanic Whites had the highest rates. Non-Hispanic Asians have consistently had the lowest mortality rates.

<sup>4</sup> 2020 deaths are a rate of the 2019 population, while 2021 deaths are a rate of the 2020 population, except for racial and ethnic group rates which are relative to the 2019 population.

**Exhibit 2: Weekly COVID-19 Death Rates by Age Group****Exhibit 3: Weekly COVID-19 Death Rates by Sex**

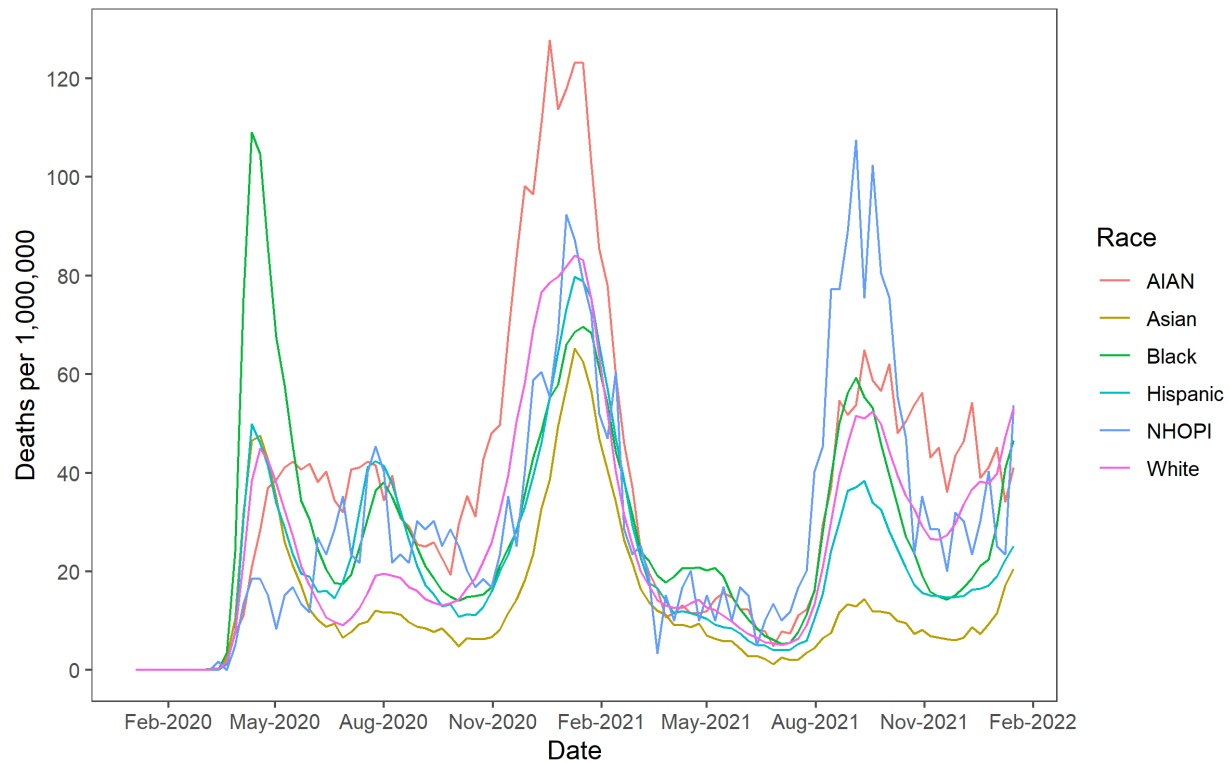
**Exhibit 4: Weekly COVID-19 Death Rates by Race and Ethnicity<sup>5</sup>**

Exhibit 5 shows the weekly COVID-19 mortality rate per one million residents in nursing homes, from June 2020, just after reporting from nursing homes began and was settled, to January 2022. We see the decline in the rate in the early summer 2020 from the widely reported high at the beginning of the pandemic, and again a massive spike in winter 2020/2021, at a rate approaching 5,500 per million at the end of December 2020, despite the by-then presumably universal imposition of CMS guidelines for resident and staff safety. But mortality rates of nursing home residents plummeted in spring 2021 to almost zero upon the roll-out of vaccines and boosters, although there was a pick-up in the fall and again recently, to around 675 deaths per million residents. Although skepticism seems appropriate around case counts for the general population, testing has been regular at nursing homes for some time now, per CMS guidelines, and therefore it is informative to look at the proportion of deaths of nursing home residents to the number of cases, as shown in Exhibit 6. The proportion drops from over 30 percent to below 15 percent in fall 2020, but then rises dramatically to nearly 40 percent in February 2021, following the winter peak. It then drops again, in a somewhat zig-zag fashion, reaching lows just above 5 percent in July 2021 and falling to 2 percent recently. Overall, we have a sense of a substantial improvement in mortality conditions at nursing homes since the worst time period in 2020 and early 2021, with some backsliding episodes. This seems mostly to be related to the introduction and effectiveness of vaccines.

<sup>5</sup> AIAN – American Indian and Alaska Natives, NHOPI – Native Hawaiian and Other Pacific Islanders

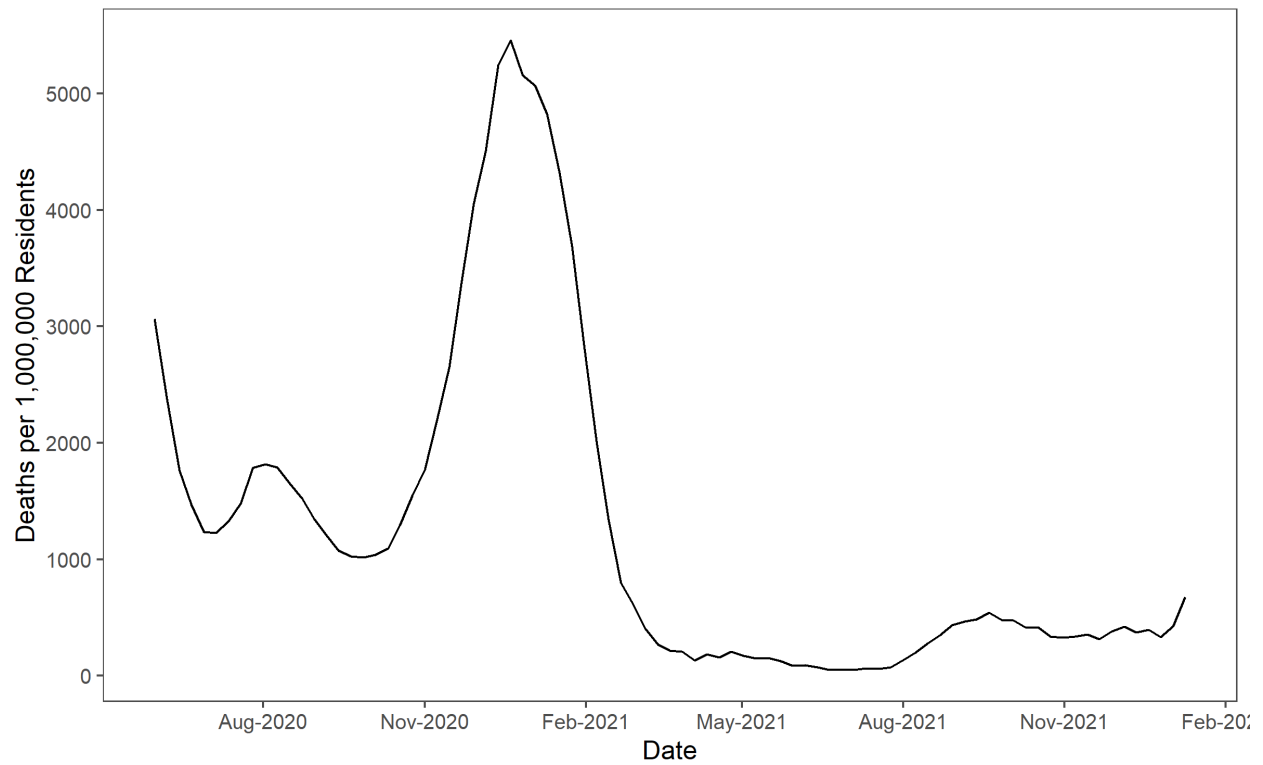
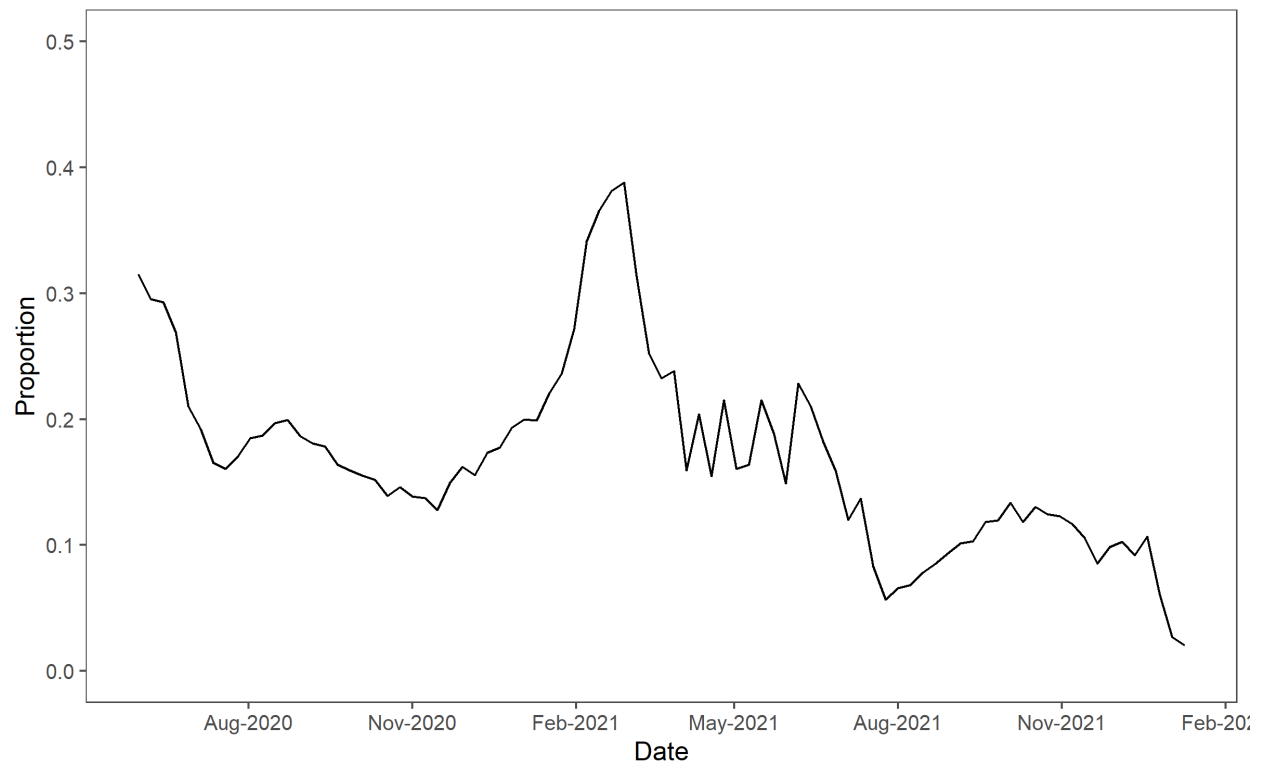
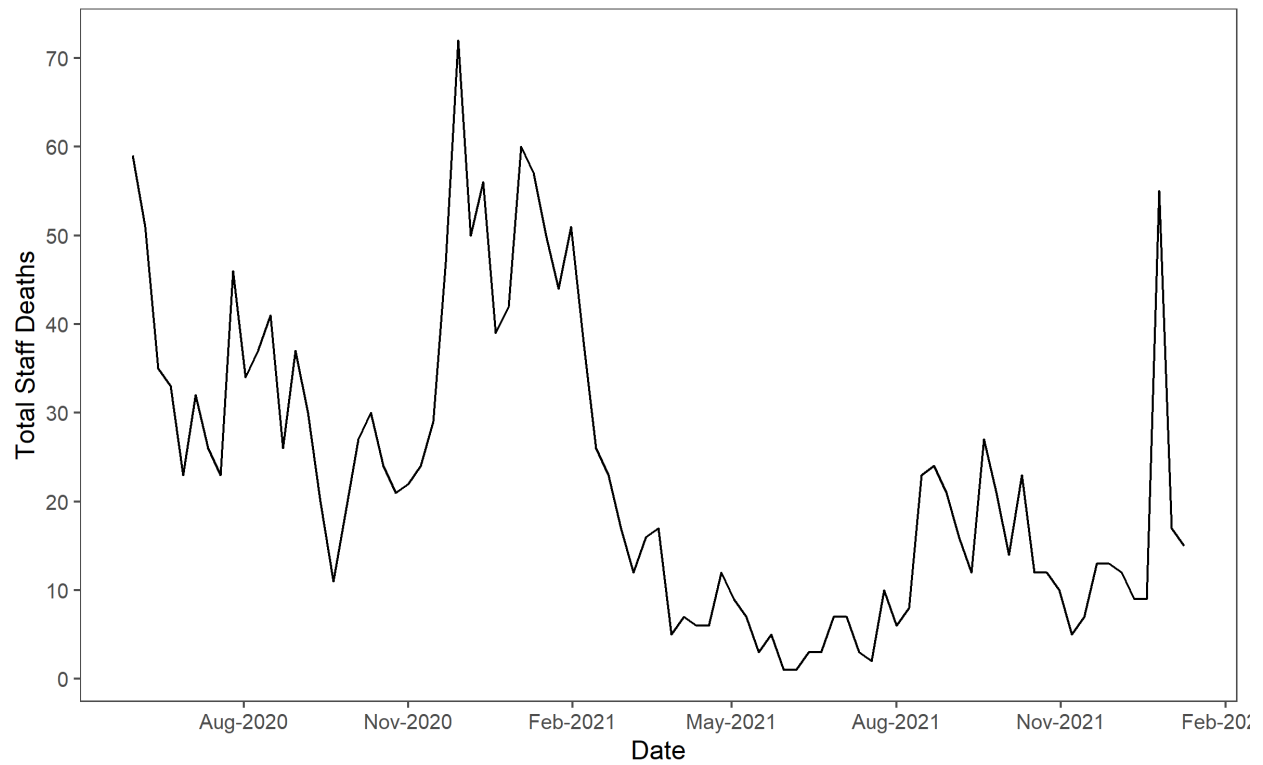
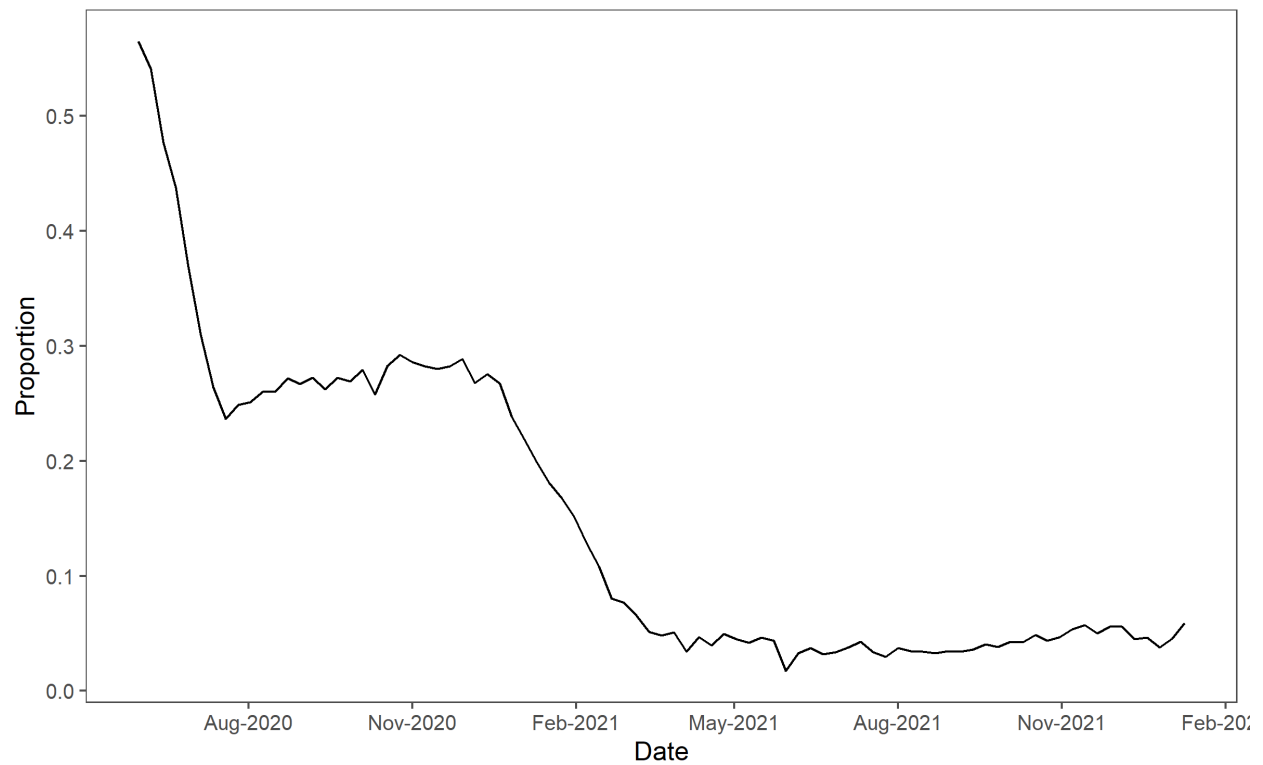
**Exhibit 5: Weekly Nursing Home Resident COVID-19 Death Rate****Exhibit 6: Proportion of Nursing Home COVID-19 Deaths to Nursing Home COVID-19 Cases**

Exhibit 7 shows the number of COVID-19 deaths among nursing home staff (it is not possible to calculate mortality rates because the precise census of staff is not available). Still we see roughly the familiar patterns, with over 70 weekly deaths in late November 2020, and a drop to single digits through March 2021 to August 2021, but a worrisome recent spike at the end of December 2021. The pattern of case counts (not shown) for nursing home staff is similar to deaths.

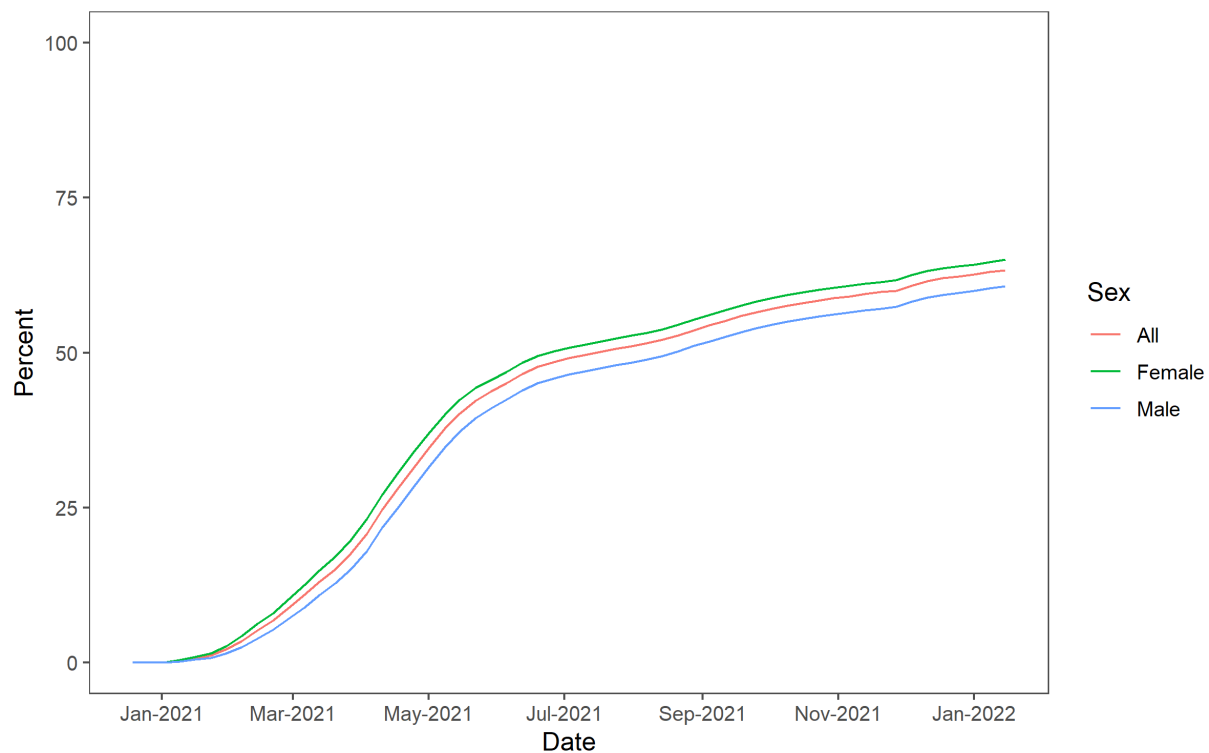
Exhibit 8 shows the proportion of weekly COVID-19 deaths in the US that were reported to have occurred in nursing home residents since June 2020. We see a large drop-off in early July 2020, from over 50 percent to below 25 percent, perhaps as a result of the implementation of the CMS safety guidelines. We then see another substantial decline to around five percent in early 2021, coinciding with the introduction of vaccines, initially focused on the elderly. This low proportion has been maintained largely since then, albeit with a slight creep-up in the subsequent spike periods.

The fact that vaccinations do not fully protect from the changing nature of COVID-19 infection (“breakthroughs”) is tempered by the still strong apparent safety from death that vaccinations give, especially if boosted. According to the CDC, in November 2021, the risk for an adult aged 18 years and older of testing positive for COVID-19 if unvaccinated is only four times than if fully vaccinated, whereas the risk of dying from COVID-19 if unvaccinated is 15 times higher compared to fully vaccinated adults. In November 2021, unvaccinated adults aged 18 years and older had 13 times the risk of testing positive for COVID-19 and 68 times the risk of dying from COVID-19 compared to fully vaccinated adults with booster doses. These rates are standardized by age, but not adjusted for time since vaccination, underlying conditions, including natural immunity gained from prior infection, or other demographic factors and are based on data from a select sample of hospitals. More recently, the CDC has also recognized the role of natural immunity in reducing infections, hospitalizations, and deaths. A CDC study states that during May–November 2021, case and hospitalization rates were highest among persons who were unvaccinated without a previous diagnosis. Before Delta became the predominant variant in June, case rates were higher among persons who survived a previous infection than persons who were vaccinated alone. By early October, persons who survived a previous infection had lower case rates than persons who were vaccinated alone. Still, given the dangerously high risk indicated by the infection-fatality rate for the older population, it is clear that vaccinations and boosters matter a lot for these vulnerable people.

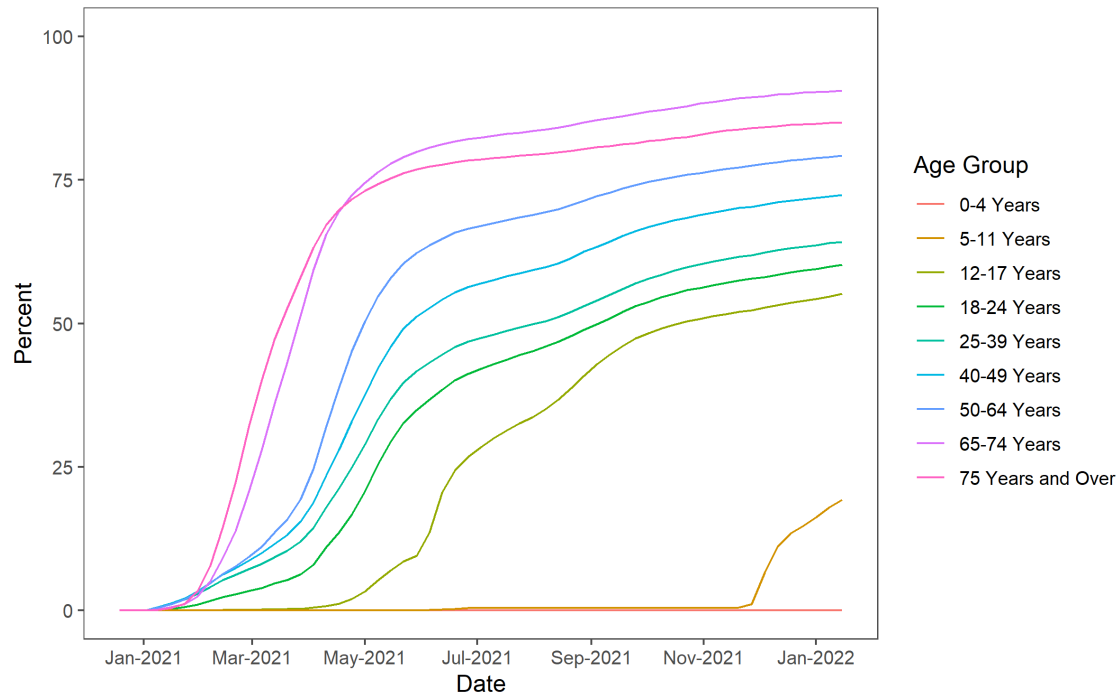
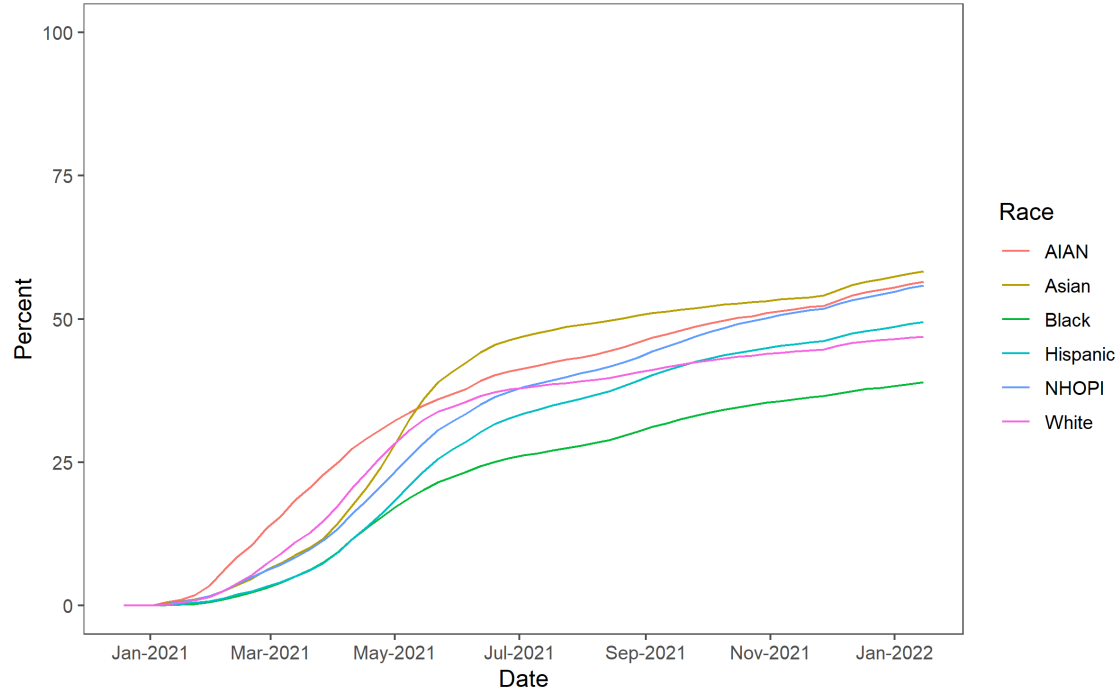
**Exhibit 7: Weekly Nursing Home Staff COVID-19 Deaths****Exhibit 8: Weekly Proportion of US COVID-19 Deaths that Occurred in Nursing Home Residents**

As shown in Exhibit 9, by January 2022, about 63 percent of the US population was fully vaccinated; interestingly, despite their slightly lower risk, women had a somewhat higher vaccination rate. This vaccination rate, lower than other countries at this stage in the pandemic and availability of vaccines,<sup>6</sup> includes children in the calculation, for which the school-age groups were allowed to get vaccinated only relatively recently and whose risk is low. So it is more insightful to look at vaccination rates by age, in Exhibit 10. There we see that the age 65 to 74 group now has the highest rate of vaccination, at around 91 percent, while about 85 percent of the oldest group, ages 75 and older, have been fully vaccinated. Below these age groups, vaccination rates are lower among the lower ages; among the 50 to 64 age group, where COVID-19 infection-fatality rates are significant, about 80 percent are fully vaccinated. As seen in Exhibit 11, non-Hispanic Asians have the highest rates of vaccination, while Blacks have the lowest rate, significantly below other races and ethnic groups. Exhibit 12 gives rates of receipt of boosters for the two oldest age groups – both at about 56 percent; men and women (not shown) also have similar booster rates.

**Exhibit 9: Full COVID-19 Vaccination Rate by Sex**

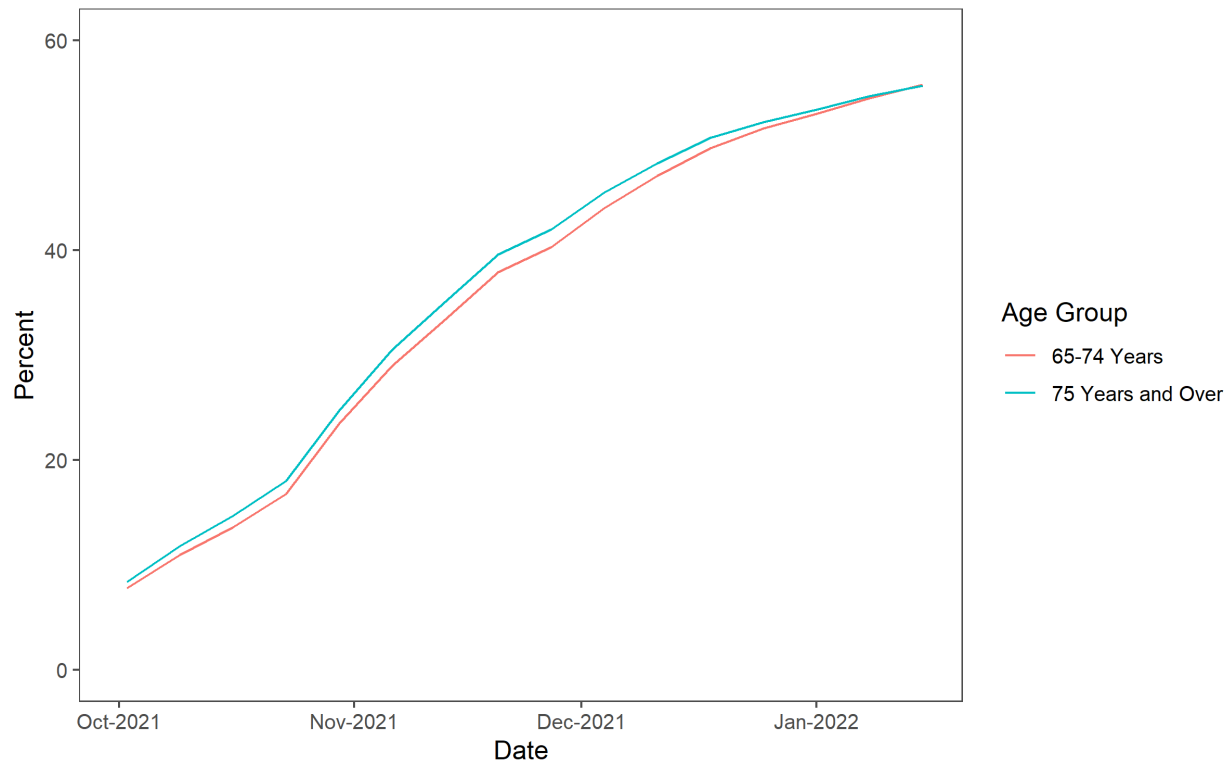


<sup>6</sup> Denmark, without mandates, has a population vaccination rate of about 81 percent.

**Exhibit 10: Full COVID-19 Vaccination Rate by Age Group****Exhibit 11: Full COVID-19 Vaccination Rate by Race and Ethnicity<sup>7</sup>**

<sup>7</sup> Vaccination rates by race and ethnicity are calculated where race and ethnicity status is known. Over the time period analyzed, race and ethnicity data completeness increased from 68.1 percent to 77.5 percent. Thus, the vaccination rates in these graphs are underestimates.

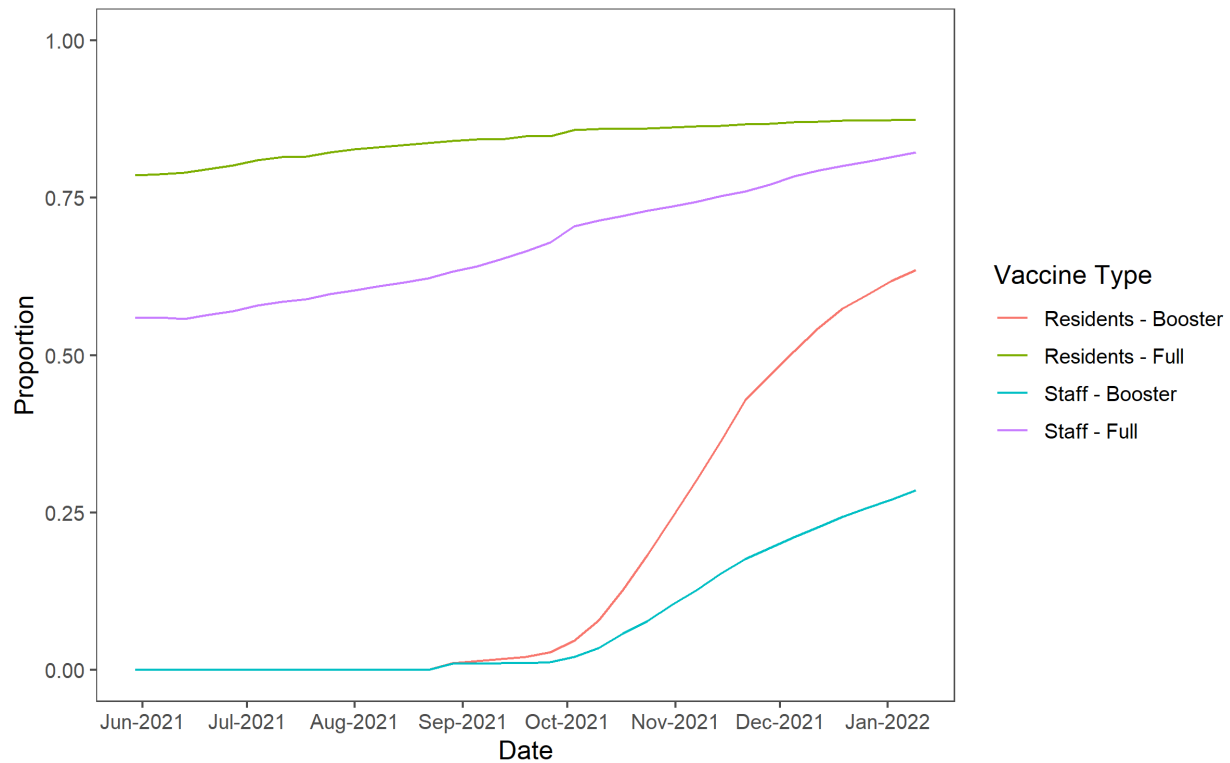


**Exhibit 12: Booster COVID-19 Vaccination Rate by Age Group**

Turning to nursing homes, Exhibit 13 gives vaccination and booster rates for residents, of all ages, and staff. About 87 percent of nursing home residents and 82 percent of nursing home staff are fully vaccinated, and only about 64 percent of residents and 29 percent of staff are boosted. Given the risks attendant to congregate living, the frailty of residents, the communicability from staff, and the poor tradeoffs from the non-pharmaceutical interventions, such as isolation, to contain outbreaks in nursing homes, these vaccination and booster rates should be much higher, especially as more than a year has passed since the availability of vaccines.

### Summary and Policy Conclusions

There is an exponential relationship between age and the infection-fatality rate for COVID-19. While the rate is very low for children and young adults, it is significant for those above age 50, and catastrophic for the elderly. Indeed, at the beginning of the pandemic, up to 40 percent of total deaths in the US were residents of nursing homes. While application of strict isolation of residents and other measures were able to reduce this high COVID mortality temporarily, the winter 2020-21 spike again hit the elderly and nursing home residents hard. Moreover, deaths from Alzheimer's disease and other non-COVID-19 causes for residents increased, likely owing to the consequences of strict isolation policies in nursing homes. Staff brought in infections, but extending the isolation circle to them is not practical. So, more universal non-pharmaceutical interventions were employed, but careful studies and the experience of subsequent spikes raise doubts about their effectiveness, particularly over extended periods. By contrast, we see through studies and experience, the effectiveness of vaccines and boosters to limit infections and, especially, hospitalizations and fatalities. Natural immunity and disease treatments work too, but we need to focus efforts to vaccinate and boost more completely among those

**Exhibit 13: Full and Booster COVID-19 Vaccination Rates in Nursing Homes**

age groups with heightened risk and vulnerability, especially the elderly and nursing home residents, in order to reduce the overall mortality in the US. Also, vaccinations and boosters or proof of prior infection should be near universal among the staff in nursing homes and visitors that have continual and close contact with residents, to protect residents and the staff themselves. Although individual nursing homes mandating staff vaccinations would have risked staff departures, a universal mandate also applied to home care agencies and other competitors in the labor market lowers that risk.

It is significant and dangerous, that as the cessation of COVID-19 emergency measures is being considered, that vaccination rates among the elderly and nursing home residents and staff are not nearly universal, with only medical exceptions, only in the 80 to low 90 percent range, and boosters are below 65 percent. While the federal government is finally, with much delay, requiring nursing home staff to get vaccinated (appropriate for those with no proof of prior infection), their booster rate lags severely. It is reasonable for the federal government to incentivize staff to get boosters through modest cash awards, say \$300; this modest spending would be a much more appropriate expenditure for the US society and economy than the billions spent on direct care workers providing home care in the 2021 American Rescue Plan legislation which had no connection with COVID-19. The requirement in New York and California that visitors to nursing homes, most of whom are older adult children and relatives, must be vaccinated and boosted should be made national, through CMS guidance, although the continual testing rules of these states seem excessively burdensome and unnecessary and an exception for those with proof of prior infection is appropriate.

This raises the natural question whether there should be a requirement for nursing home residents to be fully vaccinated against COVID-19, similar to other congregant living arrangements, like the armed

forces and colleges, for example. This seems to be legal. The danger is that mandates create resistance and politicization. In addition, vaccine hesitancy may have been increased through mistakes in CDC communication and strategy; see Dayaratna and Michel (2021). But Reber and Kosar (2021) find political resistance to be less significant among the elderly, where the main vaccine reluctance is apparently cultural, especially among blacks, as the CDC data also shows. So it is a trade-off, which suggests a mandate just for new residents. At the least, more aggressive, but culturally sensitive and effective, education and persuasion efforts must be made, for example through the use of nudges, as Milkman et al. (2022) has shown to be somewhat effective at pharmacies. Perhaps this is a task for Medicare, that is, the entire non-vaccinated elderly and disabled population should be contacted that a vaccine appointment has been made for them and will be paid completely through their Part B or Part D benefits. Also COVID-19 vaccination rates of residents at nursing homes should now be made a major factor in CMS quality ratings.

## References

Robert J. Barro, “Non-pharmaceutical interventions and mortality in US cities during the great influenza pandemic, 1918-1919,” AEI Economics Working Paper 2020-04, July 2020.

M. Keith Chen, Judith Chevalier, and Elisa F. Long, “Nursing home staff networks and COVID-19,” PNAS 2021, 118 (1) e2015455118.

Christopher J. Cronin and William N. Evans, “Nursing Home Quality, COVID-19 Deaths, and Excess Mortality,” March 15, 2021, University of Notre Dame working paper, *Journal of Health Economics*, forthcoming.

Kevin Dayaratna and Andrew Vanderplas, “A Statistical Analysis of COVID-19 and Government Protection Measures in the U.S.,” Heritage Foundation Special Report No. 243, March 19, 2021.

Kevin Dayaratna and Norbert Michel, “A Statistical Analysis of COVID-19 Breakthrough Infections and Deaths,” Heritage Foundation Backgrounder No. 3648, August 12, 2021.

Jonas Herby, Lars Jonung, and Steve H. Hanke, “A Literature Review and Meta-Analysis of the Effects of Lockdowns on COVID-19 Mortality,” Studies in Applied Economics Number 200, Johns Hopkins University, January 2022.

Andrew T. Levin, William P. Hanage, Nana Owusu-Boaitey, Kensington B. Cochran, Seamus P. Walsh, and Gideon Meyerowitz-Katz, “Assessing the age specificity of infection fatality rates for COVID-19: systematic review, meta-analysis, and public policy implications,” *European Journal of Epidemiology*, 2020, 35: 1123 – 1138.

Katherine L. Milkman, and 44 other authors, “A 680,000-person megastudy of nudges to encourage vaccination in pharmacies,” PNAS 2022 119(6) e2115126119.

Sarah Reber and Cyrus Kosar, “Vaccine hesitancy in nursing homes isn’t all politics,” Brookings Report, August 19, 2021.

Christopher J. Ruhm, “Excess Deaths in the United States During the First Year of COVID-19,” NBER Working Paper Number 29503, November 2021.

Francesco Sanmarchi, Davide Golinelli, Jacopo Lenzi, Francesco Esposito, Angelo Capodici, Chiara Reno, and Dino Gibertoni, “Exploring the Gap Between Excess Mortality and COVID-19 Deaths in 67 Countries,” JAMA Network Open, 2021; 4(7).