Report |
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Did the COVID-19 vaccines save millions of lives in the USA? Quantitative assessment of published claims

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Abstract

Many media and public-record statements, including Congressional statements and testimony, since 2022, have often asserted that COVID-19 vaccination in the USA prevented some 100 million infections, saved some millions of lives, saved some tens of

millions of hospitalizations, and saved some 1 trillion dollars in associated medical costs. These fantastic and unverifiable claims are based on theoretical models of so-called counterfactual scenarios, which are back predictions under hypothetical absence of COVID-19 vaccination. The said claims are reported in several scientific articles, often in leading scientific journals, however their authors sparingly show and essentially never examine the time evolution of the back predictions for plausibility. We calculate time evolutions corresponding to the back predictions. We show that if one accepts the counterfactual models and their inputs to then calculate the corresponding excess all-cause mortality that would have occurred, then one graphically obtains excess all-cause mortality by time (by week) that is contrary to realistic behaviours. By accepting the counterfactual models, we must believe that the two main COVID-19 vaccination campaigns (doses 1+2 and first-booster dose rollouts, in early and late 2021, respectively) coincidentally were each applied just in time prior to two staggering spontaneous many-fold increases in viral virulence. In other words, we must believe that the massive and repeated COVID-19 vaccine rollouts did not significantly reduce mortality in 2021 and in 2022 compared to 2020 (they actually did not) because the virus became more virulent than ever in those years, twice, in early 2021 and in late 2021—early 2022, producing 5-fold hypothetical increases in excess all-cause mortality by year. The counterfactual scenarios are so improbable that they can, on the sole basis of the predictions themselves, be qualified as impossible.

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1 Context and purpose

On 10 October 2024, Dr. Peter Hotez testified to Congress under legal obligation to tell the truth as follows (transcript, at pages 42-43):

Table 1. Extract of Congressional interview of Peter Hotez, 10 October 2024.

COMMITTEE ON OVERSIGHT AND ACCOUNTABILITY, SELECT SUBCOMMITTEE ON THE CORONAVIRUS PANDEMIC, U.S. HOUSE OF REPRESENTATIVES,
WASHINGTON, D.C.
INTERVIEW OF: PETER HOTEZ
Thursday, October 10, 2024

https://oversight.house.gov/wp-content/uploads/2024/12/Hotez-Final_Redacted.pdf
(accessed 2025-09-16)
(bold highlights added)

Staff. … **Dr. Hotez** …
… I want to echo our majority colleagues' thanks and appreciation for you being here.
It goes without saying, but you are one of the Nation's preeminent experts in vaccines, and so I'd like to take a few minutes to collect your perspectives on some topics in this area, and I'd like to begin with the COVID-19 vaccine specifically.
Dr Hotez. Yeah.

EXAMINATION

BY MR. LICHTMAN:

Q Just as a starting point, can you explain the role that the COVID-19 vaccine had in saving lives and reducing suffering from the COVID-19 pandemic?
A Yes, I'd be happy to do that.
The studies by my colleague and friend Alison Galvani at Yale find that in the United States COVID vaccines probably saved 3.1 or 3.2 million lives and averted 18 million hospitalizations.
So no question this has had a huge impact on the health of the American people.
I mean, **if it wasn't for those vaccines, instead of 1-plus million deaths, it would be 4 million deaths.** I mean, it just would have been absolutely catastrophic.
And, in addition, now we know COVID vaccinations also have other benefits. So this virus is a thromboembolic virus, so it's not only causing respiratory illness. Now we

know it's causing heart attacks, it's causing strokes. So the prevention of heart attacks and strokes from vaccination, huge, and also the prevention of long COVID.

So absolutely game-changing in terms of its impact in the United States, and the same globally in places where the vaccines were made available. And that's where we came in, to make the vaccines that the Pharma companies wouldn't make.

Q Of course. **And I believe either similar or perhaps the same research out of the Commonwealth Fund also showed that the COVID-19 vaccines significantly reduced medical expenditures here in the United States and helped contain some of those costs.** Do you agree with that?

A **Absolutely. I can't remember the exact figure but it was really high.**

Q But despite its historic contributions to moving society past the darkest days of the COVID-19 pandemic, there have been suggestions that COVID-19 vaccines are unsafe.

…

Here, "[t]he studies by my colleague and friend Alison Galvani at Yale" and all of this refer to a blogpost by Fitzpatrick et al. (2022) dated 13 December 2022 on the website of The Commonwealth Fund.

The said blogpost (Fitzpatrick et al., 2022) gives results entirely based on counterfactual modelling (that is, back predictions under hypothetical absence of COVID-19 vaccination), without giving sufficient detail to allow scientific verification of either the calculation itself or its inputs, whereas related methods have apparently been used by the authors elsewhere (Pandey et al., 2022; Sah et al., 2022; Vilches et al., 2022a). The claims and the explicit inputs and methods, to our knowledge, have not been explained in a follow-up publication.

The said claims (Fitzpatrick et al., 2022) have been uncritically and disproportionately covered in mainstream media, since its posting and recently, for example, as follows.

New York Times

"How many lives have been saved by Covid vaccines?

Scientists believe that the vaccines have prevented millions of deaths. A study in the journal Lancet Infectious Diseases estimated that the shots saved 14.4 million lives worldwide in the first year alone.

In the United States, they are thought to have prevented more than 18.5 million

hospitalizations and 3.2 million deaths by the end of 2022.” (2025-09-02)

https://www.nytimes.com/2025/09/02/health/trump-covid-vaccines.html

https://archive.ph/Sq0an

CBC

“ "The mRNA technology has been proven to be highly effective," Hotez said. "By some estimates, 3.2 million American lives were saved by COVID mRNA vaccines during the pandemic." ” (2025-08-25)

https://www.cbc.ca/news/health/mrna-vaccine-barda-explainer-1.7602830

ABC News

“ “Here’s the bottom line: mRNA vaccines for COVID, according to estimates from Yale School of Public Health, saved 3.2 million lives,” Dr. Peter Hotez, a professor of pediatrics and molecular virology at Baylor College of Medicine in Houston, told ABC News.” (2025-05-23)

https://abcnews.go.com/Health/safety-efficacy-mrna-vaccines-amid-recent-scrutiny/story?id=122068940

https://archive.ph/O6yQt

CNN

“The Covid-19 vaccines have kept more than 18.5 million people in the US out of the hospital and saved more than 3.2 million lives, a new study says – and that estimate is most likely a conservative one, the researchers say.” (2022-12-13)

https://www.cnn.com/2022/12/13/health/covid-19-vaccines-study

https://archive.ph/rYEqD

The Hill

“The Commonwealth Fund estimated the vaccines prevented more than 18.5 million hospitalizations and 3.2 million deaths from December 2020 to last month.

Researchers added the vaccines also prevented 120 million more COVID-19 infections and saved the U.S. more than $1 trillion.” (2022-12-13)

https://thehill.com/policy/healthcare/3773239-covid-vaccines-saved-3-2-million-us-lives-researchers-say/

https://archive.ph/IYGvC

Yale School of Public Health (Facebook account)

VIDEO: “A sampling of media coverage of the new Yale School of Public Health and The Commonwealth Fund analysis that found U.S. COVID vaccinations have saved 3 million lives.” (2022-12-19; accessed 2025-09-27)

https://www.facebook.com/YaleSPH/videos/554401139547193

It is important to rigorously assess influential claims — both in the context of the body of relevant science and for logic and validity of the underlying assumptions — because the said claims may be demonstrably incorrect. False claims accepted by government officials and their advisors can have a disastrous effect on public health policy and society. The analysis below shows that Dr. Peter Hotez, in particular, appears not to have critically ascertained the value of the claims in the blogpost of Fitzpatrick et al. (2022) but instead relied on the status of its senior author (his friend; and collaborator, as per Bartsch et al., 2021) and her institution.

2 Nature of the counterfactual exercise

The blogpost results of Fitzpatrick et al. (2022) were obtained by a counterfactual theoretical calculation. In counterfactual analysis (BGI Consulting, 2007) “the outcomes of the intervention are compared with the outcomes that would have been achieved if the intervention had not been implemented.” Here, the intervention is COVID-19 vaccination in the USA. Therefore, the counterfactual theoretical calculations involve back predictions of mortality and other outcomes under hypothetical absence of vaccination. It is impossible to actually know how many people would have died (or been saved) from not being vaccinated. Instead, the number of lives saved is calculated using elaborate theoretical hypotheses and inputs (such as disease characteristics and vaccine efficacy) presumed to be valid.

In order to estimate the number of lives saved, counterfactual modellers need to estimate how many SARS-CoV-2 infections would have occurred through time without vaccination, and how many of these infections would have caused death. Simply put, the vaccine cannot save you if you would not have been infected. This brings us to

arguably the most tenuous part of the counterfactual calculation used by Fitzpatrick et al. (2022): The hypothetical prevalence (infections) by time is calculated by contagion dynamics modelling, which has its own assumptions, complexities and uncertainties; not to mention that it may not be applicable whatsoever (Hickey et al., 2025).

The other main difficulty is that the modellers assume in all current vaccine counterfactual calculations that the vaccine efficacy inputs are reliable, despite being produced via contrived, questionable and non-transparent clinical trials (Gøtzsche, 2013; Rancourt, 2025a; Siri, 2025).

Fitzpatrick et al. (2022) concluded that in the USA:

- 3.2 million deaths
- 18.5 million hospitalizations
- 120 million infections
- $1.15 trillion in medical costs

were averted up to 2022-11-30 (two year period) by COVID-19 vaccination.

Using the same kind of counterfactual approach (contagion dynamics modelling + presumed-valid vaccine efficacy estimates), Watson et al. (2022) obtained a similarly fantastic result for the USA (taking the average of their two similar scenarios):

- 1.83 million deaths

averted up to 2021-12-08 (one year period) by COVID-19 vaccination.

The Watson et al. (2022) study has been fundamentally criticized (Rancourt and Hickey, 2023; Ophir et al., 2025; Sorli, 2025).

The counterfactual analysis of Ioannidis et al. (2024, 2025) gives a number of lives saved by COVID-19 vaccination in the USA through 2024 (four year period) that is an order of magnitude (10 times) less than the numbers obtained by Fitzpatrick et al. (2022) and by Watson et al. (2022).

Ioannidis et al. (2024, 2025) obtain 2.5 million lives saved globally through 2024. Using the fractions USA / World of lives saved obtained by Watson et al. (scenario 1: 1.76/14.4 and scenario 2: 1.90/19.8; from their supplementary material), the Ioannidis et al. global value (2.5 million) corresponds for the USA to:

- 270 thousand deaths

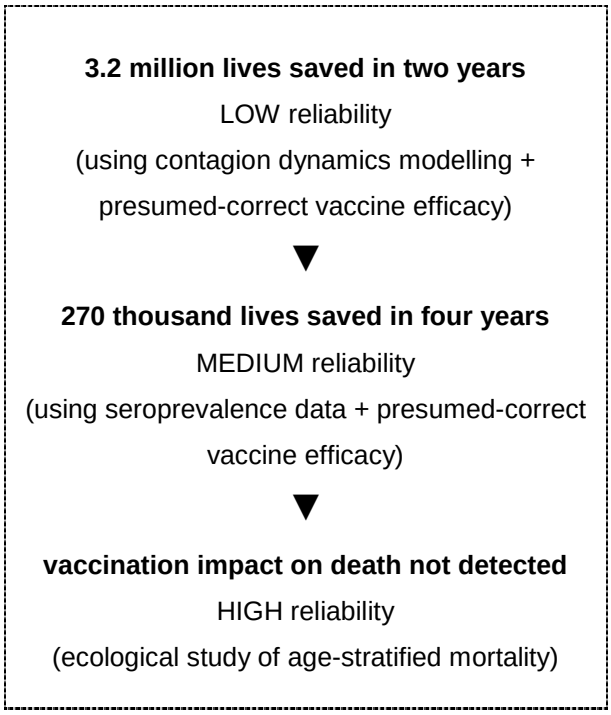
averted through 2024 (four year period) by COVID-19 vaccination.

The results of Fitzpatrick et al. (2022) and Watson et al. (2022) on the one hand are irreconcilable on their face with the results of Ioannidis et al. (2024, 2025) on the other hand. Both Fitzpatrick et al. (2022) and Watson et al. (2022) used “contagion dynamics modelling + presumed-valid vaccine efficacy estimates” whereas Ioannidis et al. (2024, 2025) used “seroprevalence data and reported COVID-19 deaths + presumed-valid vaccine efficacy estimates” in the counterfactual method, thus avoiding contagion dynamics modelling.

Rancourt (2025b) critically assessed the papers of Ioannidis et al. (2024, 2025), and finds no reliable reason to belief that the COVID-19 vaccines saved any lives. Nonetheless, it appears that authors can misguide themselves far more with contagion dynamic modelling than with seroprevalence data, as most epidemiologists would expect.

A better way is to devise a method that avoids counterfactual models altogether, and relies solely on measured data, especially higher reliability data such as mortality. This was done by McNamara et al. (2022). They performed an ecological study in which they exploited the established fact that assigned COVID-19 mortality, like all-cause mortality, is highly dependent on age, in fact exponential with age. They cleverly used death in lower age groups to normalize death in the elderly age groups, prior to and during vaccination, in the USA in the period 2020-11-01 to 2021-04-10. In their extensive analysis of the data, McNamara et al. (2022) found a null result: “the magnitude of the impact of vaccination roll-out on deaths was unclear.”

Therefore, in this case the sequence of reliability is:



It is not surprising that using contagion dynamics modelling is unreliable for hindcasting anything about the declared COVID-19 pandemic in that Hickey et al. (2025) have demonstrated that high-resolution and global geotemporal variations in excess all-cause mortality are incompatible with viral spread of a respiratory disease.

However, the purpose of the present article is not merely to point out the unreliability of the Fitzpatrick et al. (2022) blogpost, and published articles using the same counterfactual approach (Ogden et al., 2022; Shoukat et al., 2022; Steele et al., 2022; Vilches et al., 2022a, 2022b; Watson et al., 2022; Yamada et al., 2023).

Rather, we provide a proof that the Fitzpatrick et al. (2022) method implies impossible consequences when their counterfactual mortality is plotted by time (deaths per week) over the period of application, irrespective of any criticism of the validity of their method and inputs.

We have previously applied our demonstration of implausibility to 95 countries studied by Watson et al. (2022) (Rancourt and Hickey, 2023). Here, we apply the said demonstration of implausibility in more detail to the USA for the blogpost results of Fitzpatrick et al. (2022). The same holds for all the studies using essentially the same counterfactual approach with comparable presumed COVID-19 vaccine efficacies, such as: Ogden et al. (2022), Sah et al. (2022), Shoukat et al. (2022), Steele et al. (2022), Vilches et al. (2022a, 2022b), Watson et al. (2022), and Yamada et al. (2023).

3 Data and method for testing plausibility of calculated number of deaths averted

3.1 Data

All-cause mortality and vaccination data by time for the USA and its states are from the US Department of Health and Human Services (HHS, 2025a; HHS, 2025b).

3.2 Calculation of counterfactual mortality by time

For a given long period (many months), a formula for the counterfactual number of lives saved is as follows. One must derive the number of deaths, D0, that should occur from the presumed pathogen in the absence of the intervention (i.e., without vaccination) and use an estimate of the vaccine efficacy (taken to be real-world efficiency), Evd, in preventing deaths. Evd is the vaccine-attributed reduction of probability of death per person presumed to be fatally infected. Then, the number of lives saved, Ls, (or deaths averted) is the product of D0, vaccine coverage Cv (expressed as a fraction of the population considered to be vaccinated) and Evd, in the period considered:

$$Ls = D0 \times Cv \times Evd. \qquad (1)$$

Here, “coverage” implies boosters intended to combat both waning vaccine potency and the presumed emergence of new variants. Cv can be known with relative certainty, whereas D0 and Evd are disjunctively problematic. Estimates of D0 usually rely on contagion dynamics modelling or seroprevalence and mortality data, whereas estimates of Evd are inferred from limited clinical trial data.

If we want the counterfactual time series of lives saved (by week) during and after vaccination rollouts, then we calculate the number of lives saved at each given time “t” (at the dates of each given week), Ls(t), as follows.

First, the number of infections saved (by vaccination) at each given time “t”, ISv(t), is calculated as:

$$ISv(t) = nI(t) \times mCv(t) \qquad (2)$$

where

- nI(t) is the number of infections that would hypothetically have occurred at time “t” (in the given week occurring at or corresponding to time “t”) in the absence of the intervention (vaccination).
- mCv(t) is the vaccine-produced-immunity coverage at time “t” against infection, by definition between 0 and 1.

Here, mCv(t) is given by the mathematical convolution

$$mCv(t) = (Cv \otimes Ev)(t) \qquad (3)$$

where

- Cv(τ) is the function by time of vaccine coverage, expressed as a fraction from 0 to 1 per time.

- Ev(τ) is the function by time (since vaccination) of vaccine efficiency against infection (0 to 1 per time), which includes both a delay since vaccination and efficiency waning.

Therefore, the number of infections saved (by vaccination) at each given time “t”, ISv(t), is calculated as:

$$ISv(t) = nI(t) \times (Cv \otimes Ev)(t) = nI(t)(Cv \otimes Ev)(t) \qquad (4)$$

Next, this in turn is used to calculate the number of lives saved (by vaccination) at time “t”, Ls(t), as:

$$Ls(t) = (ISv \otimes IFP)(t) = (nI(Cv \otimes Ev) \otimes IFP)(t) \qquad (5)$$

where

- IFP(τ) is the function by time (since infection) of the likelihood (0 to 1 per time) of death following infection, which is the time-dependent infection fatality probability.

Equation 5 is a probabilistic estimate rather than one that follows individuals and their personal vaccination and survival histories. Also, it is for average individuals, not age or otherwise stratified.

In application, for simplicity, we approximate IFP(τ) to be a mathematical Delta function (a unitary pulse centered at zero) multiplied by the infection fatality ratio, IFR,

$$IFP(\tau) = IFR\ \delta(\tau) \qquad (6)$$

which is equivalent to assuming the death to occur at the time of infection with probability equal to the IFR (from 0 to 1). This introduces a shift of the corresponding mortality towards earlier time, with a shift magnitude equal to the mean time between

infection and death for fatal infections. (This shift is cancelled as explained below, by our use of the actual excess all-cause mortality as a proxy for nI(t).)

With this simplification (Equation 6), Equation 5 for Ls(t) becomes:

$$Ls(t) = IFR \times ISv(t) = IFR\ nI(t)\ (Cv \otimes Ev)(t) \qquad (7)$$

again, where the constant IFR is the infection fatality ratio.

Also, in application, for simplicity, we take Ev(τ) to be a zero-to-constant rectangular response function of 182-day (26-week) width, delayed by 14 days (2 weeks) following vaccination. Likewise, we take Cv(τ) to be proportional to total vaccine doses delivered per unit time (by week), where the Ev(τ) response function automatically prevents double counting of injections; and we take nI(t) to be proportional to actual measured excess all-cause mortality (Section 3.3) at “t”.

The latter application to obtain nI(t) assumes that actual measured excess all-cause mortality is a valid proxy for potentially lethal prevalence of the virus, rather than using measured new cases data. However, this choice of proxy shifts the thus obtained nI(t) towards later time, the mean time between infection and death for fatal infections, which is cancelled by the shift arising from our application of Equation 6 (delta function). In any case, these shifts are individually small compared to the duration of the declared pandemic.

The proportionality constants (for the proxy and including IFR) are automatically obtained by normalization to the claimed number of lives saved being tested.

We verified that the results are insensitive to our simplifications on the illustrated time scale of the graphical displays. In particular, we tested rectangular response function widths (vaccine non-waning durations) of 91 days (13 weeks) and 364 days (52 weeks).

Rancourt and Hickey (2023) used the same calculation method, with the additional simplification that nI(t) was assumed to be a time-independent constant in the period of interest, in testing counterfactual scenarios of Watson et al. (2022).

In this way, we calculate the number of lives saved by time increment (by week) and normalize the result to the number of lives saved reported by authors of any given counterfactual estimate, over the time period of the reported counterfactual estimate.

We thus obtain the all-cause mortality by time that corresponds to the counterfactual scenario being tested and add it to the actual measured excess all-cause mortality by time. In other words, we calculate what total all-cause mortality by time would have been if the reported counterfactual calculation was a correct representation of reality and no COVID-19 vaccines were administered.

3.3 Actual measured excess all-cause mortality by time

Actual measured excess all-cause mortality by time (week) and its one-standard-deviation uncertainty are calculated as follows. The method has been explained and amply illustrated by Rancourt et al. (2024).

The excess all-cause mortality at a given time (week) is the difference (positive or negative) between the reported all-cause mortality for the given time and the expected all-cause mortality for the given time, which is ascertained from the historic all-cause mortality in a reference period immediately preceding the Covid period (prior to the 11 March 2020 World Health Organization declaration of a pandemic).

In practice, our reference period is 2015 through 2019. We least-squares fit a straight line to the same week in each of the five reference years as the week of interest, where the slope of this fitted line is constrained to always (for every week of interest) be equal to the slope of a least-squares fitted line to all of the all-cause mortality data (all weeks) in the full 5-year reference period, for the given country or state.

The thus obtained fitted line is used (by extrapolation) to predict the expected all-cause mortality. The one-standard-deviation (1σ) uncertainty in the expected all-cause mortality is estimated as sqrt(π/2) times the average magnitude of the 5 deviations in the 2015-2019 reference period, for each particular week of interest. This simple relation is exact in the limit of a large sampling number, for a normally distributed uncertainty.

Finally, the one-standard-deviation uncertainty of the actual excess all-cause mortality is the combined error that includes the 1σ uncertainty in the expected value and the independent statistical (1σ) error in the all-cause mortality (sqrt(N)).

4 Results

The calculation of counterfactual mortality by time (Equation 7) and the corresponding total all-cause mortality by time that is advanced as the postulated reality in the hypothetical absence of vaccination is illustrated for the USA, 2018-2024, for the counterfactual results (3.2 million lives saved) of Fitzpatrick et al. (2022), in Figure 1.

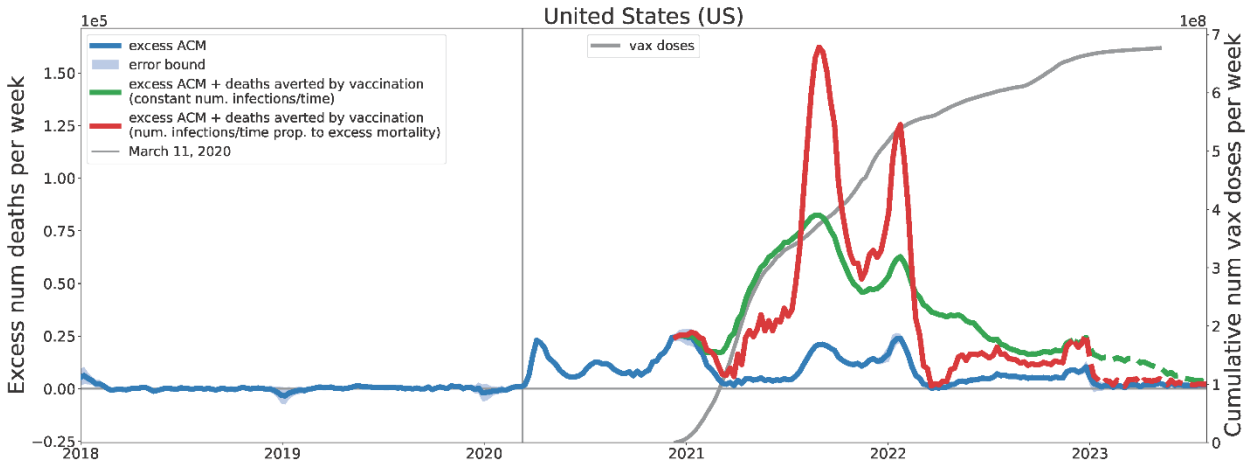


Figure 1. Counterfactual mortality by time advanced as the postulated reality in the hypothetical absence of vaccination, USA, 2018-2024, for the counterfactual results (3.2 million lives saved) of Fitzpatrick et al. (2022). Blue line and blue shading: actual measured excess all-cause mortality by week and its 1σ uncertainty. Vertical grey line: date of the 11 March 2020 WHO declaration of a pandemic. Monotonically increasing grey curve: cumulative COVID-19 vaccine doses administered. Green curve: counterfactual

total excess all-cause mortality by week following the simplification of time-independent constant nI (constant prevalence). Red curve: Counterfactual total excess all-cause mortality by week taking nI(t) (time-dependent prevalence) to be proportional to actual measured excess all-cause mortality by week. Beyond the date of the end of the Fitzpatrick et al. (2022) counterfactual period (30 November 2022), the red and green curves are shown as dashed.

Calculations of Figure 1 are repeated in Figure 2 to illustrate the effect of varying the rectangular response function width (vaccine non-waning duration). Here we represent the COVID-19 vaccine doses administered by week (in each week) rather than the cumulative.

Here (Figure 2, Figure 3), the first large peak in vaccinations in early 2021 is generally associated with doses 1 and 2, whereas the second large peak in vaccinations in late 2021 and early 2022 is generally associated with the 1st booster dose (3rd injection).

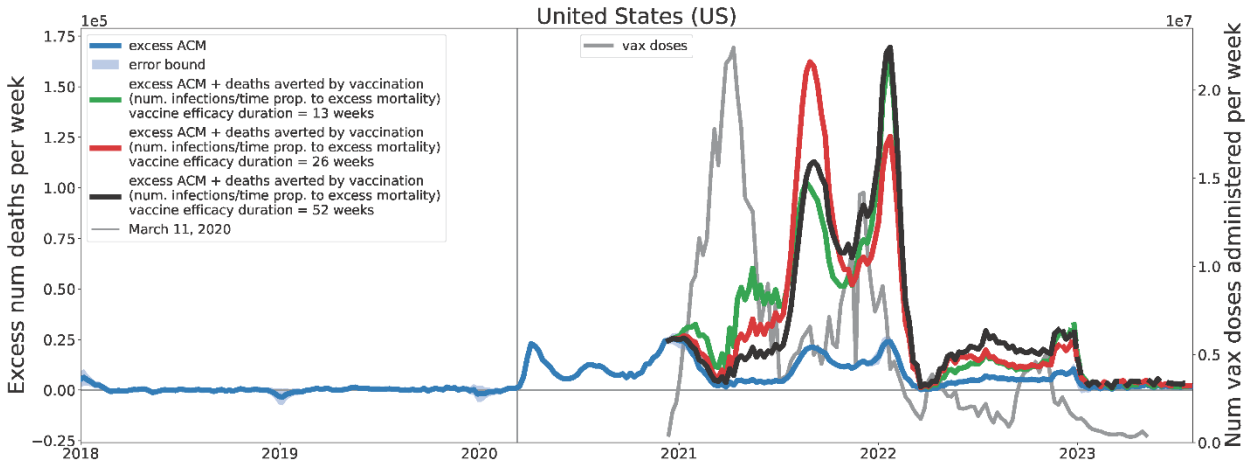
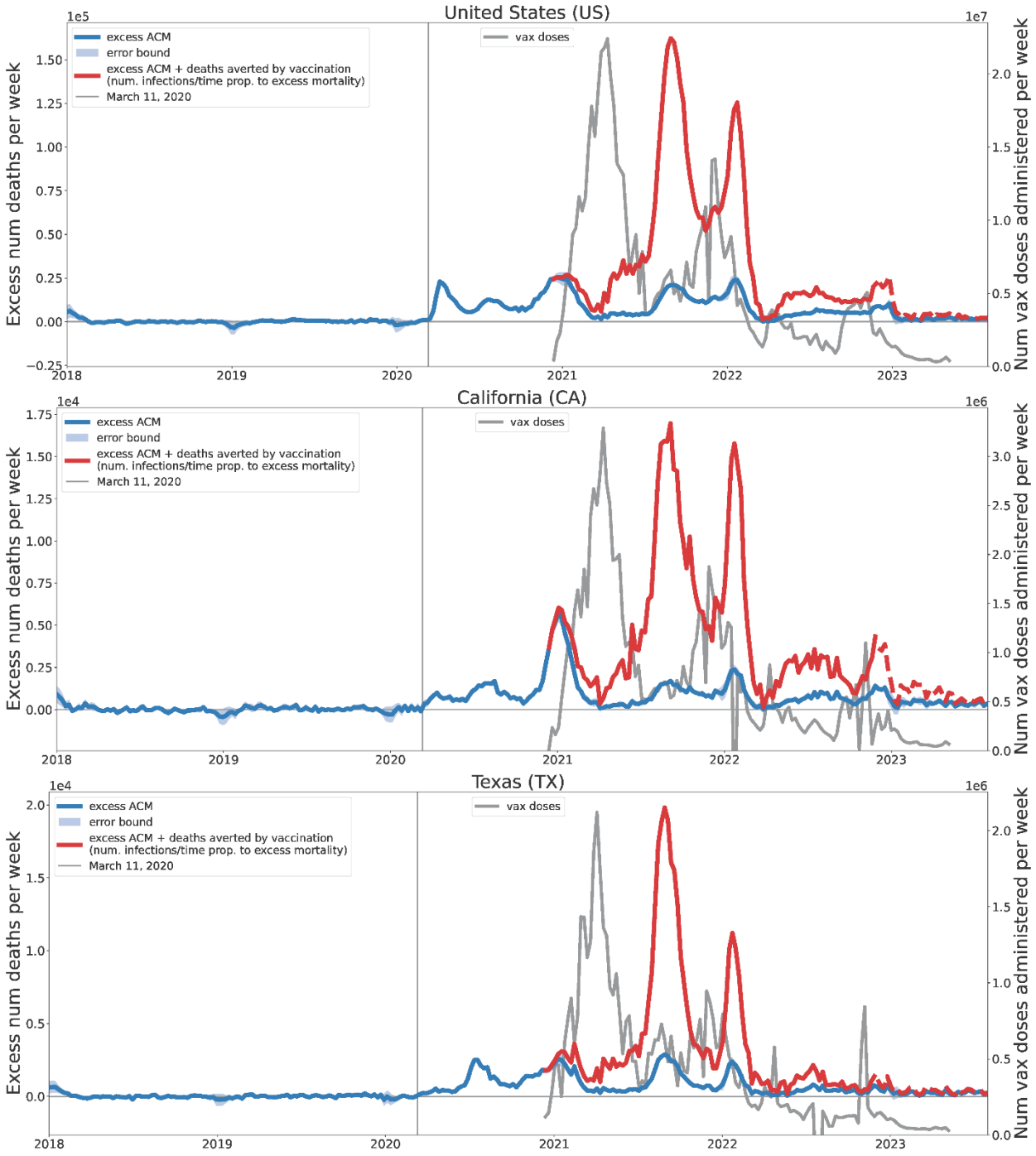


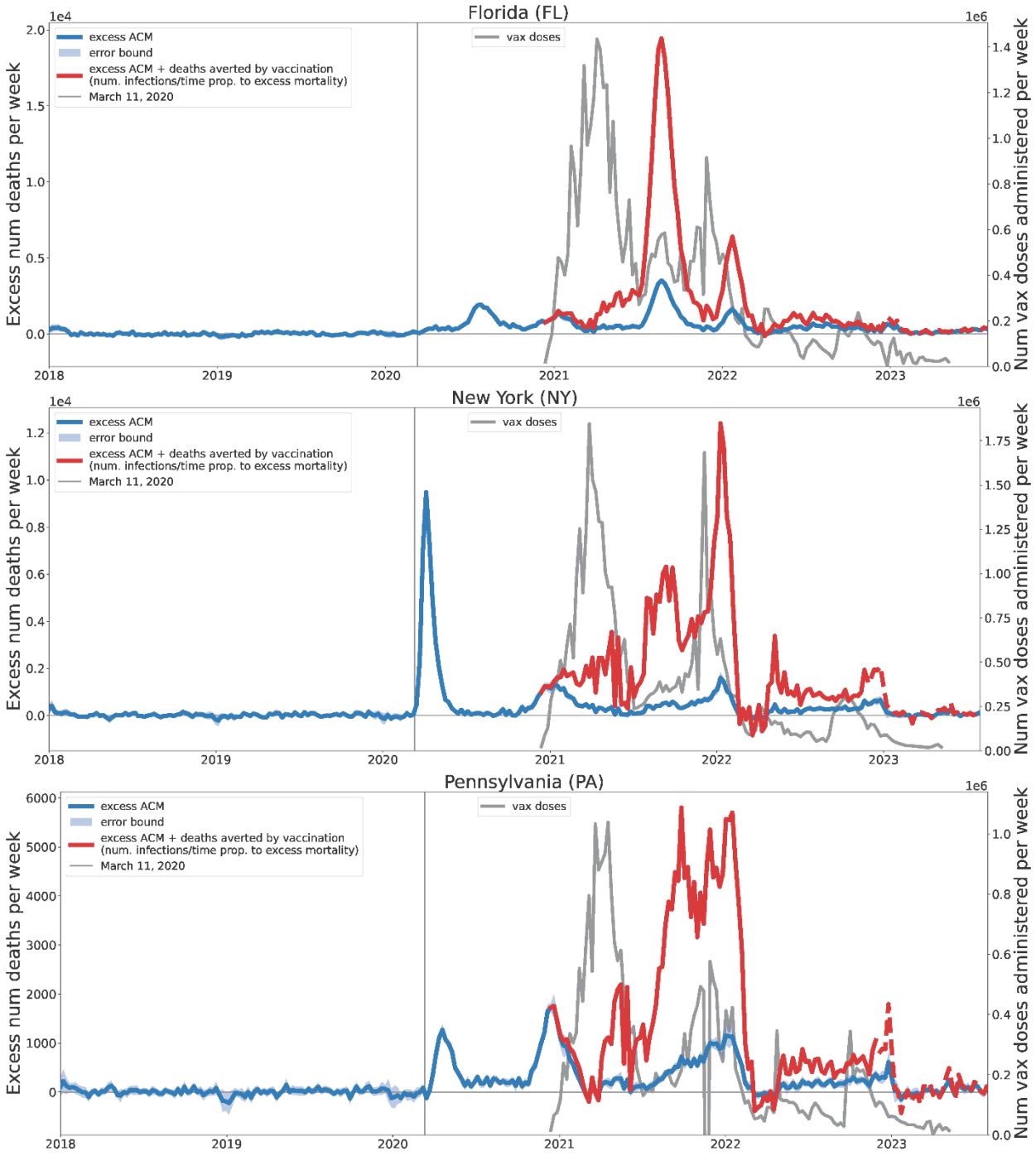
Figure 2. Counterfactual mortality by time advanced as the postulated reality in the hypothetical absence of vaccination, USA, 2018-2024, for the counterfactual results (3.2 million lives saved) of Fitzpatrick et al. (2022), taking nI(t) (time-dependent prevalence) to be proportional to actual measured excess all-cause mortality by week, with three different rectangular response function widths (vaccine non-waning durations): 13 weeks (green), 26 weeks (red), and 52 weeks (black). Blue line and blue shading: actual measured excess all-cause mortality by week and its 1σ uncertainty. Vertical grey line: date of the 11 March 2020 WHO declaration of a pandemic. Variable grey line: COVID-19 vaccine doses administered by week. Beyond the date of the end of the Fitzpatrick et al. (2022) counterfactual period (30 November 2022), the green, red and black curves are shown as dashed.

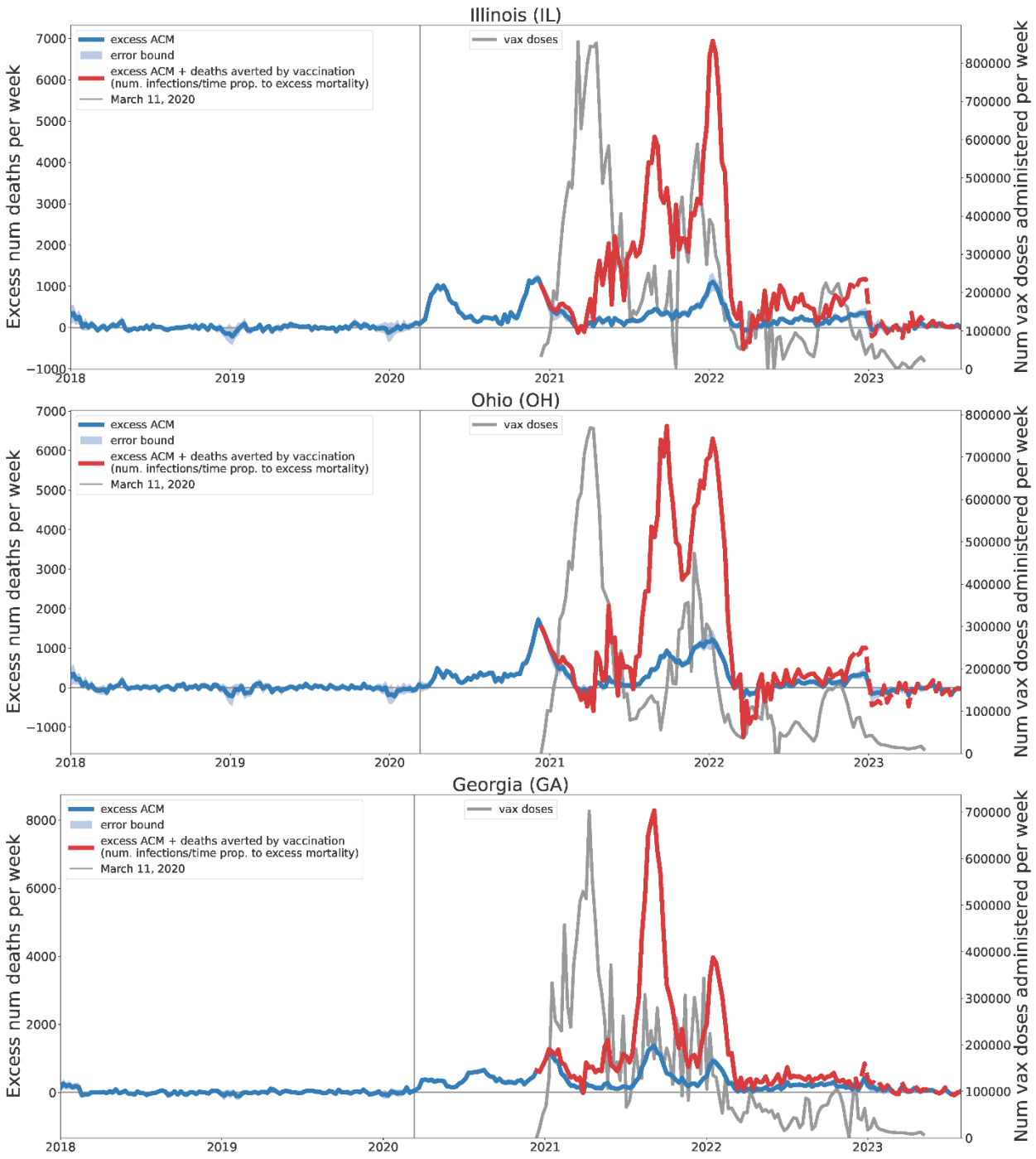
The same style of presentation as in Figure 1 is used in the Appendix, showing the calculations in panels for each of the ten most populous states of the USA (in order of decreasing 2020 population): California, Texas, Florida, New York, Pennsylvania, Illinois, Ohio, Georgia, North Carolina, and Michigan. These ten states account for approximately 54% of the population of the USA.

For the USA states, in the Appendix and in Figure 3, we took counterfactual numbers of lives saved from the whole-USA value of Fitzpatrick et al. (2022) (3.2 million lives saved) by using state population fractions of USA population in 2020, taking the same counting period as used by Fitzpatrick et al. (2022) (from 12 December 2020 through 30 November 2022), since Fitzpatrick et al. (2020) do not report values for individual states.

In the same style as Figure 2, the same results for the ten most populous states as in the Appendix and for the USA are in Figure 3, as follows in 11 panels.


United States (US)
1e5
1e7
excess ACM
error bound
excess ACM + deaths averted by vaccination (num. infections/time prop. to excess mortality)
March 11, 2020
vax doses
Excess num deaths per week
Num vax doses administered per week
California (CA)
1e4
1e6
Texas (TX)
2018
2019
2020
2021
2022
2023


Florida (FL)
1e4
1e6
excess ACM
error bound
excess ACM + deaths averted by vaccination
(num. infections/time prop. to excess mortality)
March 11, 2020
vax doses
Excess num deaths per week
Num vax doses administered per week
2018
2019
2020
2021
2022
2023
New York (NY)
1e4
1e6
excess ACM
error bound
excess ACM + deaths averted by vaccination
(num. infections/time prop. to excess mortality)
March 11, 2020
vax doses
Excess num deaths per week
Num vax doses administered per week
2018
2019
2020
2021
2022
2023
Pennsylvania (PA)
1e6
excess ACM
error bound
excess ACM + deaths averted by vaccination
(num. infections/time prop. to excess mortality)
March 11, 2020
vax doses
Excess num deaths per week
Num vax doses administered per week
2018
2019
2020
2021
2022
2023


Illinois (IL)
excess ACM
error bound
excess ACM + deaths averted by vaccination
(num. infections/time prop. to excess mortality)
March 11, 2020
vax doses
Excess num deaths per week
Num vax doses administered per week
Ohio (OH)
excess ACM
error bound
excess ACM + deaths averted by vaccination
(num. infections/time prop. to excess mortality)
March 11, 2020
vax doses
Excess num deaths per week
Num vax doses administered per week
Georgia (GA)
excess ACM
error bound
excess ACM + deaths averted by vaccination
(num. infections/time prop. to excess mortality)
March 11, 2020
vax doses
Excess num deaths per week
Num vax doses administered per week

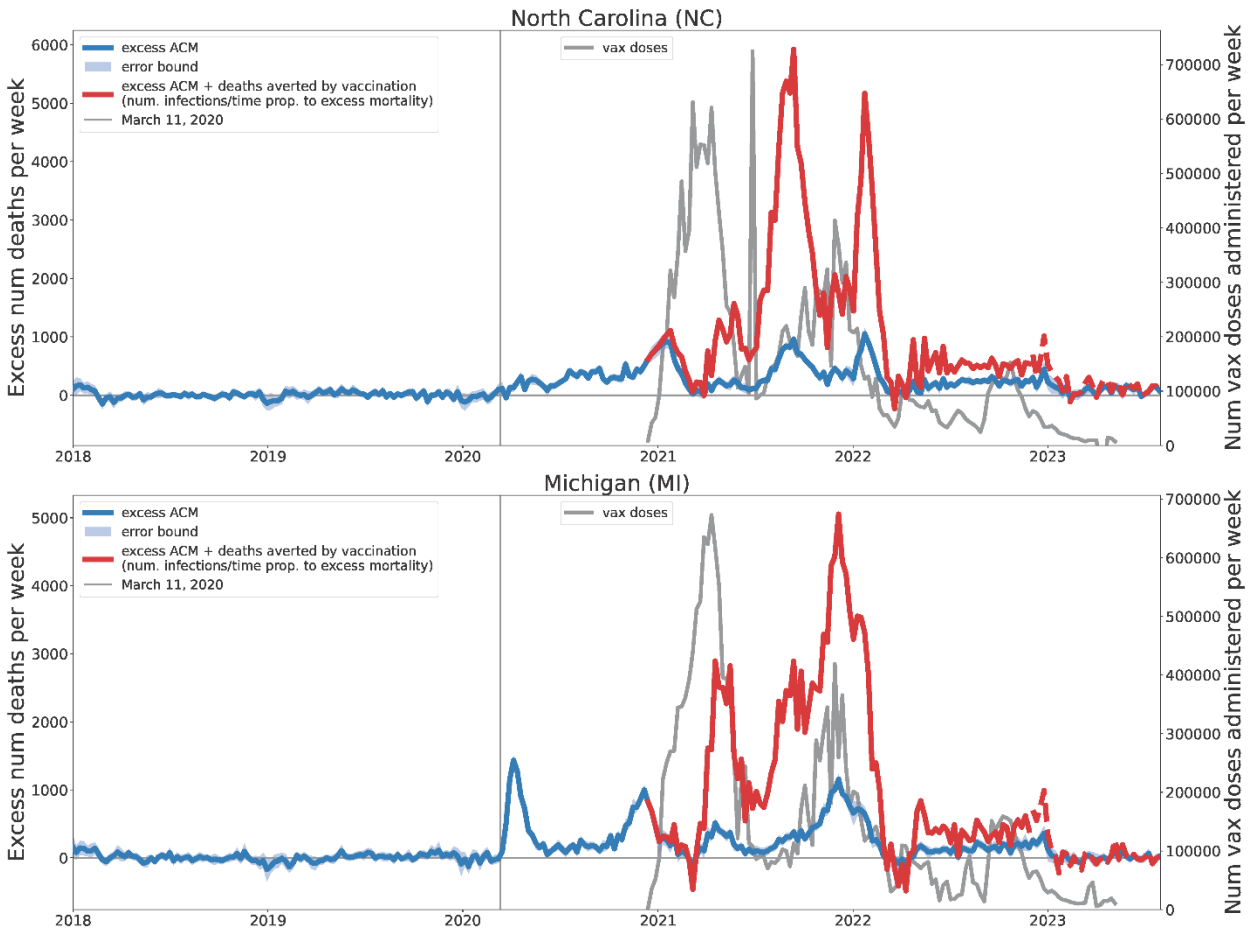


Figure 3. Counterfactual mortality by time advanced as the postulated reality in the hypothetical absence of COVID-19 vaccination, 2018-2024, for the counterfactual results of Fitzpatrick et al. (2022), for the USA and for each of the ten most populous states of the USA, as labelled, in order of decreasing 2020 population top to bottom panels. Blue line and blue shading: actual measured excess all-cause mortality by week and its 1σ uncertainty. Vertical grey line: date of the 11 March 2020 WHO declaration of a pandemic. Variable grey line: COVID-19 vaccine doses administered by week. Red curve: counterfactual total excess all-cause mortality by week taking nI(t) (time-dependent prevalence) to be proportional to actual measured excess all-cause mortality by week. Beyond the date of the end of the Fitzpatrick et al. (2022) counterfactual period (30 November 2022), the red curve is dashed.

Here, in Figure 3, small-magnitude negative values can occasionally occur (for example, in early 2022 for Ohio). These are negligible artifacts arising from rare negative values of actual measured excess all-cause mortality (compared to the historic pre-Covid-period trend, Section 3.3), giving calculated negative projected deaths in the hypothetical absence of the vaccines, in turn giving negative numbers of lives saved in those weeks.

Total yearly values of excess all-cause mortality (blue curves in the figures) and of counterfactual excess all-cause mortality (excess all-cause mortality + counterfactual lives saved) (blue curve up to 12 December 2020, red curve beyond in the figures) are tabulated in Table 2.

Table 2. Total yearly values of actual (xACM) and counterfactual (xACM + Ls) excess all-cause mortality, and totals for 2020-2022, for the USA and for its ten most populous states (in order top to bottom of decreasing 2020 population).

State	xACM 2020	xACM 2021	xACM + Ls 2021	xACM 2022	xACM + Ls 2022	Total xACM 2020-2022	Total xACM + Ls 2020-2022
USA	482,351	558,014	2,889,012	351,166	1,329,991	1,391,532	4,701,354
CA	45,298	60,682	310,066	41,522	189,377	147,501	544,740
TX	42,365	58,546	272,835	29,807	103,504	130,718	418,705
FL	29,157	49,448	219,658	24,378	66,783	102,983	315,598
NY	45,963	24,816	151,051	17,724	95,056	88,502	292,071
PA	20,177	21,209	113,971	12,994	50,805	54,380	184,953
IL	21,304	14,071	95,844	12,158	59,391	47,533	176,539
OH	17,138	20,689	106,710	10,193	42,438	48,020	166,286
GA	15,349	23,831	102,686	12,837	40,152	52,017	158,187
NC	11,883	20,055	90,814	13,488	46,739	45,427	149,436
MI	16,618	17,075	92,170	9,236	35,020	42,929	143,808

Table 3 gives ratios of yearly actual (xACM) and counterfactual (xACM + Ls) excess all-cause mortality, for the USA and for its ten most populous states (in order top to bottom of decreasing 2020 population). For example, in New York in 2021, the

counterfactual (no COVID-19 vaccines) excess all-cause mortality is 6.1 times the actual excess all-cause mortality, and 5.4 times in 2022. As another example, the ratio of actual excess all-cause mortality in 2021 to that in 2020 is 1.16 for the whole USA.

Table 3. Ratios of yearly actual (xACM) and counterfactual (xACM + Ls) excess all-cause mortality, for the USA and for its ten most populous states (in order top to bottom of decreasing 2020 population); and ratios of yearly xACM.

State	(xACM + Ls) / xACM 2020	(xACM + Ls) / xACM 2021	(xACM + Ls) / xACM 2022		xACM-2021 / xACM-2020	xACM-2022 / xACM-2020
USA	1	5.18	3.79		1.16	0.73
CA	1	5.11	4.56		1.34	0.92
TX	1	4.66	3.47		1.38	0.70
FL	1	4.44	2.74		1.70	0.84
NY	1	6.09	5.36		0.54	0.39
PA	1	5.37	3.91		1.05	0.64
IL	1	6.81	4.88		0.66	0.57
OH	1	5.16	4.16		1.21	0.59
GA	1	4.31	3.13		1.55	0.84
NC	1	4.53	3.47		1.69	1.14
MI	1	5.40	3.79		1.03	0.56

5 Discussion

Researchers who have estimated lives saved by the COVID-19 vaccines by counterfactual calculations sparingly show and virtually never examine the time evolution of the back predictions for plausibility or coincidences with bursts in vaccine administration (Fitzpatrick et al., 2022; Ogden et al., 2022; Shoukat et al., 2022; Steele

et al., 2022; Vilches et al., 2022a, 2022b; Watson et al., 2022; Yamada et al., 2023; Ioannidis et al., 2025).

For example, Watson et al. (2022) show their back prediction solely for the USA up to 8 December 2021 in their Supplementary Figure 1 of their Supplementary Appendix. The said Supplementary Figure 1 shows a large late-summer 2021 peak of hypothetical deaths averted by vaccination reaching more than 40 thousand averted deaths per day, without a comparison to the vaccine administration time series and without any comments. Watson et al. (2022) do not mention the result or discuss its plausibility in their paper.

It is important to disclose the counterfactual output time series, and to compare them directly with vaccine rollout time series, in order to evaluate whether the counterfactual output numbers are plausible, whether the calculation itself makes sense, irrespective of whether the inputs for the counterfactual calculations are valid. Our examination of the counterfactual results presented as functions of time allows this and avoids the debate about input validity while providing stringent tests of plausibility.

The said inputs for the counterfactual calculations include: inferred COVID-19 disease properties, contagion dynamics modelling outcomes, testing-based new cases reports per day or week, seroprevalence data, reported COVID-19 deaths, emergence of new variants from (questionable; Rancourt, 2022) genomic surveillance and inferred properties of new variants, and clinical-trial-based vaccine efficacy estimates presumed to represent real-world vaccine efficiency, age and comorbidity stratification, and so on. In our view, these inputs themselves are tentative at best and probably invalid (Hickey et al., 2025; Rancourt, 2025a, 2025b, 2021).

Another glaring problem with the counterfactual studies of vaccination for COVID-19 during the declared pandemic (in addition to invalidity of the input parameters) — one that is virtually never mentioned or considered — is that not vaccinating would have removed far more than solely the presumed beneficial immunological effects of the

vaccines. The vaccine rollouts were large rapid military-style campaigns, accompanied by testing and isolation protocols, that probably produced large disruptions in normal care of elderly and frail individuals (meals, hydration, movement, toilet access, medication schedules, human contact, etc.), with associated deadly consequences from biological stress (Hickey et al., 2025; Rancourt et al., 2024, 2022, 2021; Rancourt, 2024). Hypothetically removing these collateral effects by hypothetically removing the vaccine intervention would decrease counterfactual mortality, not increase it.

Our calculations (Figure 1, Figure 2, Figure 3, Appendix, Table 2, Table 3) show that if we believe the counterfactual calculation of Fitzpatrick et al. (2022) giving 3.2 million lives saved in the first two years of COVID-19 vaccination in the USA, then we must also believe that:

- although actual excess all-cause mortality never exceeded approximately 25 thousand deaths per week in the five-year period 2020-2024 (blue line, Figure 1), including in all of 2020 when vaccines were not available and populations are presumed to have been the most susceptible to the newly announced pandemic-causing respiratory virus SARS-CoV-2,
- the said virus then became so virulent in both late 2021 and early 2022 that, in the hypothetical absence of vaccination, it would have caused long-lasting bursts of excess mortality peaking at approximately 150 thousand deaths per week, and
- these sudden increases in virulence coincidently occurred following large-scale COVID-19 vaccine rollouts that were delivered just in time to save us, by bringing excess mortality down to (again coincidentally) the same level as experienced in 2020 prior to any vaccine deployment.

Accepting the time dependence of the actual and counterfactual mortalities, for the USA and its ten most populous states (California, Texas, Florida, New York, Pennsylvania, Illinois, Ohio, Georgia, North Carolina, and Michigan) (Figure 1, Figure 2, Figure 3, Appendix), compared to the vaccine rollouts (esp. Figure 3), one would have to believe in a magical and very cooperative virus that:

- did not cause any detectable excess all-cause mortality prior to the 11 March 2020 WHO declaration of a pandemic (vertical grey line in the Figures)
- started causing detectable excess all-cause mortality geosynchronously immediately following the 11 March 2020 WHO declaration of a pandemic (also see: Hickey et al., 2025)
- experienced a many-fold unprecedented increase in virulence in late 2021, following completion of the rapid COVID-19 vaccine first-dose and second-dose rollout campaigns of early 2021
- experienced a second many-fold also unprecedented increase in virulence in early 2022, following completion of the rapid COVID-19 vaccine first-booster-dose rollout campaigns of late 2021

We must believe that the two main COVID-19 vaccination campaigns (doses 1+2 and first-booster dose rollouts, in early and late 2021, respectively) coincidentally were each applied just in time prior to two staggering spontaneous many-fold increases in viral virulence, thus saving millions of lives.

In other words, we are expected to believe that the massive and repeated COVID-19 vaccine rollouts did not significantly reduce mortality in 2021 and in 2022 compared to 2020 (they actually did not, Table 3) because the virus became more virulent than ever in those years, twice (Figure 3).

In terms of yearly values, Table 3 shows that one would have to believe that whereas actual excess all-cause mortality has comparable values in 2020, 2021 and 2022, yearly excess mortality would have been more than 5 times greater in 2021 and almost 4 times greater in 2022, after almost a full year of declared pandemic and large excess mortality in 2020, had COVID-19 vaccines not been deployed; and one would have to believe that the vaccines also protected just the right amount (not significantly more or less) such that excess mortality in 2021 (and 2022 to a lesser degree) was brought down to a level close to its value in 2020.

In terms of the absolute magnitude of the hypothetical counterfactual excess all-cause mortality corresponding to the Fitzpatrick et al. (2022) results, Table 2 shows that it is approximately 100% of all USA mortality for 2019 (2.85 million deaths in 2019; Kochanek et al., 2020) in 2021, and approximately 50% of all USA mortality for 2019 in 2022, whereas in 2020, the actual measured excess all-cause mortality was approximately 17% of all USA mortality for 2019. In other words, mortality would have been twice (2.0 times) the 2019 value in 2021 and 1.5 times the 2019 value in 2022, whereas it was 1.17 times the 2019 value in 2020.

That is too many coincidences, involving too large of a hypothetical danger avoided, for the present authors to accept as plausible. The counterfactual scenarios are so improbable that they can be qualified as impossible.

In our view, no reasonable informed person or epidemiologist would accept that the mortality outcomes by time illustrated in Figure 3 would have occurred in the absence of COVID-19 vaccines.

It follows that all the counterfactual back predictions of Fitzpatrick et al. (2022) — regarding infections, hospitalizations, deaths and medical costs — are incorrect and should not be used by public health professionals or government officials.

6 Conclusion

Published counterfactual outcomes of life-saving COVID-19 vaccine benefits appear to be based entirely on contrived calculations designed in-effect to produce desired results aligned with large corporate and government interests.

Basically, since the large COVID-19 vaccination campaigns did not consequentially reduce observed excess mortality (compared to 2020), the only way to claim large numbers of lives saved is to claim that excess mortality would have been exceedingly

large without vaccination (in 2021 and 2022), approximately doubling total population-wide mortality itself in 2021 compared to 2019.

We conclude that the published counterfactual back predictions are contrived circular self-fulfilling theoretical exercises that contain impossible coincidences of large surges in viral virulence conveniently extinguished by the vaccine rollouts that in fact are not associated with any significant reduction in actual measured excess all-cause mortality.

The same is probably true of counterfactual studies of claimed benefits from non-pharmaceutical interventions during the declared COVID-19 pandemic (e.g., Flaxman et al., 2020). In this regard, see: Hickey and Rancourt (2023a, 2023b), Johnson and Rancourt (2022), and Rancourt (2021).

Published claims of life-saving COVID-19 vaccine benefits based on counterfactual calculations, whether fantastic or relatively modest, are not of a quality standard sufficient to inform health policy and should not be believed, irrespective of by whom and where they are being made.

In particular, the claims of Fitzpatrick et al. (2022) are false and should never have been leveraged in the way that they were (Section 1). The said leveraging was palpably a political exercise done without applying needed critical skepticism. From a scientific perspective, the counterfactual outcomes of Fitzpatrick et al. (2022) have the same value as propaganda.

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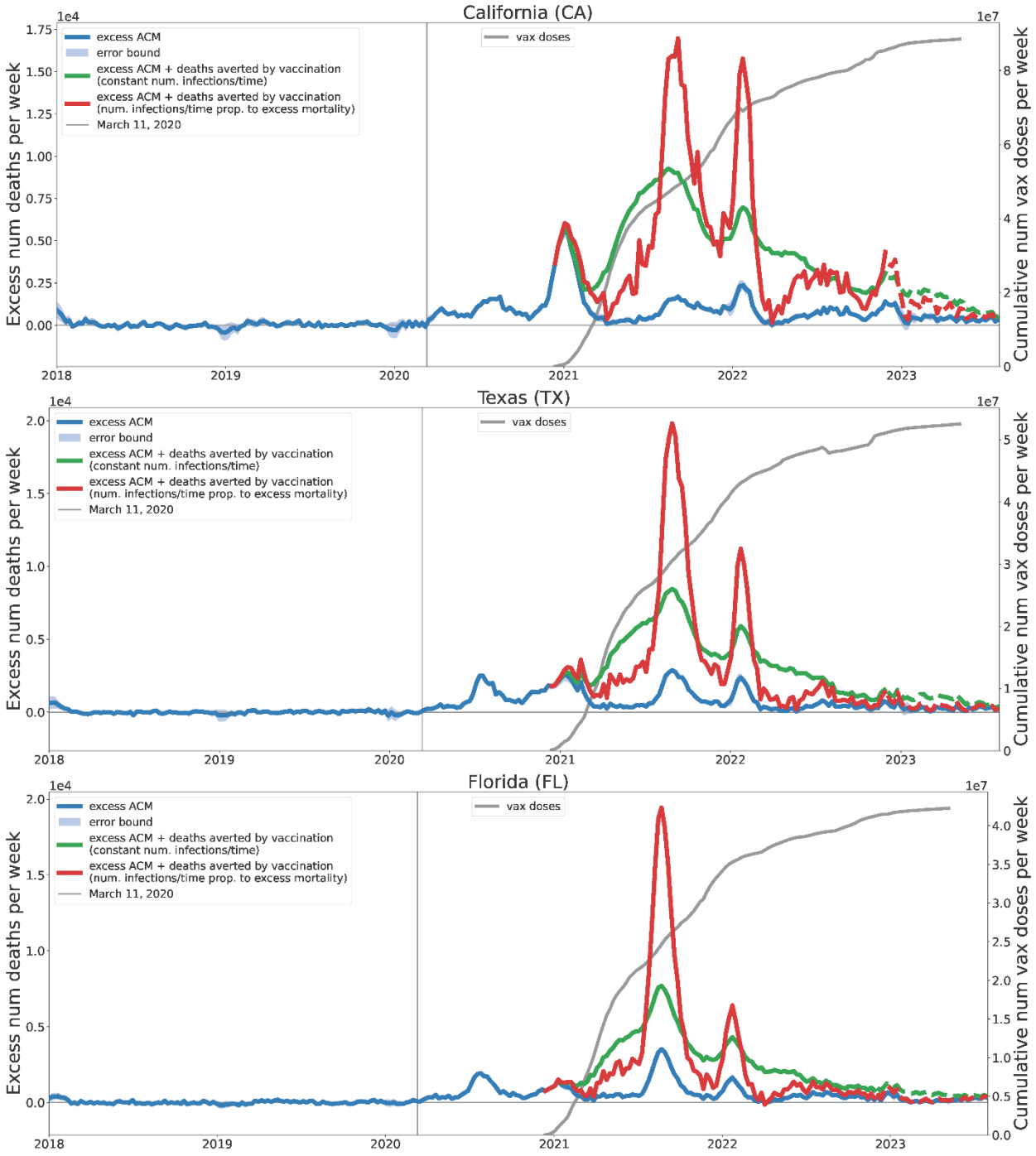
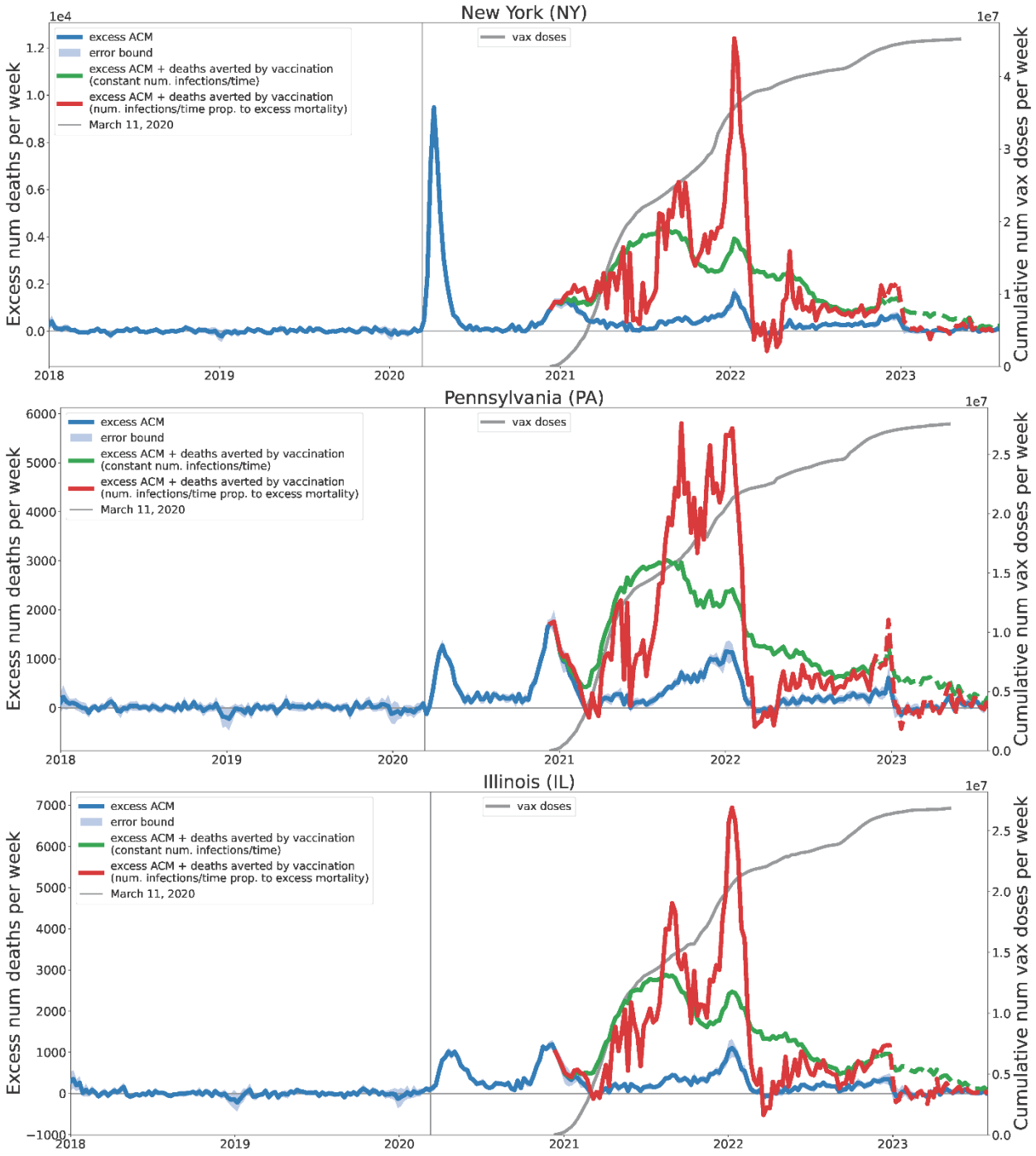
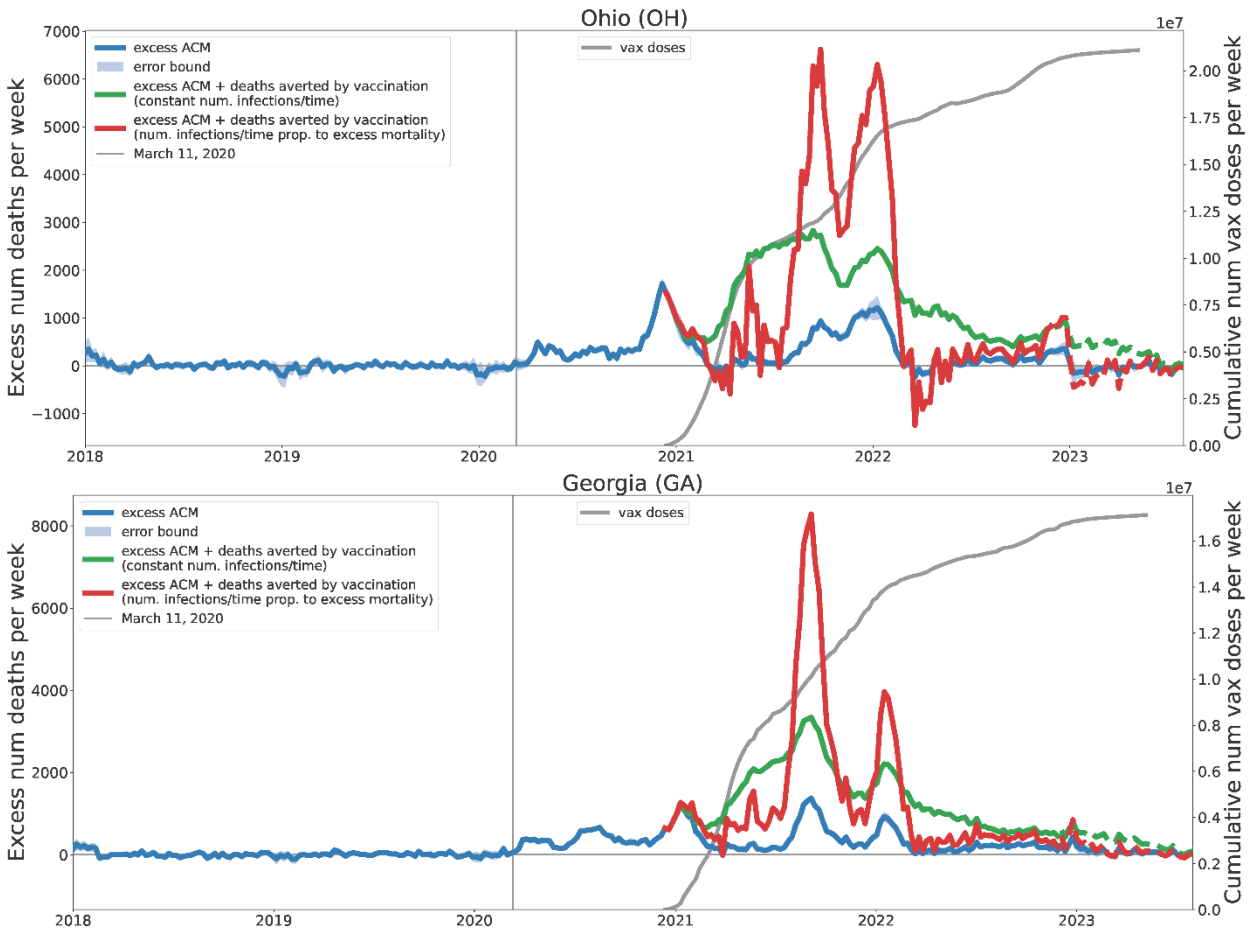
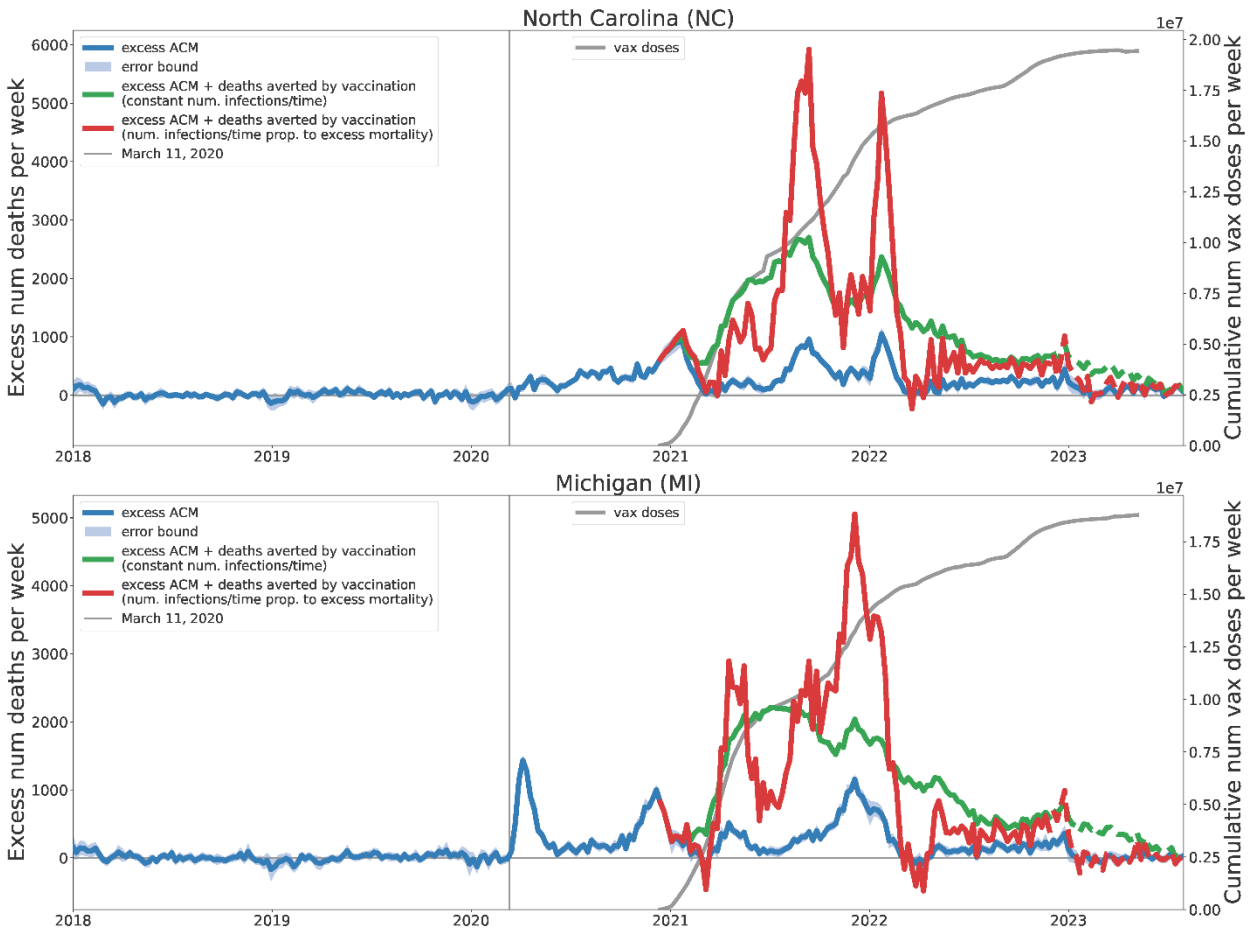
Appendix

This appendix contains a 10-panel figure: Counterfactual mortality by time advanced as the postulated reality in the hypothetical absence of vaccination, 2018-2024, for the counterfactual results of Fitzpatrick et al. (2022), for each of the ten most populous states of the USA, as labelled, in order of decreasing 2020 population top to bottom panels. Actual measured excess all-cause mortality by week and its 1σ uncertainty (blue line and blue shading). Vertical grey line is at the date of the 11 March 2020 WHO declaration of a pandemic. Monotonically increasing grey curve is cumulative COVID-19 vaccine doses administered. Counterfactual total excess all-cause mortality by week following the simplification of time-independent constant nI (constant prevalence) (green curve). Counterfactual total excess all-cause mortality by week taking nI(t) (time-dependent prevalence) to be proportional to actual measured excess all-cause mortality by week (red curve). Beyond the date of the end of the Fitzpatrick et al. (2022) counterfactual period (30 November 2022), the red and green curves are shown as dashed.


California (CA)
Texas (TX)
Florida (FL)
1e4
1e7
excess ACM
error bound
excess ACM + deaths averted by vaccination (constant num. infections/time)
excess ACM + deaths averted by vaccination (num. infections/time prop. to excess mortality)
March 11, 2020
vax doses
Excess num deaths per week
Cumulative num vax doses per week
2018
2019
2020
2021
2022
2023


New York (NY)
Pennsylvania (PA)
Illinois (IL)
excess ACM
error bound
excess ACM + deaths averted by vaccination (constant num. infections/time)
excess ACM + deaths averted by vaccination (num. infections/time prop. to excess mortality)
March 11, 2020
vax doses
Excess num deaths per week
Cumulative num vax doses per week
1e4
1e7
2018
2019
2020
2021
2022
2023


Ohio (OH)
Georgia (GA)
excess ACM
error bound
excess ACM + deaths averted by vaccination (constant num. infections/time)
excess ACM + deaths averted by vaccination (num. infections/time prop. to excess mortality)
March 11, 2020
vax doses
Excess num deaths per week
Cumulative num vax doses per week
1e7
2018
2019
2020
2021
2022
2023


North Carolina (NC)
excess ACM
error bound
excess ACM + deaths averted by vaccination (constant num. infections/time)
excess ACM + deaths averted by vaccination (num. infections/time prop. to excess mortality)
March 11, 2020
vax doses
Excess num deaths per week
Cumulative num vax doses per week
1e7
Michigan (MI)
excess ACM
error bound
excess ACM + deaths averted by vaccination (constant num. infections/time)
excess ACM + deaths averted by vaccination (num. infections/time prop. to excess mortality)
March 11, 2020
vax doses
Excess num deaths per week
Cumulative num vax doses per week
1e7