COVID-Period Mass Vaccination Campaign and Public Health Disaster in the USA From age/state-resolved all-cause mortality by time, age-resolved vaccine delivery by time, and socio-g...

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COVID-Period Mass Vaccination Campaign and Public Health Disaster in the USA

From age/state-resolved all-cause mortality by time,
age-resolved vaccine delivery by time, and socio-geo-economic data

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Abstract

All-cause mortality by time is the most reliable data for detecting and epidemiologically characterizing events causing death, and for gauging the population-level impact of any surge or collapse in deaths from any cause. Such data is not susceptible to reporting bias or to any bias in attributing causes of death. We compare USA all-cause mortality by time (month, week), by age group and by state to number of vaccinated individuals by time (week), by injection sequence, by age group and by state, using consolidated data up to week-5 of 2022 (week ending on February 5, 2022), in order to detect temporal associations, which would imply beneficial or deleterious effects from the vaccination campaign. We also quantify total excess all-cause mortality (relative to historic trends) for the entire covid period (WHO 11 March 2020 announcement of a pandemic through week-5 of 2022, corresponding to a total of 100 weeks), for the covid period prior to the bulk of vaccine delivery (first 50 weeks of the defined 100-week covid period), and for the covid period when the bulk of vaccine delivery is accomplished (last 50 weeks of the defined 100-week covid period); by age group and by state.

We find that the COVID-19 vaccination campaign did not reduce all-cause mortality during the covid period. No deaths, within the resolution of all-cause mortality, can be said to have been averted due to vaccination in the USA. The mass vaccination campaign was not justified in terms of reducing excess all-cause mortality. The large excess mortality of the covid period, far above the historic trend, was maintained throughout the entire covid period irrespective of the unprecedented vaccination campaign, and is very strongly correlated (r = +0.86) to poverty, by state; in fact, proportional to poverty. It is also correlated to several other socio-economic and health factors, by state, but not correlated to population fractions (65+, 75+, 85+ years) of elderly state residents.

The excess all-cause mortality by age group (also expressed as percentage of pre-covid-period all-cause mortality for the age group) for the whole USA for the entire covid period through week-5 of 2022 is:

all ages	1.27M	23%
0-24	13K	12%
25-44	109K	41%
45-64	274K	27%
65-74	319K	30%
75-84	316K	24%
85+	240K	14%

The corresponding fatality risk ratios are relatively uniform with age (non-exponential and non-near-exponential with age; and even skewed towards young adults), which holds essentially for all states, and for all examined periods within the covid period. This fundamental result implies that a dominant cause of excess mortality could not have been assigned COVID-19, which consistently has been measured to have a strong near-exponential infection fatality ratio with age. The implication is further corroborated by the absence of correlation between all-age-group-integrated excess mortality and age, by state. COVID-19 was not a dominant cause of excess mortality during the covid period in the USA.

All of our observations can be coherently understood if we interpret that the covid-period socio-economic, regulatory and institutional conditions induced chronic stress and social isolation among members of large vulnerable groups (individuals afflicted and co-afflicted by poverty, obesity, diabetes, high susceptibility to bacterial respiratory infection [inferred from pre-covid-period antibiotic prescription rates], old age, societal exclusion, unemployment, drug and substance abuse, and mental disability or serious mental illness), which in turn caused many of these individuals to be more and fatally immunocompromised, allowing them to succumb to bacterial pneumonia, at a time when a documented national pneumonia epidemic raged and antibiotic prescriptions were systemically reduced; in addition to possible comorbidity from COVID-19 vaccine challenge against individuals thus made immunocompromised, under broad and hastily implemented “vaccine equity” programs.

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Table of abbreviations and definitions

Abbreviation	Name	Units	Description	Notes
65+	65+	People	Resident population estimate of people aged 65 years old and over as of July 1st, 2020	
65+/pop	65+ by population	%	Proportion of the population aged 65 years old and over	
75+	75+	People	Resident population estimate of people aged 75 years old and over as of July 1st, 2020	
75+/pop	75+ by population	%	Proportion of the population aged 75 years old and over	
85+	85+	People	Resident population estimate of people aged 85 years old and over as of July 1st, 2020	
85+/pop	85+ by population	%	Proportion of the population aged 85 years old and over	
ACM	All-cause mortality	Deaths	Mortality from all causes of death (occurring in a defined period and for a defined place)	
ACM/m	ACM by month	Deaths/m	ACM occurring per month	
ACM/w	ACM by week	Deaths/w	ACM occurring per week	
At least 1 dose	At least 1 dose	People	Total count of people with at least one dose	1
Booster	Booster	People	Total count of people aged 12 years and older with a booster dose	1
CDC	Centers for Disease Control and Prevention	N/A	The Centers for Disease Control and Prevention is the national public health agency of the United States.	
COVID-19	coronavirus disease 2019	N/A	"Coronavirus disease 2019 is a contagious disease caused by severe acute respiratory syndrome coronavirus 2"	
covid period	covid period		Period starting with the WHO announcement of a pandemic on March 11, 2020, up to and including the most reliable ACM data (through December	

			2021 for the data by month; through week-5 of 2022 for the data by week)	
cvp1	COVID-peak 1	Deaths	ACM peak occurring over March, April and May 2020	
cvp2	COVID-peak 2	Deaths	ACM peak occurring over the winter 2020-2021	
Disability	Disability	%	Percent of Americans with a disability	2
Fully vaccinated	Fully vaccinated	People	Total count of people who are fully vaccinated	1
m22c	ACM for the 22-month covid period	Deaths	Integrated ACM from March 2020 to December 2021, included	
m22c-1	ACM for the 1st 22-month period prior to the covid period	Deaths	Integrated ACM from May 2018 to February 2020, included	
m22c-2	ACM for the 2nd 22-month period prior to the covid period	Deaths	Integrated ACM from July 2016 to April 2018, included	
MHI	Median Household Income	$	Estimated median household income in US dollars	
Obesity	Obesity	%	Prevalence of self-reported obesity among U.S. adults (BRFSS (Behavioral Risk Factor Surveillance System), 2020)	
pCVD	pre-covid	Deaths	corresponds to w50c-2	
pop	Population	People	Resident population estimate for the states of the USA as of July 1st of 2020	
Poverty	Poverty	%	Percent of the population living in poverty	
pVax	pre-vaccination	Deaths	corresponds to w50c-1	
pVax-pCVD	Excess mortality during the pre-vaccination period of the covid period	Deaths	pVax-pCVD = w50c-1 - w50c-2	3
pVax-pCVD/pCVD	pVax-pCVD expressed as a percentage of pre-covid mortality	%	pVax-pCVD/pCVD = (w50c-1 - w50c-2) / w50c-2 (Equation 9)	4
smp1	Summer-peak 1	Deaths	ACM peak occurring over the summer 2020	
smp2	Summer-peak 2	Deaths	ACM peak occurring over the late-summer and fall	5

			2021	
SSDI	Social Security Disability Insurance	People	Number of all disabled beneficiaries aged 18-64 of the SSDI program	
SSDI/pop	SSDI by population	%	SSDI normalized by population	
SSI	Supplemental Security Income	People	Number of recipients of the SSI program	
SSI/pop	SSI by population	%	SSI normalized by population	
USA	United States of America	N/A	USA is composed of 51 states, including the District of Columbia, Alaska and Hawaii	
VAERS	Vaccine Adverse Event Reporting System	N/A	United States program for vaccine safety, co-managed by the U.S. Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration (FDA)	
Vax	vaccination	Deaths	corresponds to w50c	
Vax-pCVD	Excess mortality during the vaccination period of the covid period	Deaths	Vax-pCVD = w50c - w50c-2	6
Vax-pCVD/pCVD	Vax-pCVD expressed as a percentage of pre-covid mortality	%	Vax-pCVD/pCVD = (w50c - w50c-2) / w50c-2 (Equation 10)	7
Vax-pVax	Difference in mortality between the vaccination period and the pre-vaccination period of the covid period	Deaths	Vax-pVax = w50c - w50c-1 (Equation 11)	
Vax-pVax/pCVD	Vax-pVax expressed as a percentage of pre-covid mortality	%	Vax-pVax/pCVD = (w50c - w50c-1) / w50c-2 (Equation 12)	
w100c	ACM for the 100-week covid period	Deaths	Integrated ACM from week-11 of 2020 (week of March 9, 2020) to week-5 of 2022 (week of January 31, 2022), included	
w100c-1	ACM for the 1st 100-week period prior to the covid	Deaths	Integrated ACM from week-15 of 2018 (week of April 9, 2018) to week-10 of 2020 (week of March 2,	

	period		2020), included	
w100c-2	ACM for the 2nd 100-week period prior to the covid period	Deaths	Integrated ACM from week-19 of 2016 (week of May 9, 2016) to week-14 of 2018 (week of April 2, 2018), included	
w50c	ACM for the 50-week vaccination period of the covid period	Deaths	Integrated ACM from week-8 of 2021 (week of February 22, 2021) to week-5 of 2022 (week of January 31, 2022), included	8
w50c-1	ACM for the 50-week pre-vaccination period of the covid period	Deaths	Integrated ACM from week-11 of 2020 (week of March 9, 2020) to week-7 of 2021 (week of February 15, 2021), included	9
w50c-2	ACM for the 1st 50-week period prior to the covid period	Deaths	Integrated ACM from week-13 of 2019 (week of March 25, 2019) to week-10 of 2020 (week of March 2, 2020), included	10
WHO	World Health Organization	N/A	The World Health Organization is a specialized agency of the United Nations responsible for international public health.	
xDc(22)1	Excess mortality during the 22-month covid period, relative to m22c-1	Deaths	xDc(22)1 = m22c - m22c-1 (Equation 1)	
xDc(22)1%	xDc(22)1 expressed as a percentage of pre-covid mortality	%	xDc(22)1% = xDc(22)1 / m22c-1 (Equation 3)	
xDc(22)2	Excess mortality during the 22-month covid period, relative to m22c-2	Deaths	xDc(22)2 = m22c - m22c-2 (Equation 2)	
xDc(22)2%	xDc(22)2 expressed as a percentage of pre-covid mortality	%	xDc(22)2% = xDc(22)2 / m22c-2 (Equation 4)	
xDc(100)1	Excess mortality during the 100-week covid period, relative to w100c-1	Deaths	xDc(100)1 = w100c - w100c-1 (Equation 5)	11
xDc(100)1%	xDc(100)1 expressed as a percentage of pre-covid	%	xDc(100)1% = xDc(100)1 / w100c-1 (Equation 7)	12

	mortality			
xDc(100)1/pop	xDc(100)1 by population		xDc(100)1 normalized by population	13
xDc(100)2	Excess mortality during the 100-week covid period, relative to w100c-2	Deaths	xDc(100)2 = w100c - w100c-2 (Equation 6)	
xDc(100)2%	xDc(100)2 expressed as a percentage of pre-covid mortality	%	xDc(100)2% = xDc(100)2 / w100c-2 (Equation 8)	

1 In Figures 10 and 11, it is presented as the cumulative number of people by week
2 Disability is defined as a long-lasting sensory, physical, mental, or emotional condition or conditions that make it difficult for a person to do functional or participatory activities such as seeing, hearing, walking, climbing stairs, learning, remembering, concentrating, dressing, bathing, going outside the home, or working at a job.
3 Also called "pre-vaccination-period excess mortality" in the text
4 Also called "covid-period pre-vaccination-period relative excess mortality" in the text
5 Also called "late-summer-2021 peak" in the text
6 Also called "vaccination-period excess mortality" in the text
7 Also called "covid-period vaccination-period relative excess mortality" in the text
8 Also called "integrated mortality in the vaccination period of the covid period" in the text
9 Also called "integrated mortality in the pre-vaccination period of the covid period" in the text
10 Also called "pre-covid-period integrated mortality" in the text
11 Also called "100-week covid-period excess mortality" in the text
12 Also called "covid-period fatality risk ratio" in the text
13 Also called "100-week covid-period fatality ratio" in the text
N/A stands for not applicable

1. Introduction

Following Rancourt's 2 June 2020 article critically assessing circumstances of the declared pandemic using all-cause mortality (ACM) (Rancourt, 2020), more and more researchers are recognizing that it is essential to examine ACM by time, and excess deaths from all causes compared with projections from historic trends, to help make sense of the events surrounding COVID-19 (Kontis *et al.*, 2020; Rancourt, Baudin and Mercier, 2020; Villani *et al.*, 2020; Rancourt, Baudin and Mercier, 2021a, 2021b; Achilleos *et al.*, 2021; Chan, Cheng and Martin, 2021; Faust *et al.*, 2021; Islam, Jdanov, *et al.*, 2021; Islam, Shkolnikov, *et al.*, 2021; Jacobson and Jokela, 2021; Joffe, 2021; Karlinsky and Kobak, 2021; Kobak, 2021; Kontopantelis *et al.*, 2021; Locatelli and Rousson, 2021; Sanmarchi *et al.*, 2021; Woolf *et al.*, 2021; Woolf, Masters and Aron, 2021; Kontopantelis *et al.*, 2022; Ackley *et al.*, 2022; Johnson and Rancourt, 2022; Lee *et al.*, 2022; Wang *et al.*, 2022).

Rancourt (2020) argued that ACM by time and by jurisdiction data for many countries and states of the USA in the months that followed the WHO 11 March 2020 declaration of a pandemic:

(1) was inconsistent with the dominant view of the characteristic features of a pandemic (high contagiousness and spread by person-to-person "contact"), and
(2) gave clear evidence of synchronous local "hot spot" (jurisdictional) response-induced mortality.

Likewise, in our further prior analyses of ACM by time (by day, week, month, year) for many countries (and by province, state, region or county), we found that both the initial and long-term ACM data in the covid period is inconsistent with a viral respiratory disease pandemic, where the time-integrated mortality per capita is highly heterogeneous between jurisdictions, with no anomalies in the first many months in most places, and hot spots or hot regions having death rate increases that are synchronous with aggressive local or regional responses, both medical and governmental, which accompanied the 11 March 2020 WHO declaration of a pandemic (Rancourt, Baudin and Mercier, 2020, 2021a, 2021b; Johnson and Rancourt, 2022).

The initial surges in ACM are highly localized geographically (by jurisdiction) and are precisely synchronous (all starting immediately after the 11 March 2020 WHO declaration of a pandemic, across continents), which is contrary to model pandemic behaviour; but is consistent with the surges being caused by the known government and institutional responses (Rancourt, 2020; Rancourt, Baudin and Mercier, 2020, 2021a, 2021b; Johnson and Rancourt, 2022).

The ACM by time data for the USA in the covid period has extraordinary features, including large peaks occurring in the summer seasons, and dramatically different state to state behaviours. State-to-state heterogeneity in integrated covid-period health-status-adjusted mortality is well illustrated by Johnson and Rancourt (Johnson and Rancourt, 2022; their Figure 7). Above-decadal-trend mortality in the covid period is massive. Nothing like this occurs in neighbouring Canada (Rancourt, Baudin and Mercier, 2021a). Nothing like this occurs in Western European countries. Similar anomalies occur in some Eastern European countries and in Russia. The large differences in covid-period mortality in the USA compared to other Western countries are probably related to the known relatively poor health-status of the USA population, suggesting large groups of particularly vulnerable residents (Roser, 2020).

We found that in the USA the state-wise integrated excess ACM of all main age groups in the summer seasons (2020 and 2021) especially was largest (on a per capita basis) in the southern states, and was correlated to state-specific obesity and poverty rates, strongly correlated to the product of obesity and poverty rates, and correlated to mean climatic temperature of the state, and to state-wise pre-covid-period antibiotic prescription rate per capita (Rancourt, Baudin and Mercier, 2021b). We postulated that vulnerable groups became more immune-deficient due to increased experienced physio-psychological stress and social isolation, and mostly succumbed to bacterial pneumonia, which is the dominant comorbidity (40-60%) reported in the CDC covid mortality data, at a time when antibiotic prescription rates show an unprecedented decrease (Rancourt, Baudin and Mercier, 2021b).

In the present article, we extend our epidemiological analysis using consolidated ACM data (by month, by week, by state, and by age group) up to week-5 of 2022 (week ending on February 5, 2022), which gives us 100 weeks since the WHO's 11 March 2020 declaration of a pandemic.

Our goal is three-fold:

(1) Accurately quantify excess mortality (ACM) during the covid period in the USA
(2) Look for socio-economic factors that correlate to time-integrated excess ACM per capita, by state
(3) Examine whether any impact of the COVID-19 vaccination campaign, which was implemented in 2021, can be detected and quantified

Presently (as of July 14, 2022), a total of 221,924,152 people are fully vaccinated against COVID-19 (Johns Hopkins, 2022) in a population of 332,878,208 (US Census Bureau, 2022a), following an unprecedented vaccination campaign, which was largely accomplished in the last 50 weeks of the covid period up to week-5 of 2022.

- Has this massive campaign had any measurable impact, positive or negative, on the all-cause mortality in the USA, for any discerned age group?
- Can such an impact be detected in delayed or immediate synchronicity with the dose delivery rates for the different age groups?
- Are there important differences in ACM by time and by age group for the periods (within the covid period) prior to and following vaccine dose delivery, and how should such differences be interpreted if they occur?

2. Data

Table 1 describes the data used in this work and the sources of the data.

Data	Country	Period	Time unit	Filters	Source
ACM	USA	1999-2021*	Month	State, sex, age group[1]	CDC, 2022a
ACM	USA	2015-2022**	Week	State, age group[2]	CDC, 2022b
Vaccines	USA	2020-2022+	Day	Age group[3]	CDC, 2022c
Vaccines	USA	2020-2022++	Day	State, age group[4]	CDC, 2022d
Obesity	USA	2020	Year	State	CDC, 2021
Population	USA	2010-2020§	Year	State, sex, age group[5]	US Census Bureau, 2021
Poverty	USA	2020	Year	State	US Census Bureau, 2022b
MHI	USA	2020	Year	State	US Census Bureau, 2022b
SSI	USA	2020	Year	State	SSA, 2022a
SSDI	USA	2020	Year	State	SSA, 2022b
Disability	USA	-	-	State	Disabled World, 2020

Table 1. Data retrieved. In this work, USA is composed of 51 states, including the District of Columbia, Alaska and Hawaii, unless otherwise stated in the text.
* These data are a combination of the data found in CDC 2022a: data for the years 1999 to 2020 were downloaded under the “Current Final Multiple Cause of Death Data” section of the reference (on November 17, 2021 for the years 1999 to 2019 and on May 18, 2022 for the year 2020), and data for the year 2021 was downloaded under the “Provisional Multiple Cause of Death Data” section of the reference on May 18, 2022. The complete series is thus from January 1999 to December 2021.
** At the date of access, data were available from week-1 of 2015 (week ending on January 10, 2015) to week-19 of 2022 (week ending on May 14, 2022). Usable data are until week-5 of 2022

(week ending on February 5, 2022) due to unconsolidated data in later weeks, which gives a large artifact (anomalous drop in mortality).
[+] At the date of access, data were available from Sunday December 13th 2020 to Wednesday May 4th 2022.
[++] At the date of access, data were available from Sunday December 13th 2020 to Sunday April 24th 2022.
[§] In this work, we use the population data of the year 2020.
[1] 11 age groups: <1, 1-4, 5-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, 85+
[2] 6 age groups: 0-24, 25-44, 45-64, 65-74, 75-84, 85+
[3] 9 age groups: <5, 5-11, 12-17, 18-24, 25-39, 40-49, 50-64, 65-74, 75+
[4] 4 age groups: 5+, 12+, 18+, 65+
[5] 86 age groups: by 1 year age group, from 0 to 85+

The vaccines data are daily cumulative data; when shown together with all-cause mortality by week data, the last day of the week is used (the Saturday) as a data point, so that both ACM and vaccination data correspond to the same time point (end of week for both).

The vaccines data presented in this work correspond to three data type (CDC, 2022c):

- *At least 1 dose*, corresponds to the "total count of people with at least one dose".
- *Fully vaccinated*, corresponds to the "total count of people who are fully vaccinated".
- *Booster*, corresponds to the "total count of people aged 12 years and older with a booster dose".

According to the CDC, a person is considered fully vaccinated when they "have second dose of a two-dose vaccine or one dose of a single-dose vaccine".

A booster dose is an additional dose given to a fully vaccinated person.

For all the scatter plots presented in this article, the following color-code is applied for the 51 states of the USA:

● California ● Texas ● Florida ● New York ● Pennsylvania ● Illinois ● Ohio ● Georgia ● North Carolina ● Michigan
● Alabama ● Alaska ● Arizona ● Arkansas ● Colorado ● Connecticut ● Delaware ● District of Columbia ● Hawaii
● Idaho ● Indiana ● Iowa ● Kansas ● Kentucky ● Louisiana ● Maine ● Maryland ● Massachusetts ● Minnesota
● Mississippi ● Missouri ● Montana ● Nebraska ● Nevada ● New Hampshire ● New Jersey ● New Mexico
● North Dakota ● Oklahoma ● Oregon ● Rhode Island ● South Carolina ● South Dakota ● Tennessee ● Utah
● Vermont ● Virginia ● Washington ● West Virginia ● Wisconsin ● Wyoming

3. Results

3.1. USA all-cause mortality by month, 1999-2021

3.1.1. Historic trend, normal pre-covid period seasonal pattern

Figure 1 shows the all-cause mortality by month (ACM/m) for the USA from January 1999 to December 2021.

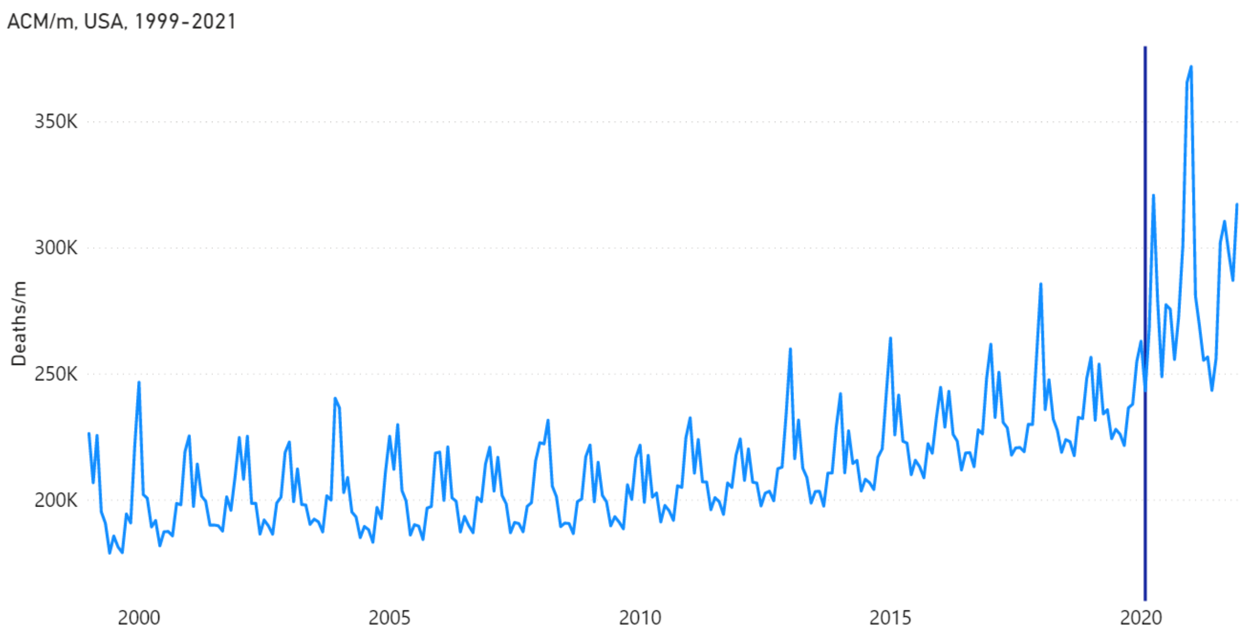


Figure 1. All-cause mortality by month in the USA from 1999 to 2021. Data are displayed from January 1999 to December 2021. The vertical dark-blue line indicates the month of February 2020, intended to point the beginning of the covid period. Data were retrieved from CDC (CDC, 2022a), as described in Table 1.

The usual seasonal variations are evident, exhibiting a regular pattern of mortality maximums in winter and mortality minimums in summer. The summer troughs follow a straight-line trend on a decadal or shorter timescale. On Figure 1 we discriminate two such periods: 2000-2008 and 2009-2019.

ACM/m has artifacts caused by the months having different numbers of days, unlike weeks (which always have 7 days). The most noticeable such artifact is the dip for the month of February, which usually has only 28 days. This allows the viewer to spot February in each winter season.

The regular seasonal pattern of mortality by month in the USA since 1999 is broken after February 2020 (Figure 1, vertical dark-blue line) when large anomalies occur. The anomalies occur in what we define as the covid period, starting after the 11 March 2020 WHO declaration of a pandemic.

We showed and discussed these anomalies in detail recently, for ACM by week (ACM/w) for the USA from week-1 (beginning of January) of 2013 to week-37 (mid-September) of 2021 (Rancourt, Baudin and Mercier, 2021b).

3.1.2. Anomalies in the covid period

In the covid period, after February 2020, we note the same peaks or features that we have previously described and interpreted (Rancourt, Baudin and Mercier, 2021b), using the nomenclature from our previous article:

- cvp1 (March-May 2020)
- smp1 (summer 2020)
- cvp2 (winter 2020-2021)
- smp2 (late-summer 2021)

Figure 2 shows those features with their labels.

Figure 2. All-cause mortality by month in the USA from 2016 to 2021. Data are displayed from July 2016 to December 2021. The cvp1, smp1, cvp2 and smp2 features discussed in the text are indicated. The vertical dark-blue line represents the month of February 2020, intended to point the beginning of the covid period. Data were retrieved from CDC (CDC, 2022a), as described in Table 1.

The anomalies in the covid period are as follows:

- A mortality peak late in the 2020 winter season, cvp1 (from February to June 2020, Figure 2).
- Peaks of mortality in the summers 2020 and 2021, smp1 and smp2, respectively, when mortality values are usually at their lowest. On Figure 2 specifically:
    - smp1 from June to September 2020
    - smp2 from July to November 2021 (connecting with the winter 2021-2022)
- A large mortality peak in the winter 2020-2021, cvp2 (from September 2020 to April 2021, Figure 2), which surpasses in magnitude any single winter mortality peaks since at least 1999 (Figure 1).

In the next section, we use the monthly ACM data to quantify the total excess mortality that occurred in the covid period, which contains these anomalies.

3.1.3. Quantifying excess mortality of the covid period, by age group and sex

We use the ACM/m data of Figure 1 to quantify the excess deaths of the covid period "to date", compared to the historic trend, as follows.

For a given age group and sex, we add all the monthly deaths together, for the months of March-2020 (start of the pandemic period; announced by the WHO on 11 March 2020) through to the latest useable month (December 2021). This is a total for 22 months (the covid period "to date"). We call this total "m22c". Then we perform a similar total for the 1st-prior 22-month period, immediately preceding the covid period, for the 22 months up to and including February 2020. We call this total "m22c-1". And we do the same for the 2nd-prior 22-month period, and we call this total "m22c-2". We continue moving back in time, to the end of the useable data in 22-month periods: m22c-3, etc.

Figure 3 shows the graph of "m22c-x" versus time, together with the ACM/m for the USA where each 22-month period has been emphasized with a different color.

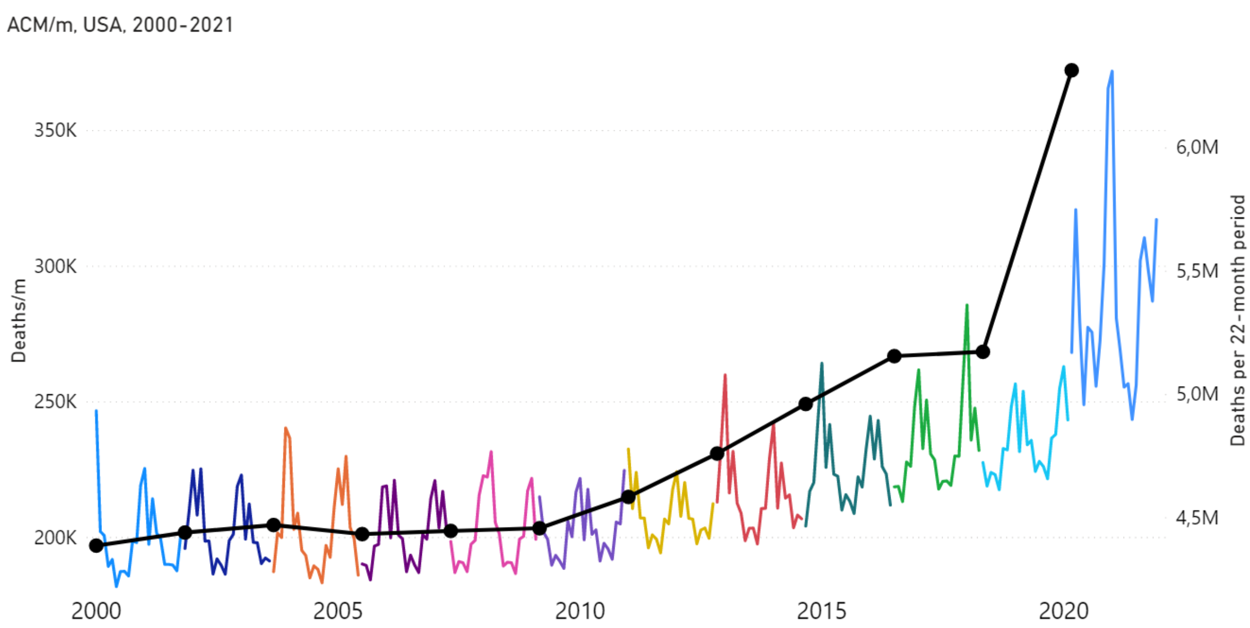


Figure 3. All-cause mortality by month (colors) and by 22-month period (black) in the USA from 2000 to 2021. Data are displayed from January 2000 to December 2021. The

different colors indicate the successive 22-month periods. The last light-blue color corresponds to the covid period. All the other previous colors are in the pre-covid period. The black line shows the integration of these successive 22-months periods. Data were retrieved from CDC (CDC, 2022a), as described in Table 1.

Figure 3, based on more than two decades of data, dramatically illustrates the sudden change in regime of ACM by time, both in magnitude of time-integrated ACM and in seasonal behaviour of ACM by time, occurring as soon as the WHO on 11 March 2020 announced a pandemic. In addition, the covid-period regime of ACM by time is characterized by large (and unprecedented in the historic record) heterogeneity by state of ACM, which is not shown in such a figure for the whole USA, but which can be appreciated in the ACM/w by state graphs of Appendix A.

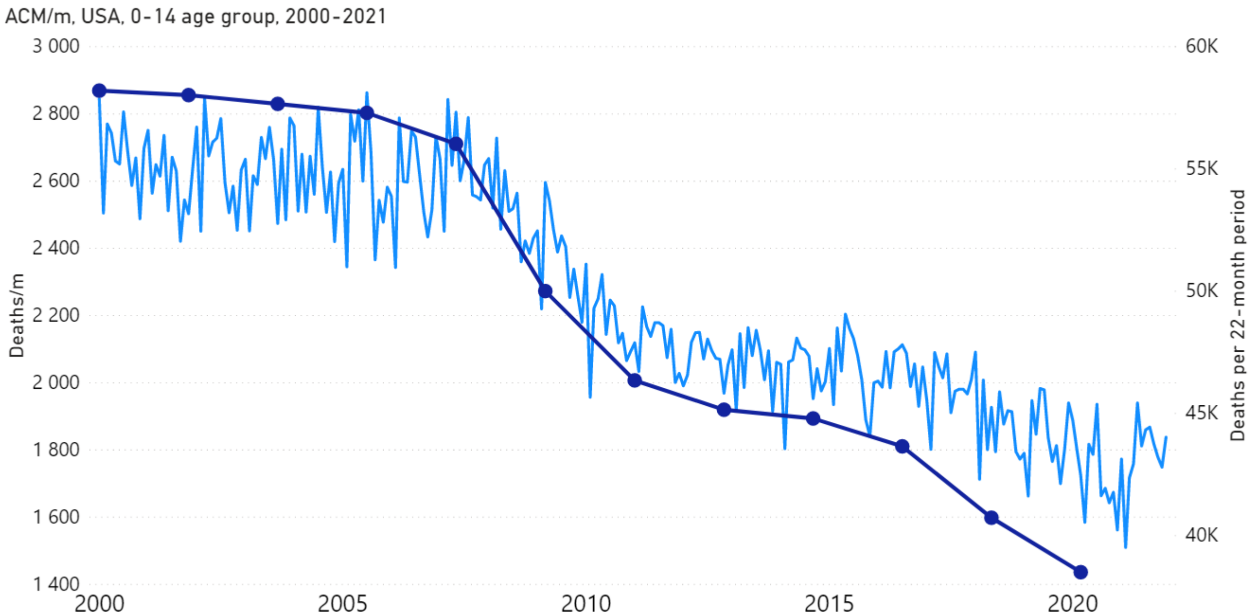
In Figure 3, each dot of the 22-month period deaths corresponds to the integration of deaths by month from the month of the dot to the previous month of the next dot, included. So the integrated deaths are shown at the beginning of each integration period (emphasized with colors).

With the integrated mortality by 22-month periods, we can spot a plateau of deaths from 2000 to 2010, an increase from 2010 to 2019, and the break between the pre-covid period and the covid period (2020).

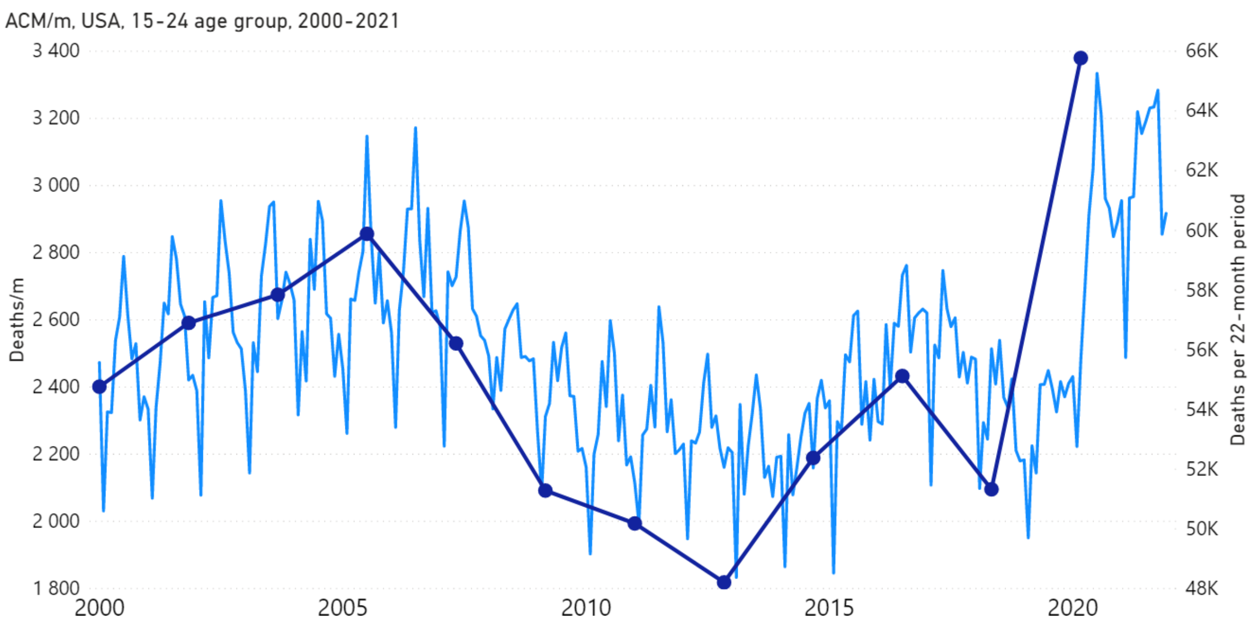
Figure 4 shows the integration of the 22-month periods with ACM/m for each of the 10-year age groups.

Figure 4. All-cause mortality by month (light-blue) and by 22-month period (dark-blue) in the USA from 2000 to 2021, for each of the age groups. Data are displayed from January 2000 to December 2021. Panels below: (A) for the 0-14 years age group; (B) for the 15-24 years age group; (C) for the 25-34 years age group; (D) for the 35-44 years age group; (E) for the 45-54 years age group; (F) for the 55-64 years age group; (G) for the 65-74 years age group; (H) for the 75-84 years age group; (I) for the 85+ years age group. Data were retrieved from CDC (CDC, 2022a), as described in Table 1.

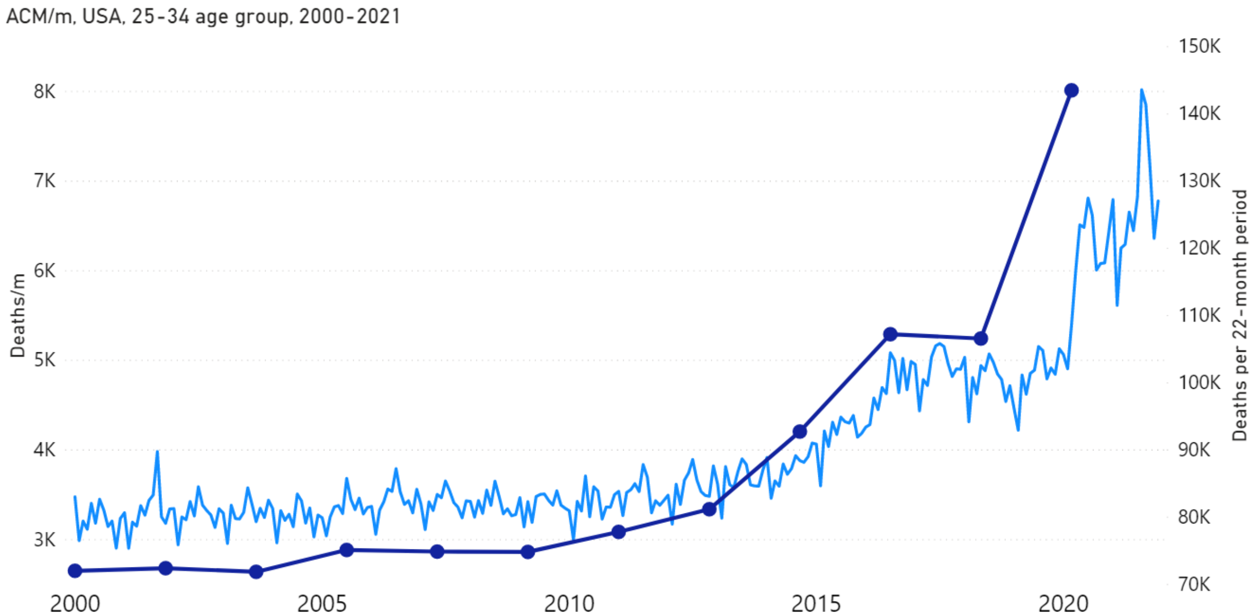
A


ACM/m, USA, 0-14 age group, 2000-2021
Deaths/m
Deaths per 22-month period
3 000
2 800
2 600
2 400
2 200
2 000
1 800
1 600
1 400
60K
55K
50K
45K
40K
2000
2005
2010
2015
2020

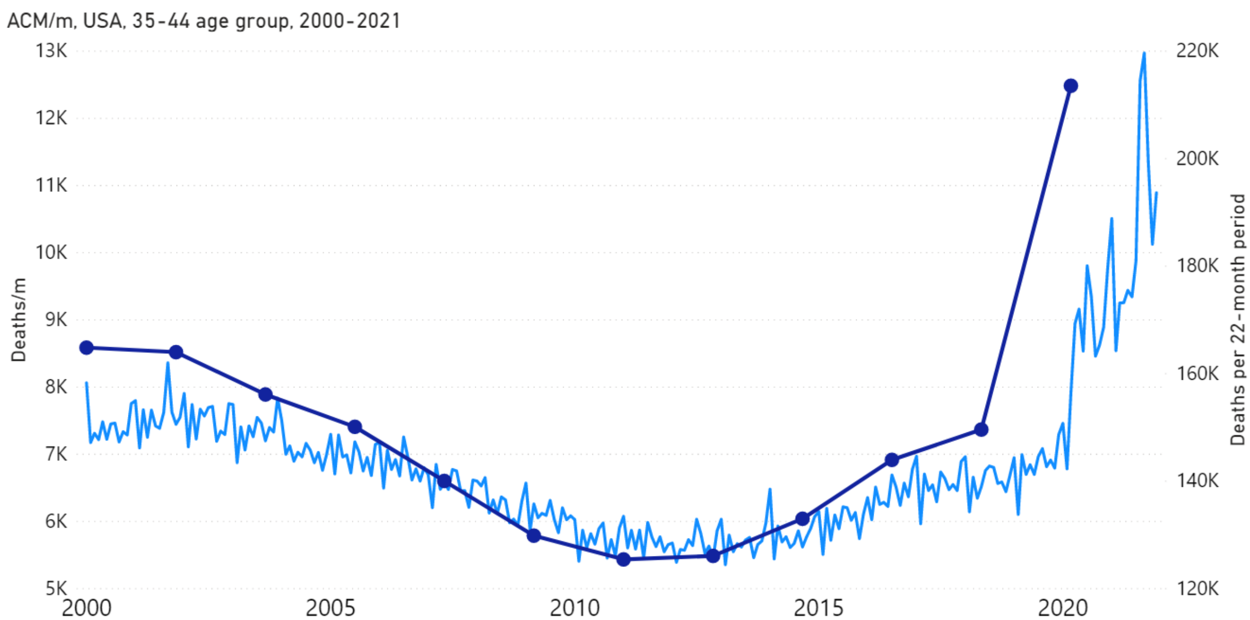
B


ACM/m, USA, 15-24 age group, 2000-2021
Deaths/m
Deaths per 22-month period
3 400
3 200
3 000
2 800
2 600
2 400
2 200
2 000
1 800
66K
64K
62K
60K
58K
56K
54K
52K
50K
48K
2000
2005
2010
2015
2020

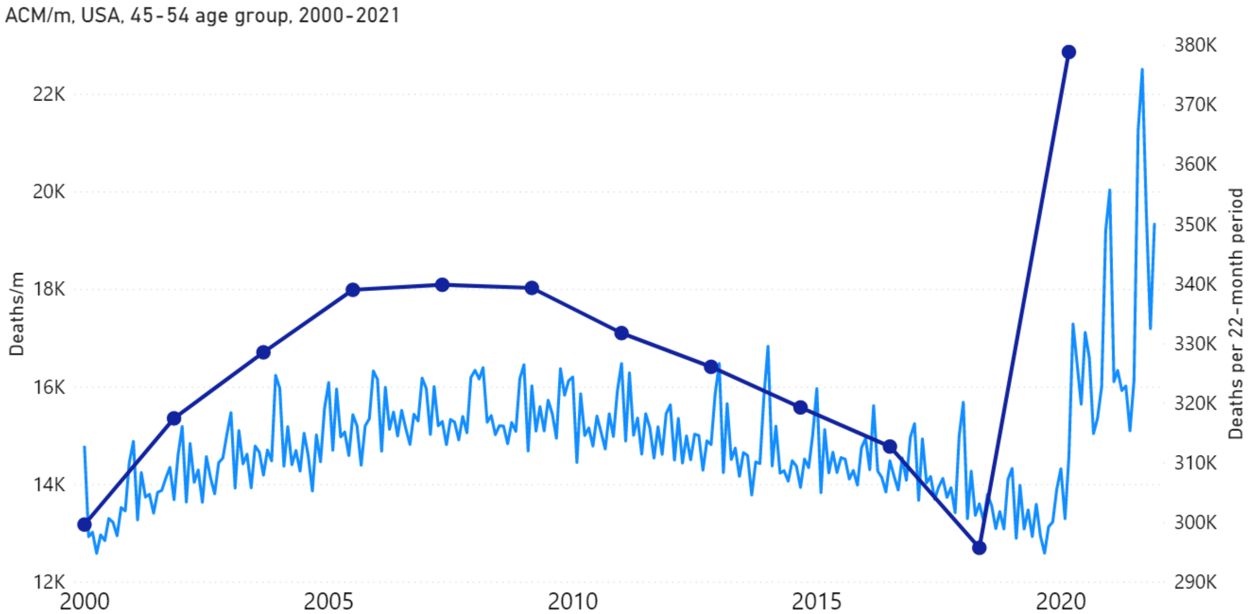
C


ACM/m, USA, 25-34 age group, 2000-2021
Deaths/m
Deaths per 22-month period
8K
7K
6K
5K
4K
3K
150K
140K
130K
120K
110K
100K
90K
80K
70K
2000
2005
2010
2015
2020

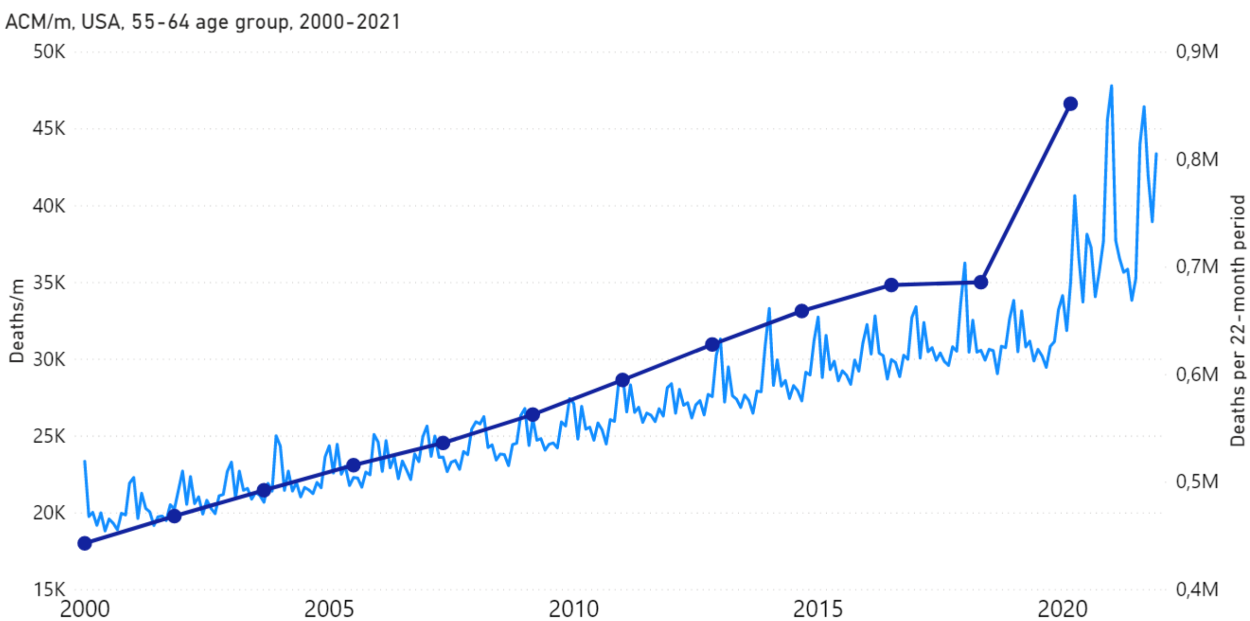
D

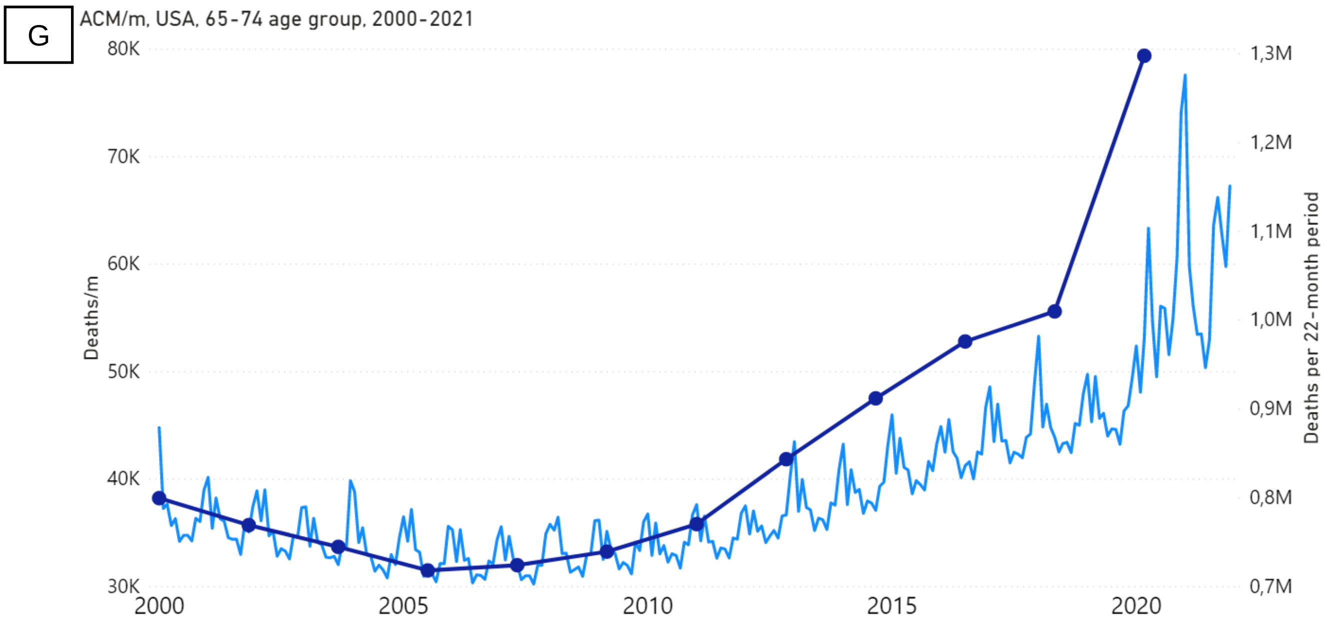

ACM/m, USA, 35-44 age group, 2000-2021
Deaths/m
Deaths per 22-month period
13K
12K
11K
10K
9K
8K
7K
6K
5K
220K
200K
180K
160K
140K
120K
2000
2005
2010
2015
2020

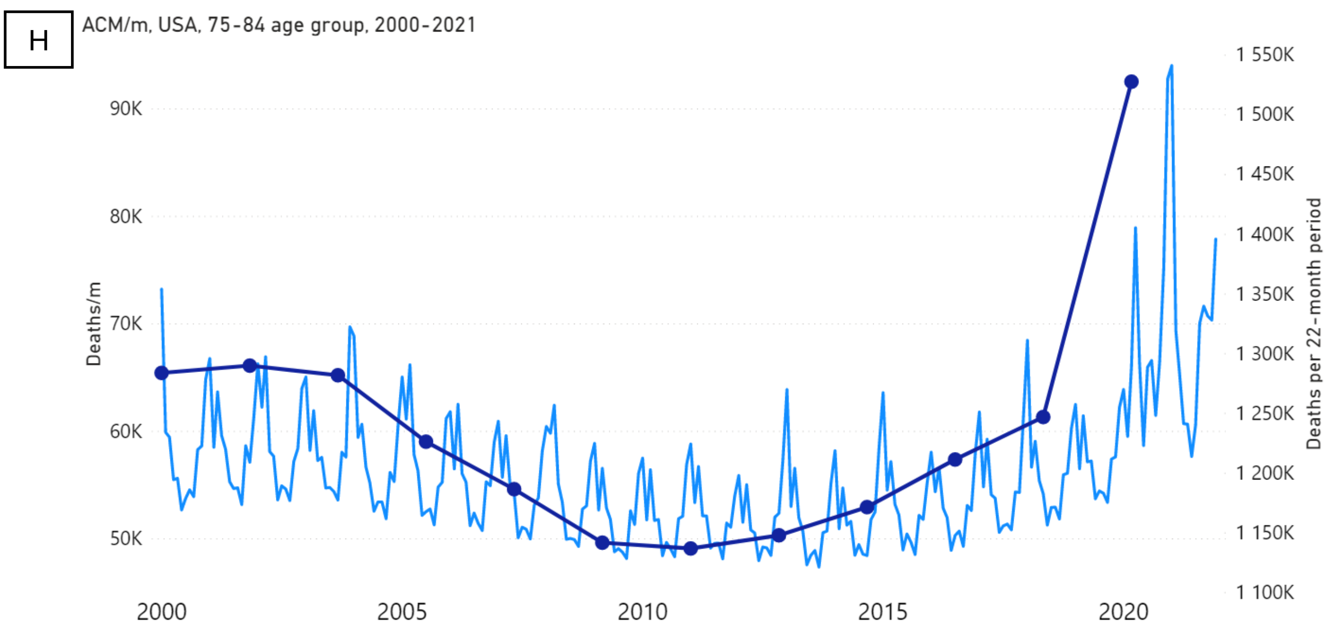
E


ACM/m, USA, 45-54 age group, 2000-2021
Deaths/m
22K
20K
18K
16K
14K
12K
2000
2005
2010
2015
2020
380K
370K
360K
350K
340K
330K
320K
310K
300K
290K
Deaths per 22-month period

F


ACM/m, USA, 55-64 age group, 2000-2021
Deaths/m
50K
45K
40K
35K
30K
25K
20K
15K
2000
2005
2010
2015
2020
0,9M
0,8M
0,7M
0,6M
0,5M
0,4M
Deaths per 22-month period


G
ACM/m, USA, 65-74 age group, 2000-2021
80K
70K
60K
50K
40K
30K
Deaths/m
1,3M
1,2M
1,1M
1,0M
0,9M
0,8M
0,7M
Deaths per 22-month period
2000
2005
2010
2015
2020


H
ACM/m, USA, 75-84 age group, 2000-2021
90K
80K
70K
60K
50K
Deaths/m
1 550K
1 500K
1 450K
1 400K
1 350K
1 300K
1 250K
1 200K
1 150K
1 100K
Deaths per 22-month period
2000
2005
2010
2015
2020

I

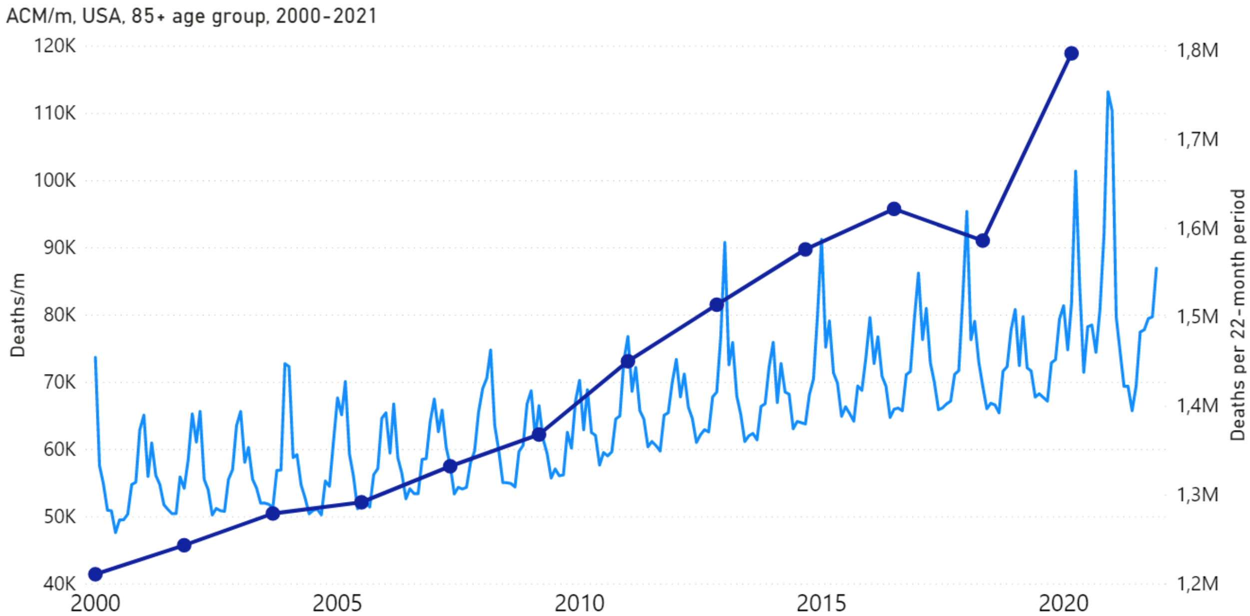


Figure 4 is hard raw data that allows one to robustly evaluate a covid-period fatality risk (covid-period excess mortality compared to the historic trend of pre-covid-period mortality) for each age group. Here, with an eye to more than two decades of data for the whole USA.

Except for the younger age group (the 0-14 year-olds, Figure 4A), we can see the break in mortality from the covid period for all the age groups: mortality by month reaches a new higher plateau and mortality by 22-month period has an increase beyond the one expected from the historic trend (Figure 4B, C, D, E, F, G, H, I). This is especially true for the 25-34 and 35-44 year-olds (Figure 4C and D), which experience close to a 50% increase in the covid period compared to the period of same duration immediately before.

Next, for a given age group and sex, we calculate the excess deaths of the covid period "to date" using two different assumptions, as follows.

In the first assumption, we take the "excess deaths of the covid period" to mean the (all-cause) deaths above the deaths that would have occurred if the same circumstances would have prevailed during the covid period as prevailed in the 1st-prior 22-month period, immediately preceding the covid period. Under this assumption, the excess deaths of the covid period, due to everything different or extraordinary that occurred or was imposed during the covid period, for a given age group and sex, is simply:

$$xDc(22)1 = m22c - m22c\text{-}1 \qquad (1)$$

In the second assumption, we take the "excess deaths of the covid period" to mean the (all-cause) deaths above the deaths that would have occurred if the same circumstances would have prevailed during the covid period as prevailed in the 2nd-prior 22-month period, the period preceding the 1st-prior 22-month period before the covid period. Under this assumption, the excess deaths of the covid period, due to everything different or extraordinary that occurred or was imposed during the covid period, for a given age group and sex, is:

$$xDc(22)2 = m22c - m22c\text{-}2 \qquad (2)$$

These formulas (Equations 1 and 2) are justified because m22c-1 and m22c-2 are different and fair estimates of what mortality would have been in the 22-month covid period if the events associated with the declared pandemic had not occurred. In other words, m22c-1 and m22c-2 are fair historical projected values of what the covid-period mortality "would have been". Judging from Figure 3 and Figure 4, there would be little benefit from applying a more mathematically sophisticated extrapolation method, while using both reference values allows one to estimate the uncertainty in our determinations of excess mortality for the covid period.

The relative magnitudes of the covid-period extra deaths above the historic trend are:

$$xDc(22)1\% = xDc(22)1 \ / \ m22c\text{-}1\text{, expressed as a percentage,} \qquad (3)$$

and

$$xDc(22)2\% = xDc(22)2 \ / \ m22c\text{-}2\text{, expressed as a percentage,} \qquad (4)$$

Table 2 contains the calculated covid-period excess mortality, for each age group and sex for the USA, and for all ages and both sexes for the entire USA (“Total”), using each assumption described above, and the relative changes also, as percentages of the reference values in Equations 1 and 2 (m22c-1 and m22c-2, respectively).

Age Group	m22c	m22c-1	m22c-2	xDc(22)1	xDc(22)2	xDc(22)1%	xDc(22)2%
< 1	**31 904**	**34 762**	**37 249**	**-2 858**	**-5 345**	**-8,22 %**	**-14,35 %**
Female	13 964	14 904	16 122	-940	-2 158	-6,31 %	-13,39 %
Male	17 940	19 858	21 127	-1 918	-3 187	-9,66 %	-15,08 %
1-4	**1 923**	**1 881**	**2 077**	**42**	**-154**	**2,23 %**	**-7,41 %**
Female	736	671	684	65	52	9,69 %	7,60 %
Male	1 187	1 210	1 393	-23	-206	-1,90 %	-14,79 %
5-14	**4 674**	**4 086**	**4 323**	**588**	**351**	**14,39 %**	**8,12 %**
Female	1 510	1 378	1 553	132	-43	9,58 %	-2,77 %
Male	3 164	2 708	2 770	456	394	16,84 %	14,22 %
15-24	**65 773**	**51 324**	**55 119**	**14 449**	**10 654**	**28,15 %**	**19,33 %**
Female	16 369	12 526	13 484	3 843	2 885	30,68 %	21,40 %
Male	49 404	38 798	41 635	10 606	7 769	27,34 %	18,66 %
25-34	**143 510**	**106 589**	**107 228**	**36 921**	**36 282**	**34,64 %**	**33,84 %**
Female	41 427	31 335	31 626	10 092	9 801	32,21 %	30,99 %
Male	102 083	75 254	75 602	26 829	26 481	35,65 %	35,03 %
35-44	**213 567**	**149 601**	**143 962**	**63 966**	**69 605**	**42,76 %**	**48,35 %**
Female	73 111	52 602	51 876	20 509	21 235	38,99 %	40,93 %
Male	140 456	96 999	92 086	43 457	48 370	44,80 %	52,53 %
45-54	**378 936**	**295 773**	**312 760**	**83 163**	**66 176**	**28,12 %**	**21,16 %**
Female	140 457	113 601	122 230	26 856	18 227	23,64 %	14,91 %
Male	238 479	182 172	190 530	56 307	47 949	30,91 %	25,17 %
55-64	**852 061**	**686 034**	**683 414**	**166 027**	**168 647**	**24,20 %**	**24,68 %**
Female	328 443	268 402	268 976	60 041	59 467	22,37 %	22,11 %
Male	523 618	417 632	414 438	105 986	109 180	25,38 %	26,34 %
65-74	**1 297 690**	**1 009 880**	**976 016**	**287 810**	**321 674**	**28,50 %**	**32,96 %**
Female	544 643	428 337	417 570	116 306	127 073	27,15 %	30,43 %
Male	753 047	581 543	558 446	171 504	194 601	29,49 %	34,85 %
75-84	**1 527 855**	**1 247 039**	**1 211 460**	**280 816**	**316 395**	**22,52 %**	**26,12 %**
Female	730 408	604 010	591 544	126 398	138 864	20,93 %	23,47 %
Male	797 447	643 029	619 916	154 418	177 531	24,01 %	28,64 %
85+	**1 797 070**	**1 586 373**	**1 622 052**	**210 697**	**175 018**	**13,28 %**	**10,79 %**
Female	1 088 768	973 291	1 004 787	115 477	83 981	11,86 %	8,36 %
Male	708 302	613 082	617 265	95 220	91 037	15,53 %	14,75 %
Total	**6 314 963**	**5 173 342**	**5 155 660**	**1 141 621**	**1 159 303**	**22,07 %**	**22,49 %**

Table 2. Estimated excess mortality of the covid period in the USA, by age group and by sex. m22c is the total deaths during the covid period (from March 2020 to December 2021, included). m22c-1 is the total deaths during the 1st-prior 22-month period before the covid period (from May 2018 to February 2020, included). m22c-2 is the total deaths during the 2nd-prior 22-month period before the covid period (from July 2016 to April 2018, included). xDc(22)1 and xDc(22)2 correspond to the excess mortality in the covid period, calculated from Equation 1 and Equation 2, respectively. xDc(22)1% and xDc(22)2% correspond to the relative changes,

calculated from Equation 3 and Equation 4, respectively. ACM data were retrieved from CDC (CDC, 2022a), as described in Table 1.

One of the most surprizing results from the above calculations is that young adults were severely negatively impacted in the covid period, more so in comparative terms (percent mortality increase relative to pre-covid values) than elderly persons. This is explored further, below.

In the next section, we follow the same method to estimate the excess mortality of the covid period in the USA from a different dataset: the all-cause mortality by week (ACM/w).

3.2. USA all-cause mortality by week, by age group, 2015-2022

3.2.1. Historic trend, discontinuous break on 11 March 2020, entering the covid period

Figure 5 shows the all-cause mortality by week (ACM/w) for the USA from January 2015 to January 2022.

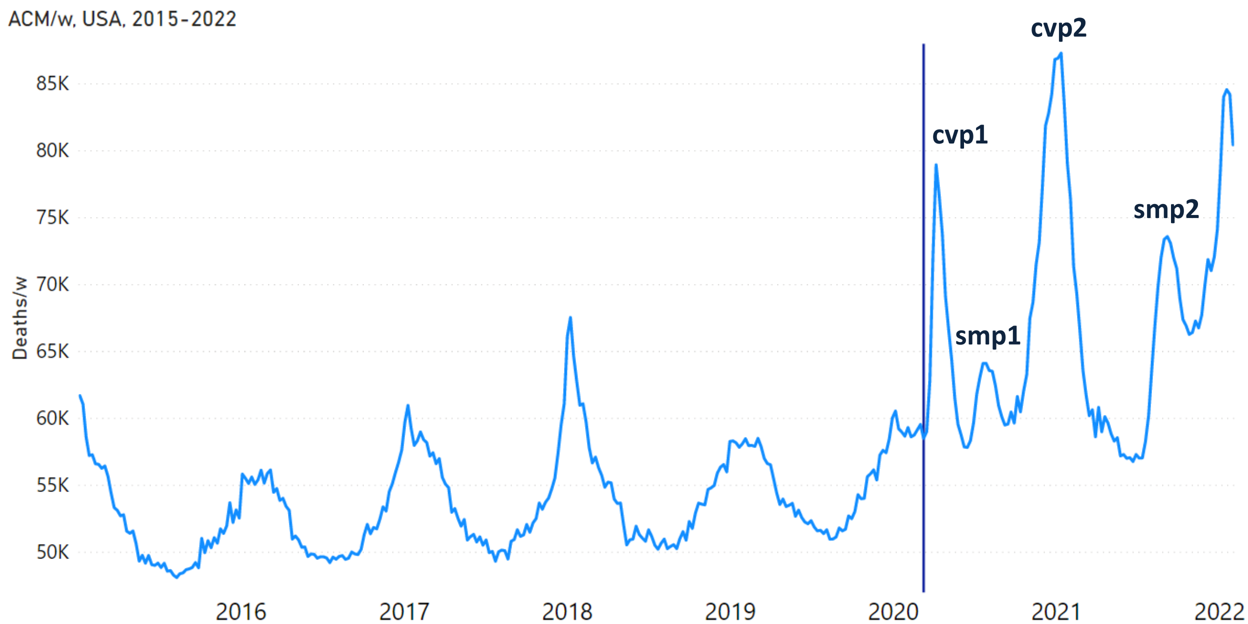


Figure 5. All-cause mortality by week in the USA from 2015 to 2022. Data are displayed from week-1 of 2015 to week-5 of 2022. The vertical dark-blue line indicates the week-11 of 2020 (week of 11 March 2020, when WHO declared a pandemic), intended to point the beginning of the covid period. The cvp1, smp1, cvp2 and smp2 features discussed in the text are indicated. Data were retrieved from CDC (CDC, 2022b), as described in Table 1.

The regular seasonal variation of mortality is seen from 2015 to early 2020, and from week-11 of 2020 (the week the WHO declared a pandemic), a new pattern of mortality (new regime of ACM by time) occurs (Figure 5, after the vertical dark-blue line). This new pattern includes the previously discussed features: cvp1, smp1, cvp2, smp2.

In the next section, we use the weekly ACM data to quantify the total excess mortality that occurred in the covid period, which includes these anomalous features.

3.2.2. Quantifying the excess mortality of the covid period, by age group

We use the ACM/w data of Figure 5 to quantify the excess deaths of the covid period "to date", compared to the historic trend, as follows.

For a given age group, we add all the weekly deaths together, for the weeks of 11 March 2020 (week-11 of 2020, start of the pandemic period; announced by the WHO on

11 March 2020) through to the latest useable week (week-5 of 2022, beginning of February 2022). This is a total for 100 weeks (the covid period "to date"). We call this total "w100c". Then we perform a similar total for the 1st-prior 100-week period, immediately preceding the covid period, for the 100 weeks up to and including week-10 of 2020. We call this total "w100c-1". And we do the same for the 2nd-prior 100-week period, and we call this total "w100c-2". We cannot move back further in time with this dataset, as the "w100c-3" would be incomplete (less than a 100 weeks, with the available data).

Figure 6 shows the graph of "w100c-x" versus time, together with the ACM/w for the USA where each 100-week period has been emphasized with a different color; thus applying the same method as in producing Figure 3.

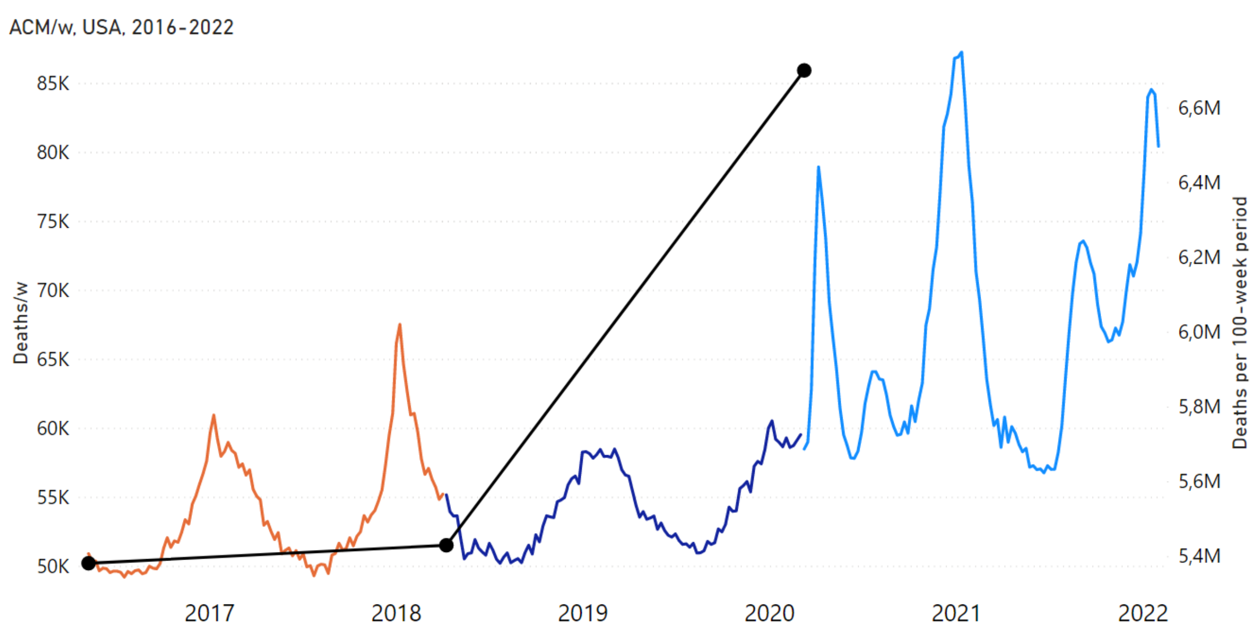


Figure 6. All-cause mortality by week (colors) and by 100-week period (black) in the USA from 2016 to 2022. Data are displayed from week-19 of 2016 to week-5 of 2022. The different colors indicate the successive 100-week periods. The light-blue color corresponds to the covid period. The dark-blue and the orange colors are in the pre-covid period. The black dots show the integrated ACM on these 100-week periods. Data were retrieved from CDC (CDC, 2022b), as described in Table 1.

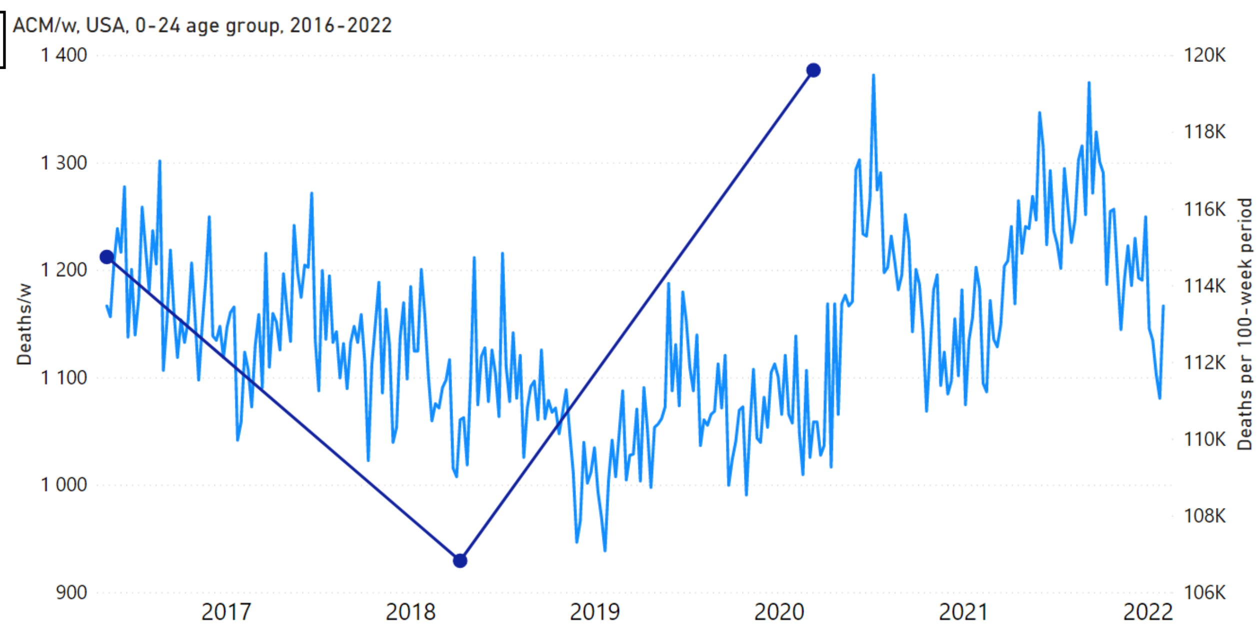
Figure 6, based on more than 7 years of data, here time-resolved by week, again (like Figure 3) dramatically illustrates the sudden change in regime of ACM by time, both in magnitude of time-integrated ACM and in seasonal behaviour of ACM by time, occurring as soon as the WHO on 11 March 2020 announced a pandemic. In addition, the covid-period regime of ACM by time is characterized by large (and unprecedented in the historic record) heterogeneity by state of ACM, which is not shown in such a figure for the whole USA, but which can be appreciated in the ACM/w by state graphs of Appendix A.

For the whole USA (all states and all ages together), the increase in ACM between the pre-covid and the covid period is close to 25% (Figure 6).

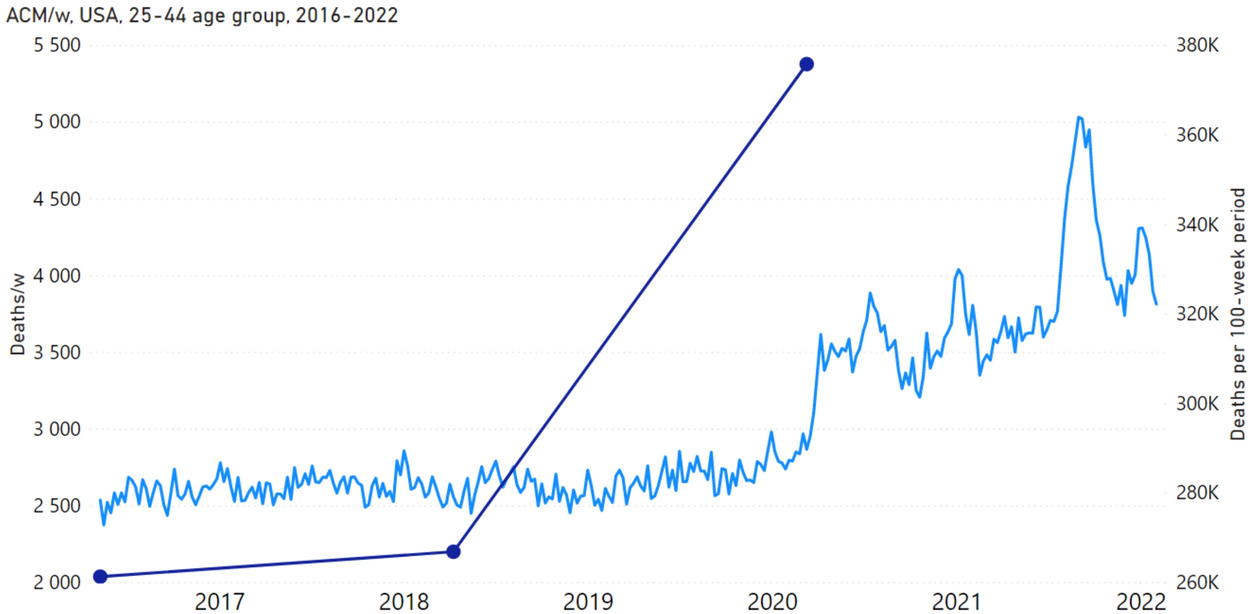
The mortality data (Figure 6) can be resolved by age group, which is shown, as follows, in Figure 7.

Figure 7. All-cause mortality by week (light-blue) and by 100-week period (dark-blue) in the USA from 2016 to 2022, for each of the age groups. Data are displayed from week-19 of 2016 to week-5 of 2022. Panels below: (A) for the 0-24 years age group; (B) for the 25-44 years age group; (C) for the 45-64 years age group; (D) for the 65-74 years age group; (E) for the 75-84 years age group; (F) for the 85+ years age group. Data were retrieved from CDC (CDC, 2022b), as described in Table 1.

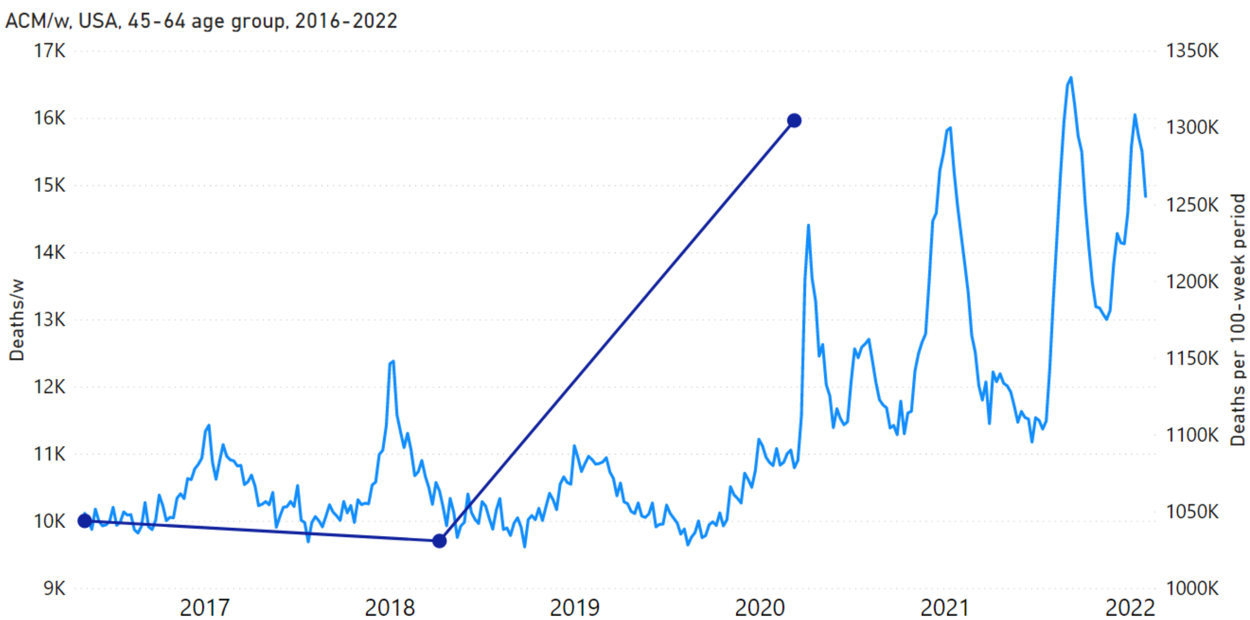
A



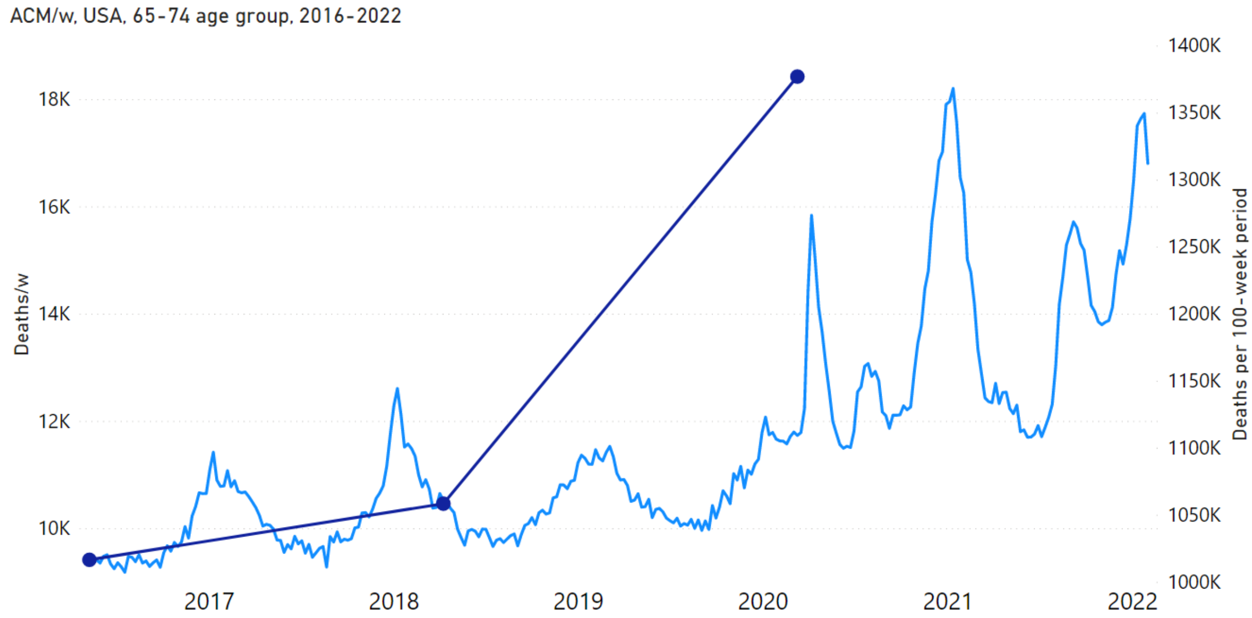
B


ACM/w, USA, 25-44 age group, 2016-2022
Deaths/w
5 500
5 000
4 500
4 000
3 500
3 000
2 500
2 000
380K
360K
340K
320K
300K
280K
260K
Deaths per 100-week period
2017
2018
2019
2020
2021
2022

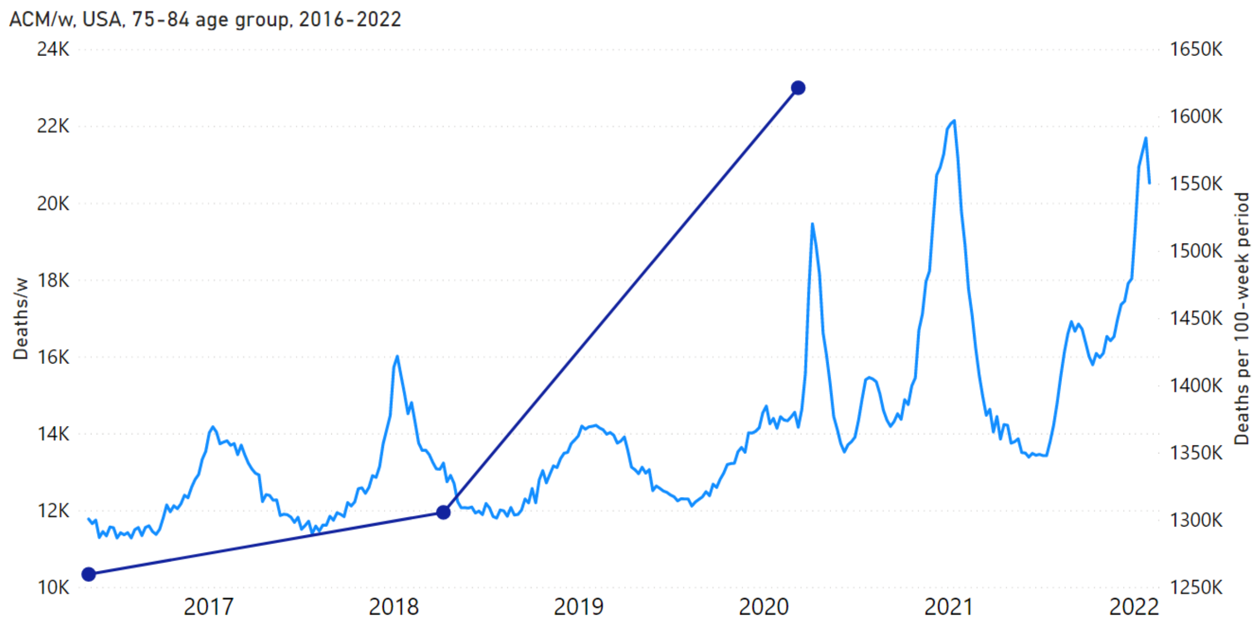
C


ACM/w, USA, 45-64 age group, 2016-2022
Deaths/w
17K
16K
15K
14K
13K
12K
11K
10K
9K
1350K
1300K
1250K
1200K
1150K
1100K
1050K
1000K
Deaths per 100-week period
2017
2018
2019
2020
2021
2022

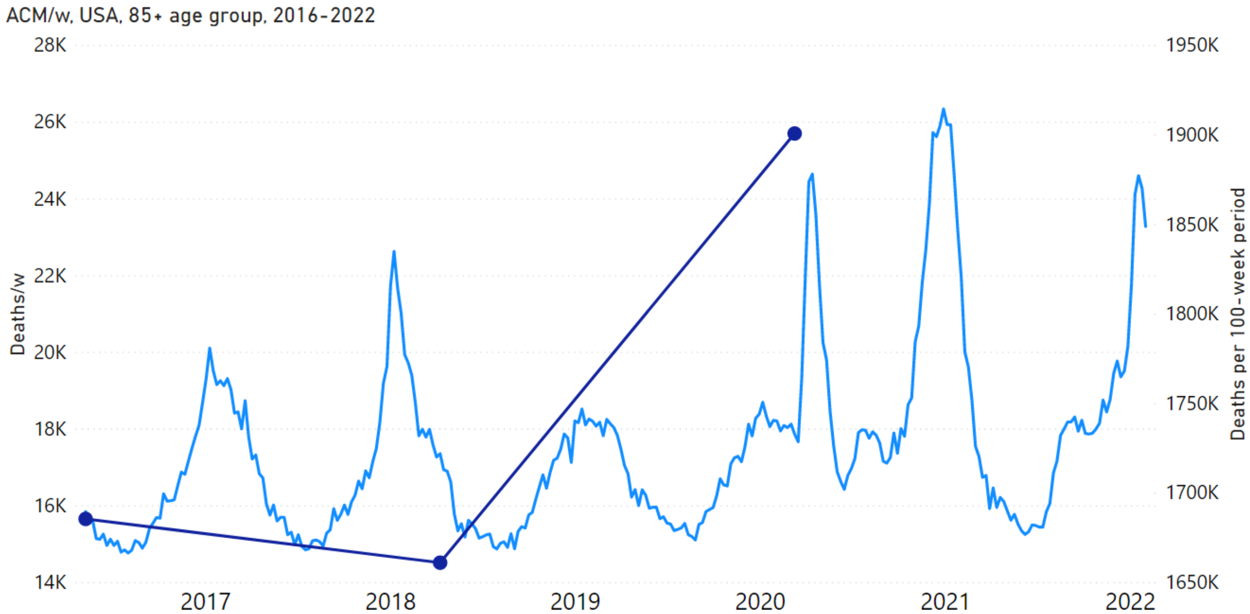
D


ACM/w, USA, 65-74 age group, 2016-2022
Deaths/w
18K
16K
14K
12K
10K
Deaths per 100-week period
1400K
1350K
1300K
1250K
1200K
1150K
1100K
1050K
1000K
2017
2018
2019
2020
2021
2022

E


ACM/w, USA, 75-84 age group, 2016-2022
Deaths/w
24K
22K
20K
18K
16K
14K
12K
10K
Deaths per 100-week period
1650K
1600K
1550K
1500K
1450K
1400K
1350K
1300K
1250K
2017
2018
2019
2020
2021
2022

F



Except for the younger age group (the 0-24 year-olds, Figure 7A), the integrated mortality of the covid period is much larger than in any of the two previous 100-week periods (Figure 7B, C, D, E, F). These results are comparable to those illustrated in Figure 4.

It is interesting to note that the sudden rise in ACM, immediately following the WHO's 11 March 2020 declaration of a pandemic, which we have discussed in several previous articles (Rancourt, 2020; Rancourt, Baudin and Mercier, 2020, 2021a, 2021b), occurs in all the age groups for the whole USA (Figure 7; and see Figure 4), not solely in the most elderly populations as reports of severe COVID-19 morbidity might lead one to conclude (e.g., Elo *et al.*, 2022; Sorensen *et al.*, 2022). This, in itself, suggests that the covid-period deaths are not predominantly explained by the postulated SARS-CoV-2 pathogen.

Next, for a given age group, we calculate the excess deaths of the covid period "to date" using our simplest assumption from above. We take the "excess deaths of the covid period" to mean the (all-cause) deaths above the deaths that would have occurred if the same circumstances would have prevailed during the covid period as prevailed in the 1st-prior 100-week period, immediately preceding the covid period. Under this assumption, the excess deaths of the covid period, due to everything different or extraordinary that occurred or was imposed during the covid period, for a given age group and state, is:

$$xDc(100)1 = w100c - w100c\text{-}1 \qquad (5)$$

In the second assumption, we take the "excess deaths of the covid period" to mean the (all-cause) deaths above the deaths that would have occurred if the same circumstances would have prevailed during the covid period as prevailed in the 2nd-prior 100-week period, the period preceding the 1st-prior 100-week period before the covid period. Under this assumption, the excess deaths of the covid period, due to everything different or extraordinary that occurred or was imposed during the covid period, for a given age group and state, is:

$$xDc(100)2 = w100c - w100c\text{-}2 \qquad (6)$$

As with Equations 1 and 2 above, these formulas (Equations 5 and 6) are justified because w100c-1 and w100c-2 are different and fair estimates of what mortality would have been in the 100-week covid period if the events associated with the declared pandemic had not occurred. In other words, w100c-1 and w100c-2 are fair historical projected values of what the covid-period mortality "would have been". Judging from Figure 6 and Figure 7, there would be little benefit from applying a more mathematically sophisticated extrapolation method, while using both reference values allows one to estimate the uncertainty in our determinations of excess mortality for the covid period.

The relative magnitudes of the covid-period extra deaths above the historic trend are:

$$xDc(100)1\% = xDc(100)1 \,/\, w100c\text{-}1, \text{ expressed as a percentage,} \qquad (7)$$

and

$$xDc(100)2\% = xDc(100)2 \,/\, w100c\text{-}2, \text{ expressed as a percentage,} \qquad (8)$$

Table 3 contains the thus calculated covid-period excess mortality, for each age group for the USA, and for the entire USA ("Total"), using each assumption described above, and the relative changes also, as percentages of the reference values in Equations 5 and 6 (w100c-1 and w100c-2, respectively).

Age Group	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
0-24	119 621	106 833	114 753	12 788	4 868	11,97 %	4,24 %
25-44	375 881	266 917	261 359	108 964	114 522	40,82 %	43,82 %
45-64	1 304 887	1 031 015	1 044 091	273 872	260 796	26,56 %	24,98 %
65-74	1 377 235	1 058 708	1 016 822	318 527	360 413	30,09 %	35,45 %
75-84	1 621 693	1 305 924	1 259 881	315 769	361 812	24,18 %	28,72 %
85+	1 900 921	1 661 094	1 685 547	239 827	215 374	14,44 %	12,78 %
Total	**6 700 238**	**5 430 491**	**5 382 453**	**1 269 747**	**1 317 785**	**23,38 %**	**24,48 %**

Table 3. Estimated excess mortality of the covid period in the USA, by age group. w100c is the total deaths during the covid period (from week-11 of 2020 to week-5 of 2022, included). w100c-1 is the total deaths during the 1st-prior 100-week period before the covid period (from week-15 of 2018 to week-10 of 2020, included). w100c-2 is the total deaths during the 2nd-prior 100-week period before the covid period (from week-19 of 2016 to week-14 of 2018, included). xDc(100)1 and xDc(100)2 correspond to the excess mortality in the covid period, calculated from Equation 5 and Equation 6, respectively. xDc(100)1% and xDc(100)2% correspond to the relative changes, calculated from Equation 7 and Equation 8, respectively. ACM data were retrieved from CDC (CDC, 2022b), as described in Table 1.

Equivalents to Table 3 for each of the states of the USA can be found in Appendix A.

Not surprisingly, we find the same results as with the ACM/m data, where young adults were relatively more impacted in the covid period than elderly persons.

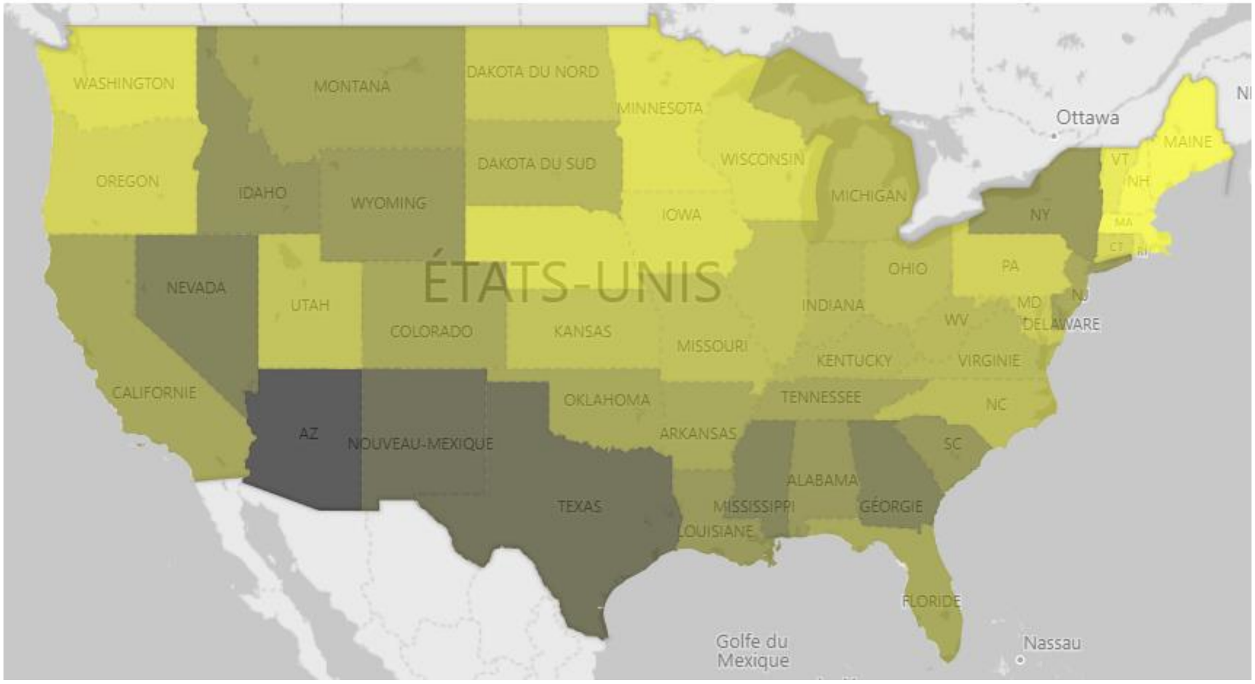
In the next section, we explore the excess mortality of the covid period at the state level.

3.2.3. Excess mortality of the covid period, by state

Figure 8 shows USA maps of the state-wise values of the covid-period excess mortality (xDc(100)1), as relative changes in percentage of the pre-covid period mortality (xDc(100)1%) (Panel A), and xDc(100)1 per state population (Panel B), for comparison.

A

XDC(100)1% IN THE USA



B

XDC(100)1/POP IN THE USA

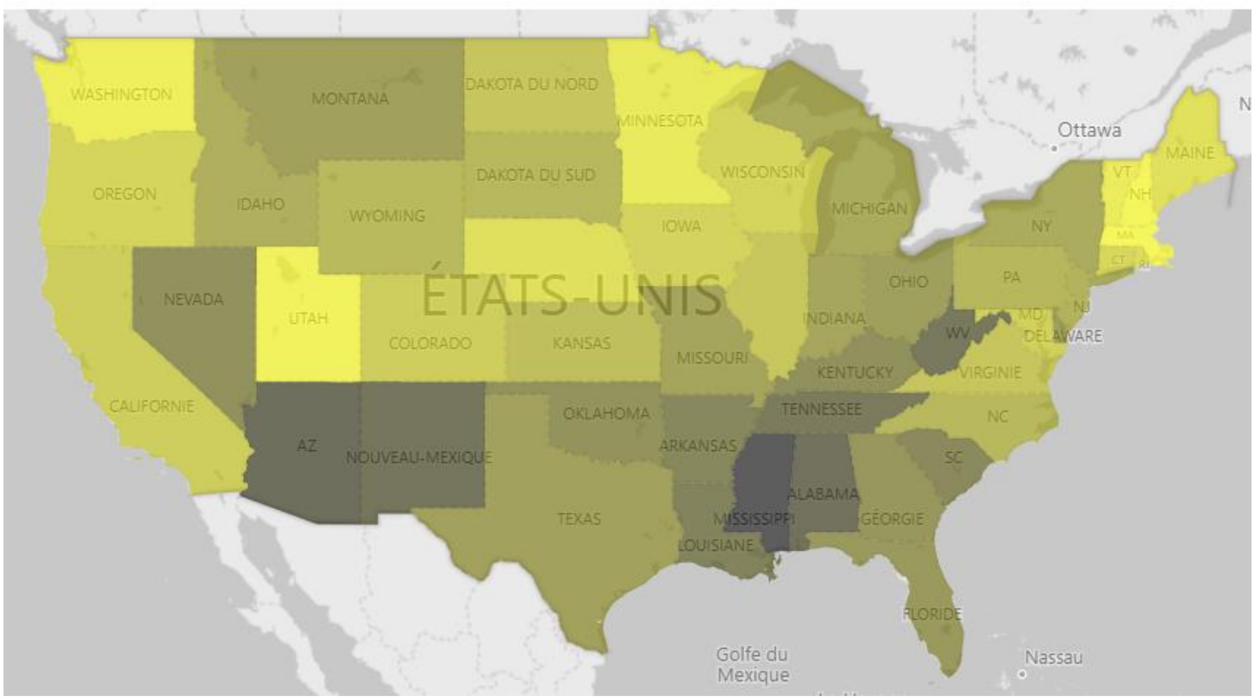


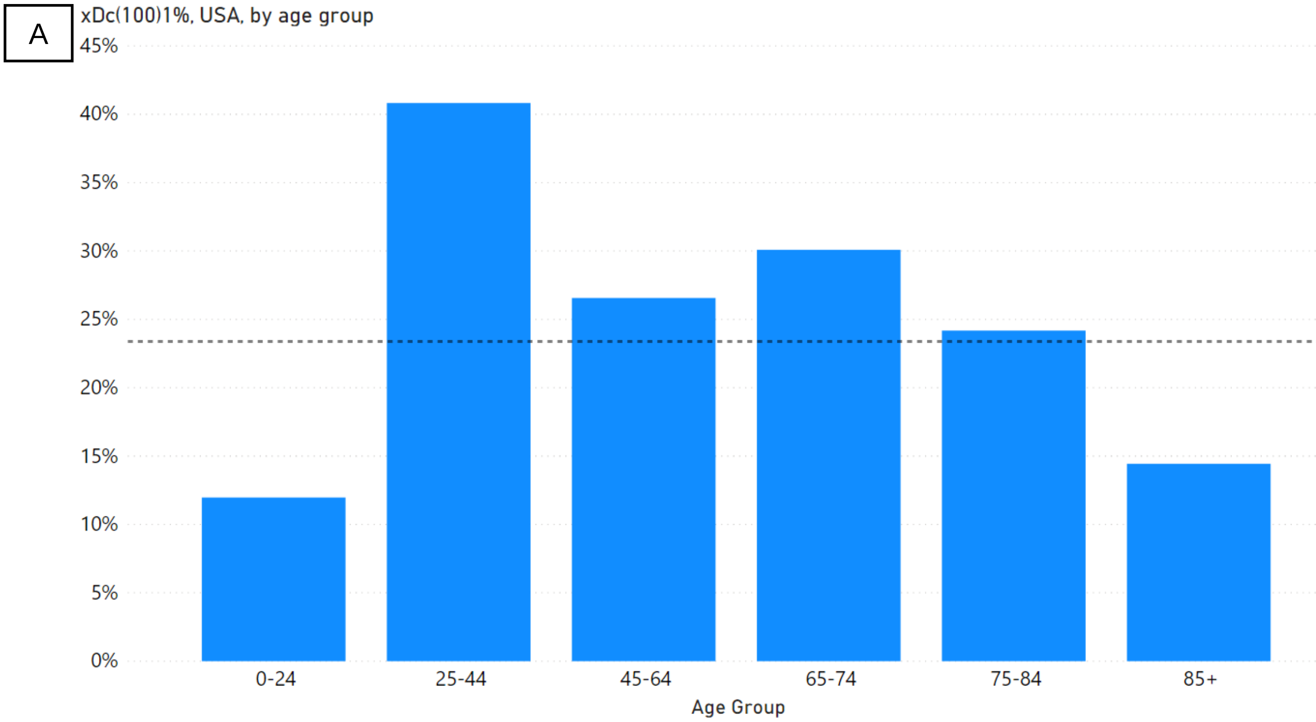
Figure 8. Maps of the excess mortality of the covid period in the USA, as percentages of the pre-covid period mortality (panel A) and as normalized by state population (panel B). Alaska and Hawaii are excluded. The darker the color (black), the more intense is the relative change. ACM data were retrieved from CDC (CDC, 2022b) and population data were retrieved

from US Census Bureau (US Census Bureau, 2021), as described in Table 1. xDc(100)1 and xDc(100)1% are calculated from Equation 5 and Equation 7, respectively.

These maps (Figure 8) can be compared to the maps of poverty and obesity shown in Appendix B; and to the maps from Rancourt et al. (Rancourt, Baudin and Mercier, 2021b) of life expectancy (their Figure 38a), antibiotic prescriptions (their Figure 38b), average climatic temperature (their Figure 22), intensity of the smp1 mortality (their Figure 16), intensity of the cvp1 mortality (their Figure 15). Some of these comparisons are discussed further below.

Generally, high 100-week covid-period mortality per capita or per baseline mortality occurs in the Southern states, and in the hottest climatic state of Arizona. This is similar to what we have reported previously for summer-season covid mortality (Rancourt, Baudin and Mercier, 2021b). Below we show that state-wise covid-period mortality is very strongly correlated ($r = +0.86$) to state-wise poverty, and also correlated to median household income, obesity, disability, and government subsidy programs; which in turn are known to be correlated to each other and to diabetes prevalence, life expectancy, and antibiotic prescriptions. All of this is consistent with the geographical pattern shown in Figure 8.

Figure 9 shows the xDc(100)1% (Equation 7) values from Table 3 by age group, for the whole USA (Panel A), and for the ten most populous states (Panel B), ordered from the most populous to the less populous (US Census Bureau, 2022a): California, Texas, Florida, New York, Pennsylvania, Illinois, Ohio, Georgia, North Carolina and Michigan. The horizontal dashed line represents the value for the whole USA (all ages and all states).



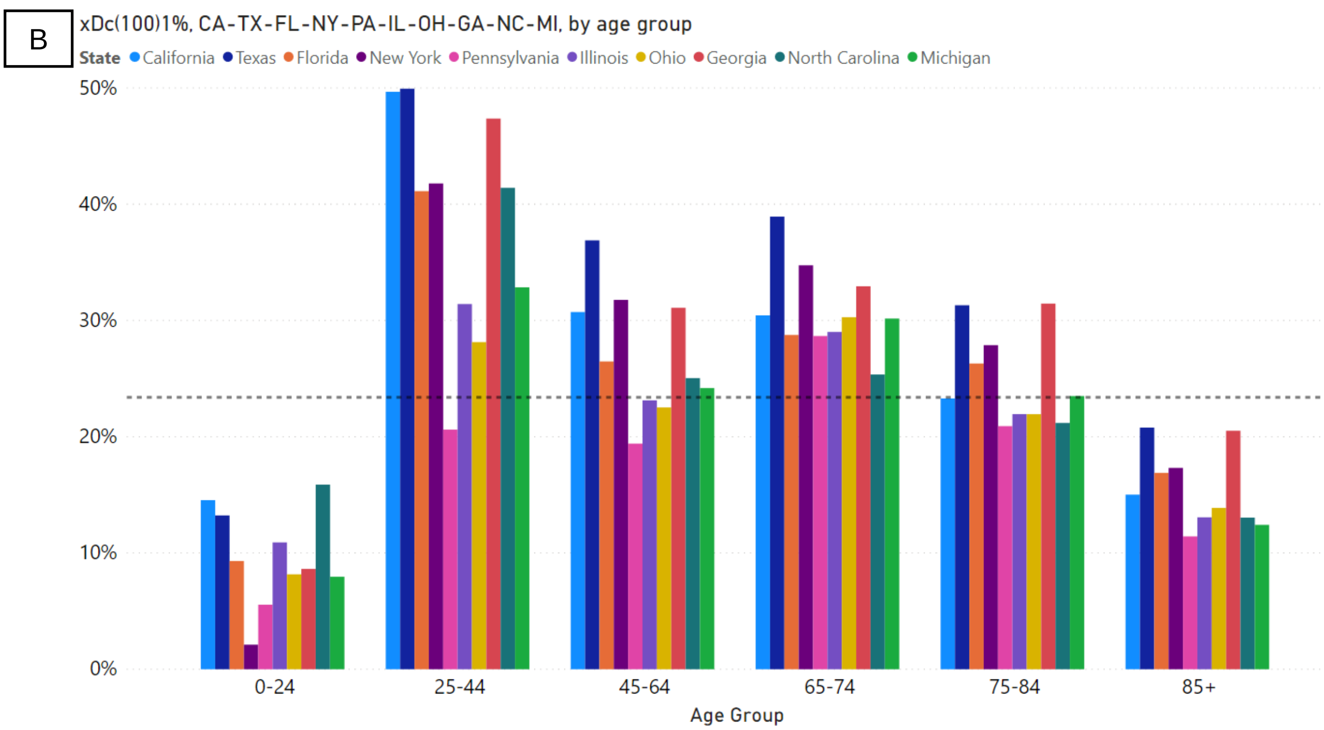


Figure 9. Excess mortality of the covid period in the USA (panel A) and in the ten most populous states of the USA (from left to right in each band: California, Texas, Florida, New York, Pennsylvania, Illinois, Ohio, Georgia, North Carolina, Michigan) (panel B), as percentages of the pre-covid period mortality, by age group. The constant dashed line

represents the value for the whole USA. ACM data were retrieved from CDC (CDC, 2022b), as described in Table 1. xDc(100)1% is calculated from Equation 7.

Figure 9 illustrates one of the most striking features of mortality in the covid period: The relative covid-period excess mortality (covid-period fatality risk ratio, relative to pre-covid mortality) is broadly distributed to all age groups and is not exponential or near-exponential with age as determined for viral respiratory diseases, including COVID-19, when these are the verified dominant cause of death.

Indeed, we note that all age groups were significantly differentially affected in the covid period, which is inconsistent with the reported infection fatality ratios (morbidity) that generally increase exponentially with age, as is also the case for many chronic diseases and for all-cause mortality risk itself (e.g., Richmond *et al.*, 2021; Elo *et al.*, 2022; Sorensen *et al.*, 2022). Again, this suggests that the covid-period deaths are not predominantly explained by the postulated SARS-CoV-2 pathogen. Rather, risk of death in the covid period appears to result from distributed aggression against vulnerable populations in all the age groups, not predominantly (or exponentially) the elderly.

We see from Figure 9 that young adults (25-44 years) were particularly devastated by the events and conditions of the covid period. It is not unreasonable to postulate that this age group would have been most impacted by the large-scale life-changing economic and job-loss changes that occurred in the covid period, or that this age group would have been most devastated by social isolation and institutional abandonment for those who are mentally disabled or otherwise dependent on a fragile social support network.

Next, we examine whether any impact of the mass and age-distributed USA vaccination campaign can be detected and quantified.

3.3. Time and age-group variations of mortality during the covid period, and relation to implementation of the vaccination campaign

3.3.1. All-cause mortality by week and vaccination delivery by week, by age group, 2019-2022

In our previous article about ACM in the USA (Rancourt, Baudin and Mercier, 2021b), we stated the following about the vaccination campaign:

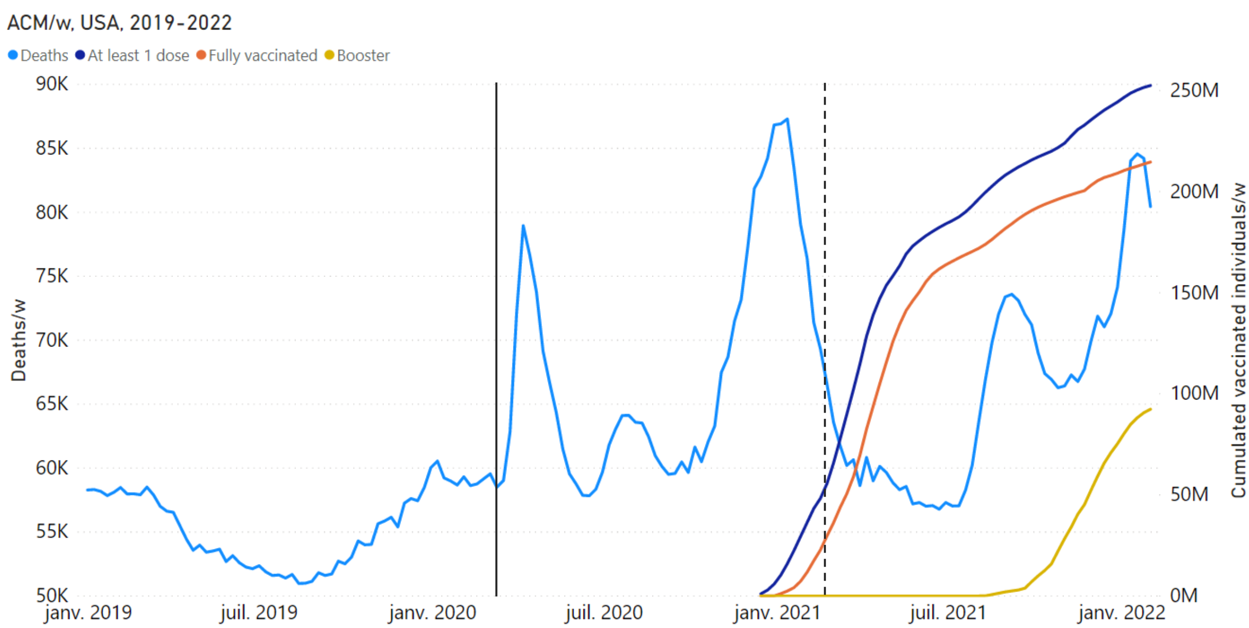
> "Readers who would be tempted to ascribe the downturn in the cvp2 peak to the vaccination campaign should note that the downturn coincides with the expected seasonal downturn of every seasonal winter maximum that has ever been observed by epidemiologists in the last century or more.
>
> More importantly, the largely completed vaccination campaign did not prevent a second surge of summer deaths (2021, "smp2") (Figure 31). The mortality in the said second surge appears to be comparable to or more than the mortality for summer-2020. Furthermore, the COVID-19-assigned deaths (CDC, 2021a) are significantly greater in number in summer-2021 than in summer-2020 (Figure 34), and, unlike at any other time in the COVID-era, account for virtually all the excess (above-SB) deaths, in the summer-2021 feature (smp2) (Figure 34), following the vaccination campaign.
>
> There is no sign in the ACM/w that the vaccination campaign has had any positive effect. However, given that the vaccination campaign starts well after the 2020 summer and essentially ends mid-summer-2021 prior to the start of the smp2 feature, given that the 2021 excess (above-SB) summer deaths (smp2) occur in significantly younger individuals than the excess summer-2020 deaths, and given that the smp2 feature is significantly larger than the smp1 feature for the said younger individuals (35-54 years, Figures 33d and 33e; and 55-64 years, Figure 33f, to a lesser degree), it is possible that vaccination made 35-54 year olds and others more vulnerable to death, especially summer death in disadvantaged individuals in hot-climate states (Montgomery et al., 2021) (Simone et al., 2021)."

Here, we examine this question again, *via* the time and age-group variations in structure of the ACM/w (Figure 5 and Figure 7) in the covid period, using the most up-to-date consolidated data.

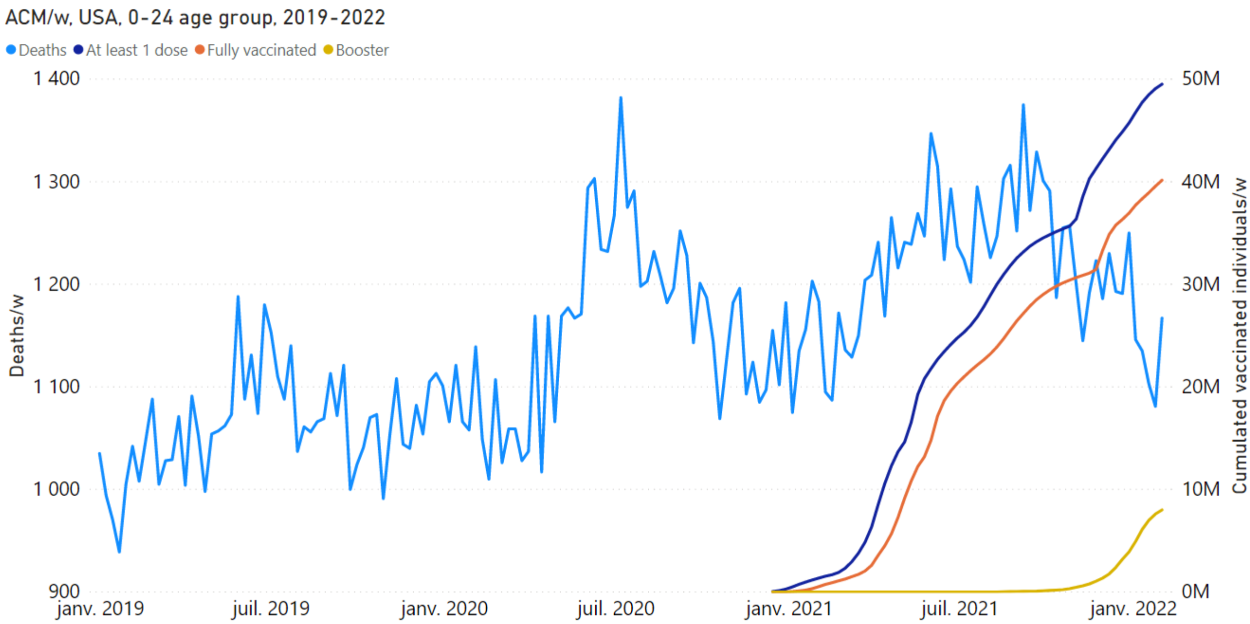
Figure 10 shows the all-cause mortality by week (ACM/w) for the USA from January 2019 through January 2022, together with vaccination data, for all the available age groups.

Figure 10. All-cause mortality by week (light-blue), cumulated number of people with at least one dose of vaccine (dark-blue), cumulated number of fully vaccinated people (orange) and cumulated number of people with a booster dose (yellow) by week in the USA from 2019 to 2022, for all and each of the age groups. Data are displayed from week-1 of 2019 to week-5 of 2022. The vertical solid line indicates week-11 of 2020 (week of 11 March 2020, when WHO declared a pandemic), indicating the beginning of the covid period. The vertical dashed line indicates week-8 of 2021, dividing the covid period into two periods of 50 weeks each: the pre-vaccination period (before the dashed line) and the vaccination period (after the dashed line). Panels below: (A) for all ages; (B) for the 0-24 years age group; (C) for the 25-44 years age group; (D) for the 45-64 years age group; (E) for the 65-74 years age group; (F) for the 75+ years age group. Data were retrieved from CDC (CDC, 2022b, 2022c), as described in Table 1.

A

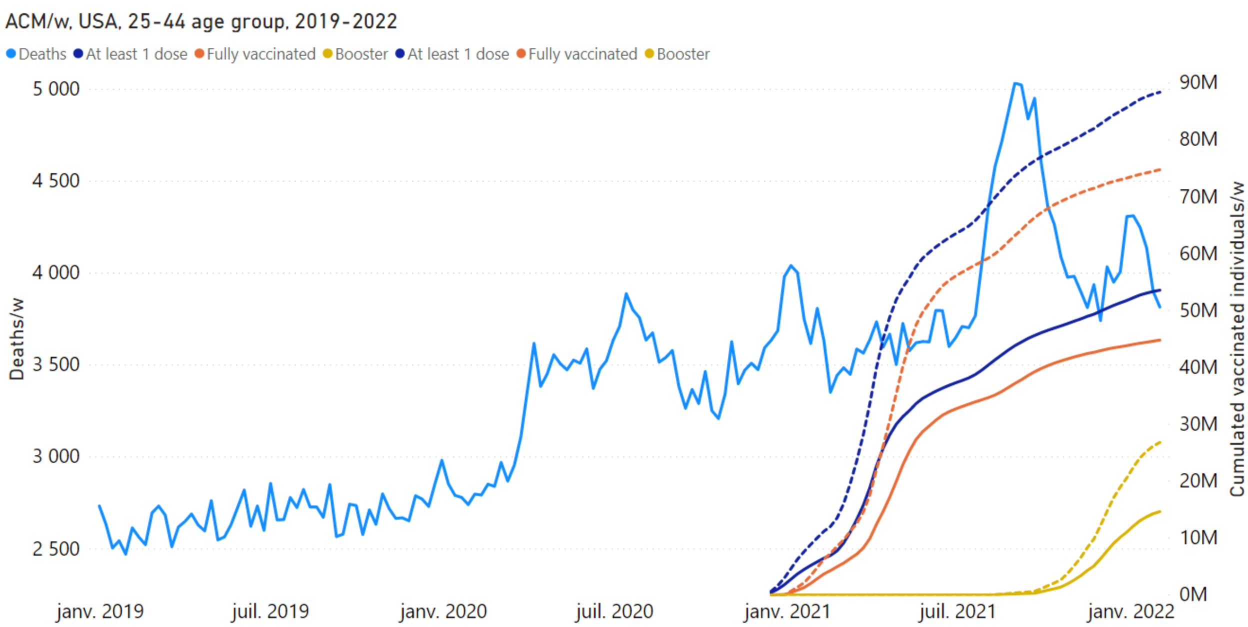


B



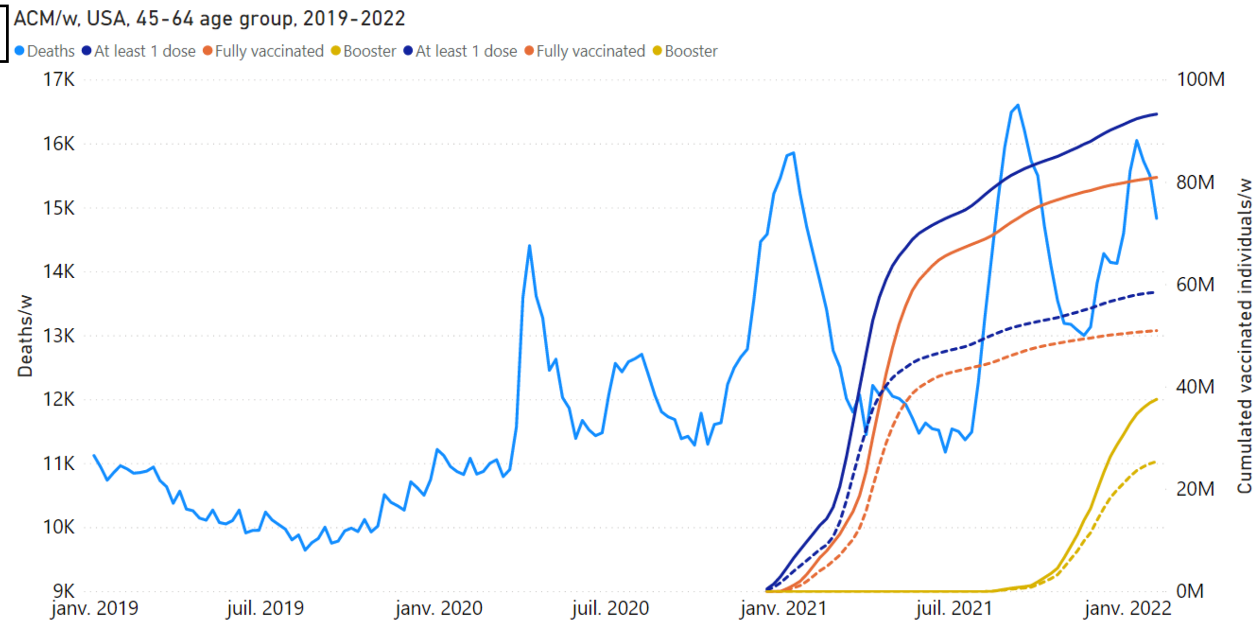
The booster data for this age group only concern people aged 12 years and older.

C



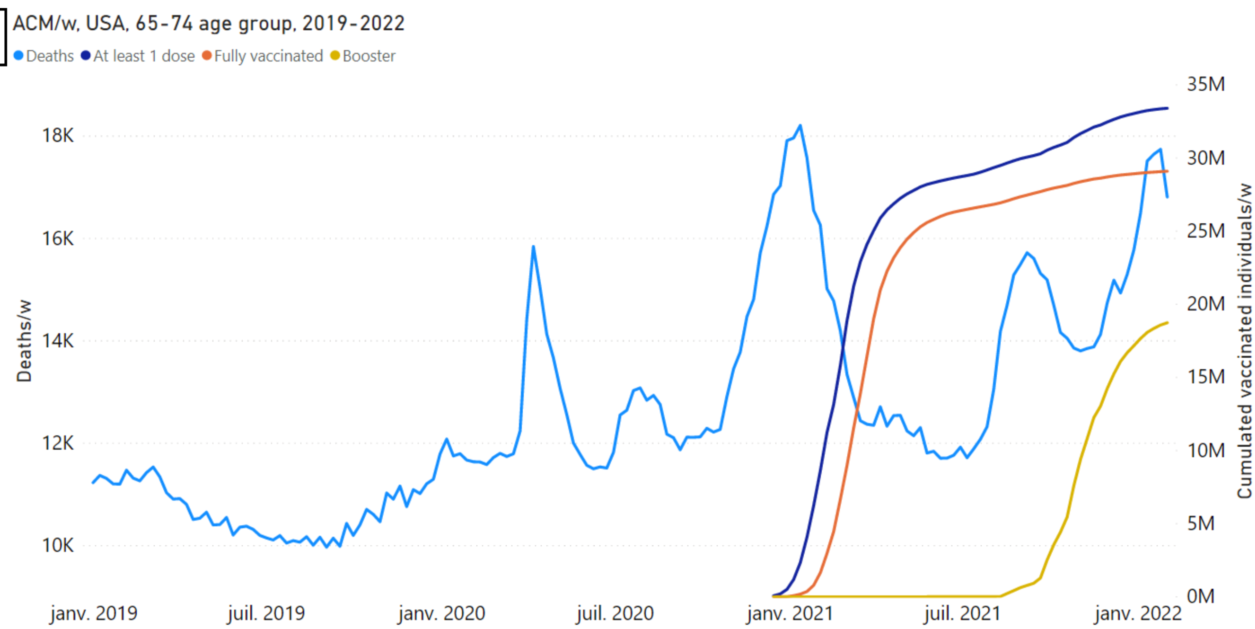
For the vaccination data of this age group, the solid lines are for the 25-39 year olds and the dashed lines are for the 25-49 year olds. That is because the available age groups for the mortality data don't exactly match the available age groups for the vaccination data.

D



For the vaccination data of this age group, the solid lines are for the 40-64 year olds and the dashed lines are for the 50-64 year olds. That is because the available age groups for the mortality data don't exactly match the available age groups for the vaccination data.

E



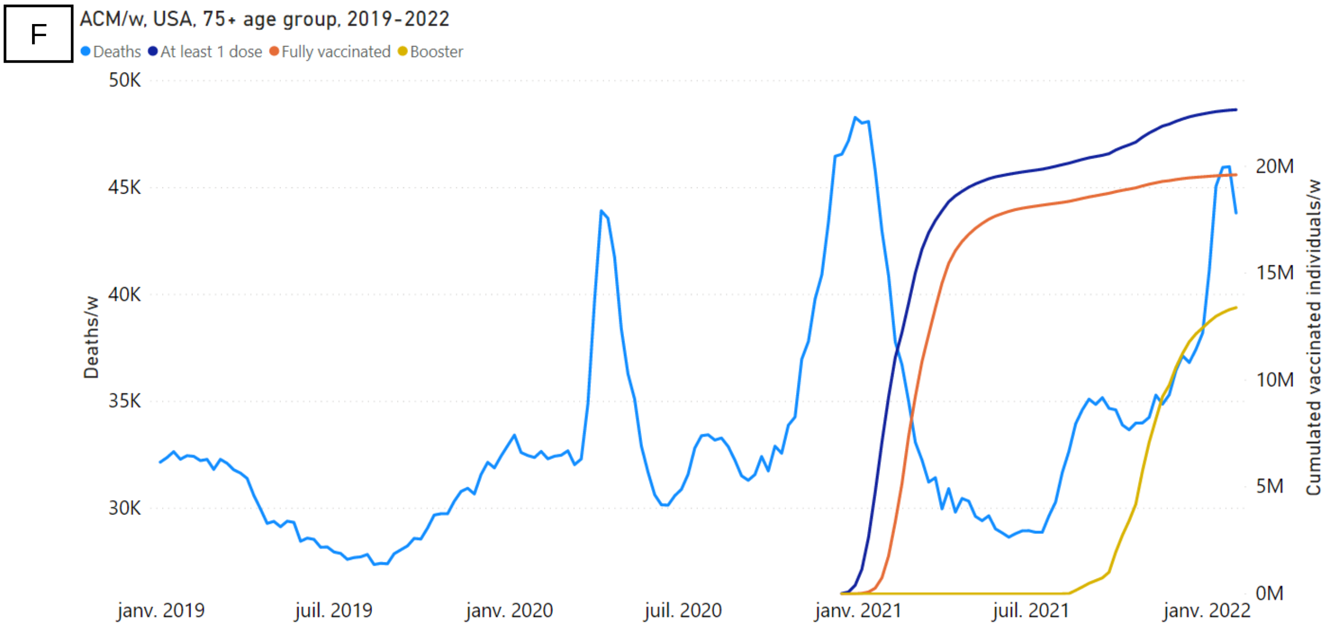


Figure 10 is a key figure in the present article because it allows an investigation of whether accelerations of vaccine delivery are synchronous or near-synchronous with surges (vaccine-induced death) or subsequent drops (vaccine-induced protection against death) in ACM, for all ages (Figure 10A) and by age group (Figure 10 B, C, D, E, F). In this regard, we make the following observations.

- First, one might be tempted to mechanistically associate the initial and most important surge in 1st-dose vaccine delivery with the large drop in mortality that for several age groups occurs at about the same time (in March-2021 for all ages, Figure 10A). This is incorrect for the following reasons:
    - The drop in mortality is expected from purely seasonal considerations: high mortality in the winter always drops eventually.
    - The cvp1 at the end of the winter occurring in the pre-vaccination period of the covid period saw an eventual large decrease, months before the start of the vaccination campaign.
    - There is an increase in ACM in the 0-24 years age group, rather than a decrease (Figure 10B), and similarly for the 25-44 years age group (Figure 10C). The vaccine would need to be harmful or beneficial regarding death, depending on the age group.

  - For the 45-64, 65-74 and 75+ years age groups, the 2020-2021 winter peak in ACM occurs in the same way even though the vaccine-delivery upsurge is at different times, because the most elderly were vaccinated first (Figure 10D, E, F). The vaccine's life-saving properties would need to be strongly dependent on age for these ages.
- Second, it is clear that the prominent late-summer-2021 peak in ACM (all ages, and all age groups except 0-24 years) is far in excess of any proportionate increase in vaccination-dose delivery. The said late-summer-2021 peak occurs in a period during which the cumulative vaccine dose delivery is essentially regular, without a large fractional step-wise increase.
- Third, the latter observation notwithstanding, there is nonetheless a modest but statistically significant stepwise increase in 1st-dose vaccine delivery, which is synchronous with the late-summer-2021 peak in ACM, visible for all ages and for the 25-44 and 45-64 years age groups (Figure 10A, C, D). This temporal association is prominent in the data for many specific states (e.g., Figure 11), and cannot easily be dismissed. It is discussed below.
- While the second and third bullet points above appear to be contradictory, they are not. On the one hand (second bullet point), neither large increases in ACM (upsurge of the late-summer-2021 peak) nor large decreases in ACM (drop in ACM ending the late-summer-2021 peak) can be interpreted as proportionately driven by vaccine adverse effects, while on the other hand (third bullet point), a modest stepwise upsurge in cumulative vaccine dose delivery may be causally associated with a peak in ACM if the said stepwise upsurge includes increased capture of immunocompromised residents. The two propositions (second and third bullet points) and their implications are simultaneously possible because the number of delivered vaccine doses is large compared to the number of excess deaths (the per-dose fatality toxicity ratio of the vaccine is much smaller than 1), as discussed more below.
- Fourth, one might be tempted to mechanistically associate the increase in cumulative booster-dose delivery with irregular increases in ACM in the late stage of the covid period. This is incorrect for the following reasons:

- The apparent association is confounded by the 2021-2022 winter increase. Every winter, including during the covid period, has always had increased ACM, in the entire recorded history of mid-latitude countries and jurisdictions.
- Booster and concomitant first-series dose increases have an apparent insignificant effect on ACM in the 0-24 years age group, and cause a decrease if anything in the winter 2021-2022 season (Figure 10B).
- Boosters cause no special increase in ACM in the 25-44 years age group (Figure 10C), which is the age group with the largest vaccination-period relative increase in integrated ACM (see below).
- The 2021-2022 winter peaks in all the >24 years age groups have their maxima at a time when the cumulative booster-dose delivery has plateaued, after its period of most rapid increase (Figure 10A, C, D, E, F).

Data by age group shown in Figure 10 were only available at the national level. In the next section, we look at vaccination data at the state level, with less defined age groups.

3.3.2. All-cause mortality by week and vaccination delivery by week, by state, 2019-2022

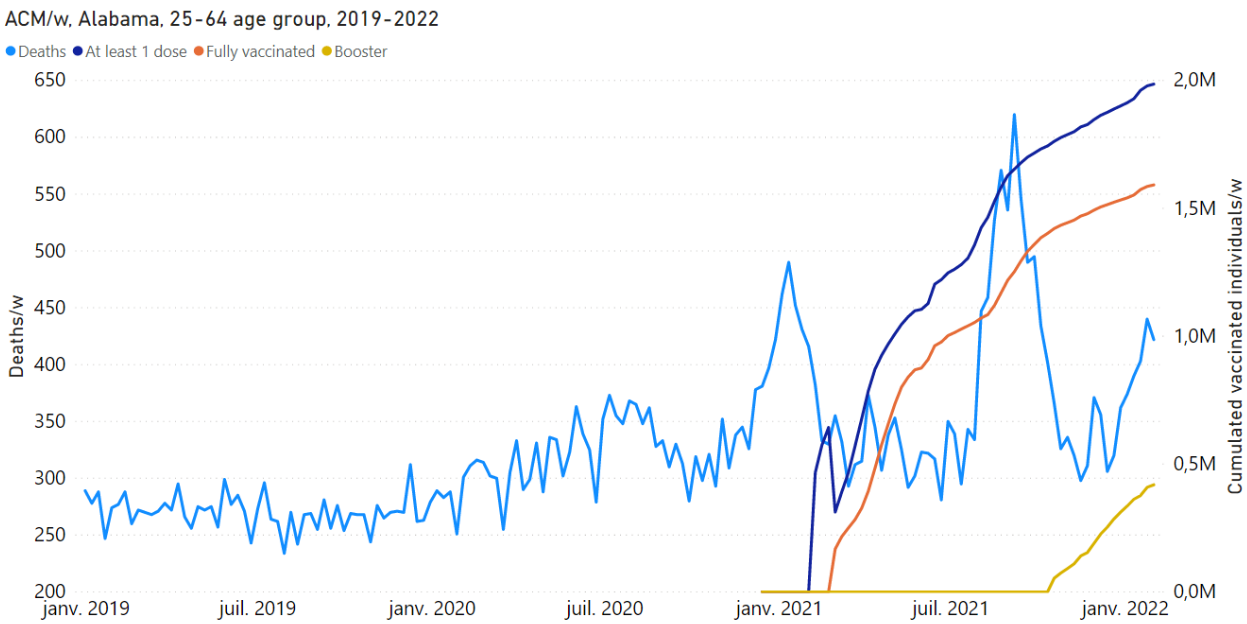
Vaccination delivery by week data is available at the state level for the 18+ and the 65+ age groups (CDC, 2022d). By subtracting the data for the 65+ age group from the data for the 18+ age group, we can calculate data for the 18-64 age group.

Figure 11 shows the all-cause mortality by week (ACM/w) for some states of the USA from January 2019 through January 2022, together with vaccination data, for the 25-64 years or the 65+ years age groups.

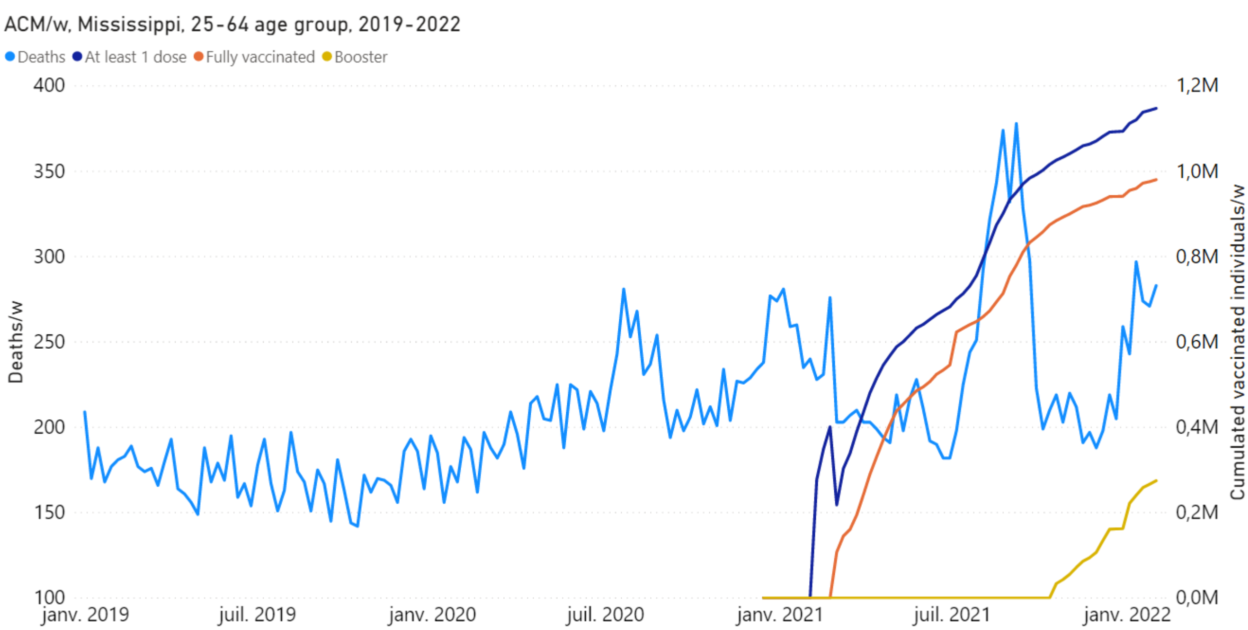
Figure 11. All-cause mortality by week (light-blue), cumulated number of people with at least one dose of vaccine (dark-blue), cumulated number of fully vaccinated people (orange) and cumulated number of people with a booster dose (yellow) by week from 2019 to 2022, and by age group for some states. Data are displayed from week-1 of 2019 to week-5 of 2022. Panels below: (A) Alabama, 25-64 years age group; (B) Mississippi, 25-64

years age group; (C) Georgia, 25-64 years age group; (D) Florida, 25-64 years age group; (E) Louisiana, 25-64 years age group; (F) Louisiana, 65+ years age group; (G) Michigan, 25-64 years age group; (H) Michigan, 65+ years age group. For the 25-64 years age group graphs, the vaccination data is for the 18-64 years age group; because the available age groups for the mortality data do not exactly match the available age groups for the vaccination data. The discontinuous breaks in cumulative number of vaccinated individuals are artifacts. Data were retrieved from CDC (CDC, 2022b, 2022d), as described in Table 1.

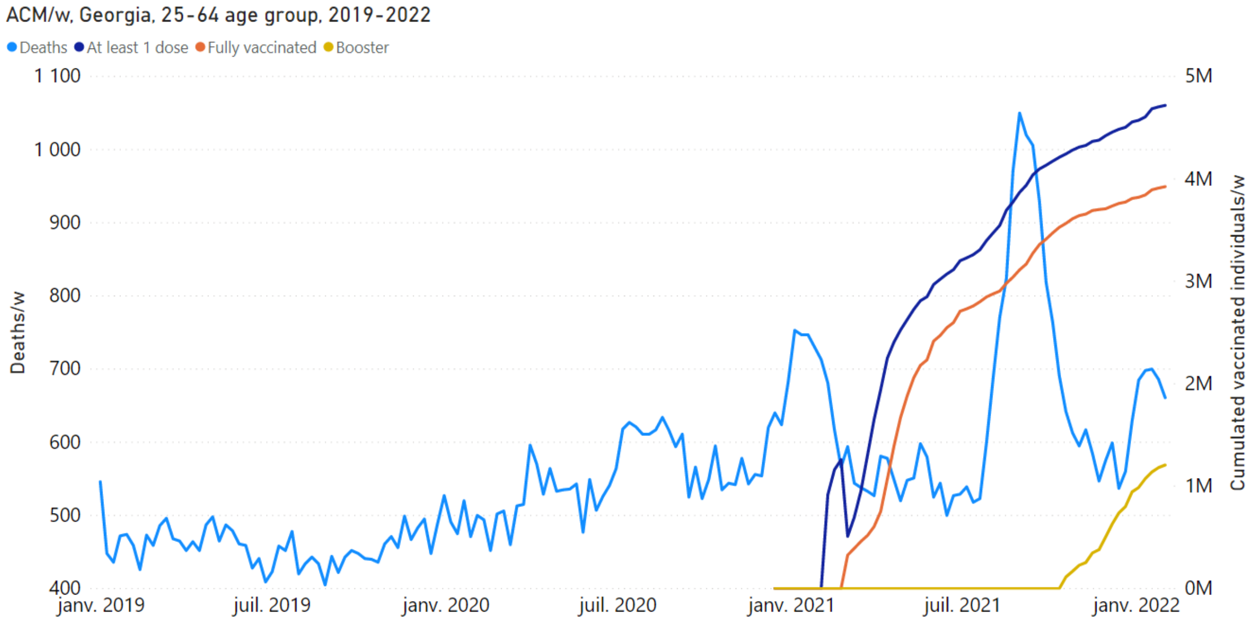
A



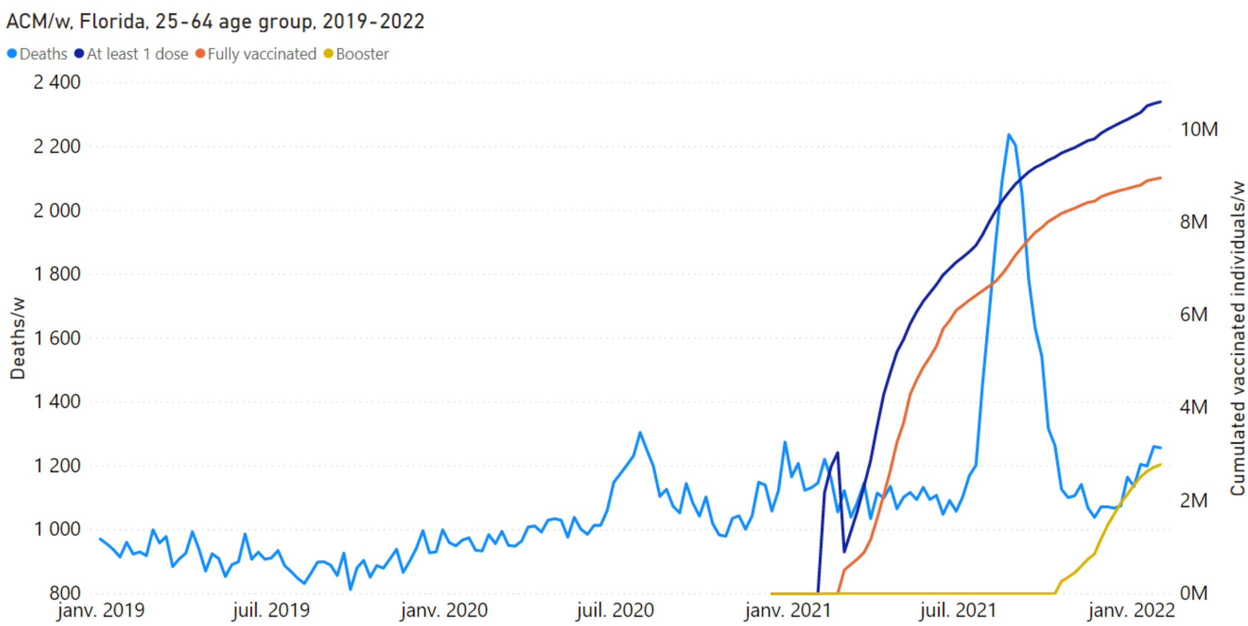
B



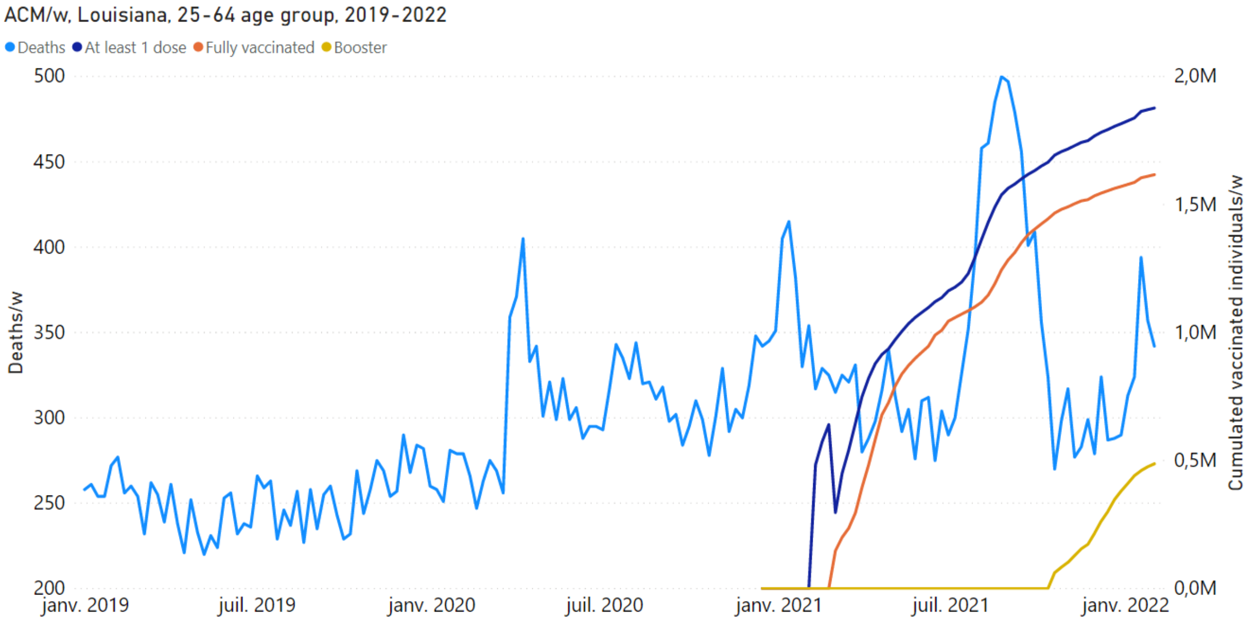
C


ACM/w, Georgia, 25-64 age group, 2019-2022
Deaths
At least 1 dose
Fully vaccinated
Booster
Deaths/w
1 100
1 000
900
800
700
600
500
400
5M
4M
3M
2M
1M
0M
Cumulated vaccinated individuals/w
janv. 2019
juil. 2019
janv. 2020
juil. 2020
janv. 2021
juil. 2021
janv. 2022

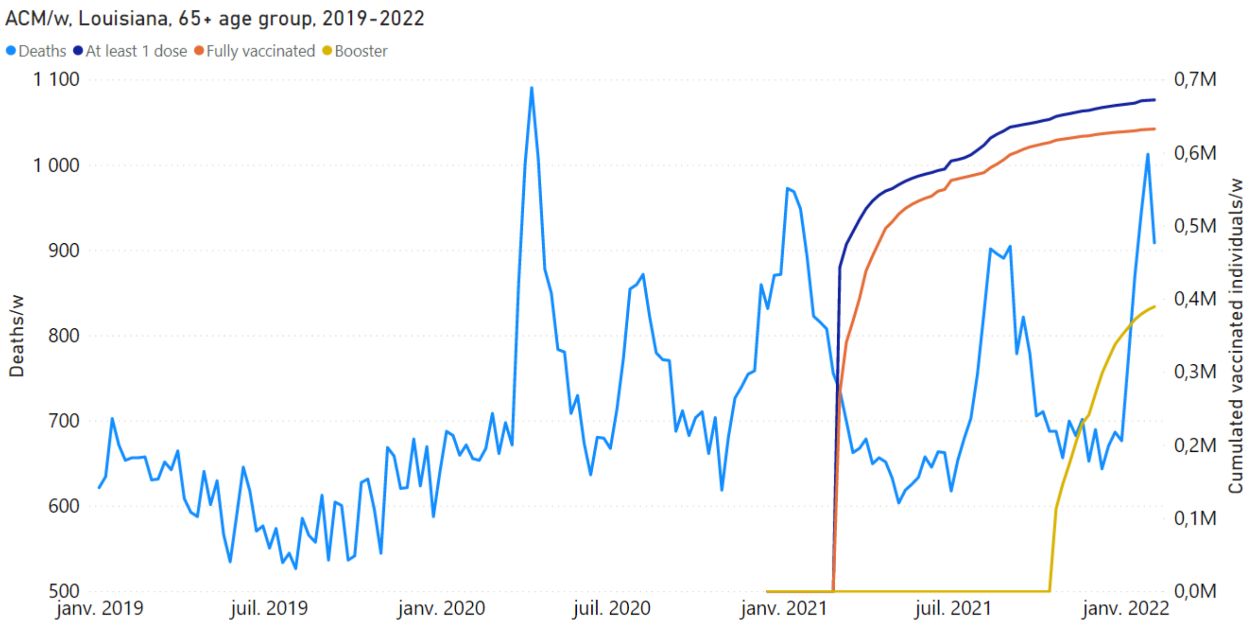
D


ACM/w, Florida, 25-64 age group, 2019-2022
Deaths
At least 1 dose
Fully vaccinated
Booster
Deaths/w
2 400
2 200
2 000
1 800
1 600
1 400
1 200
1 000
800
10M
8M
6M
4M
2M
0M
Cumulated vaccinated individuals/w
janv. 2019
juil. 2019
janv. 2020
juil. 2020
janv. 2021
juil. 2021
janv. 2022

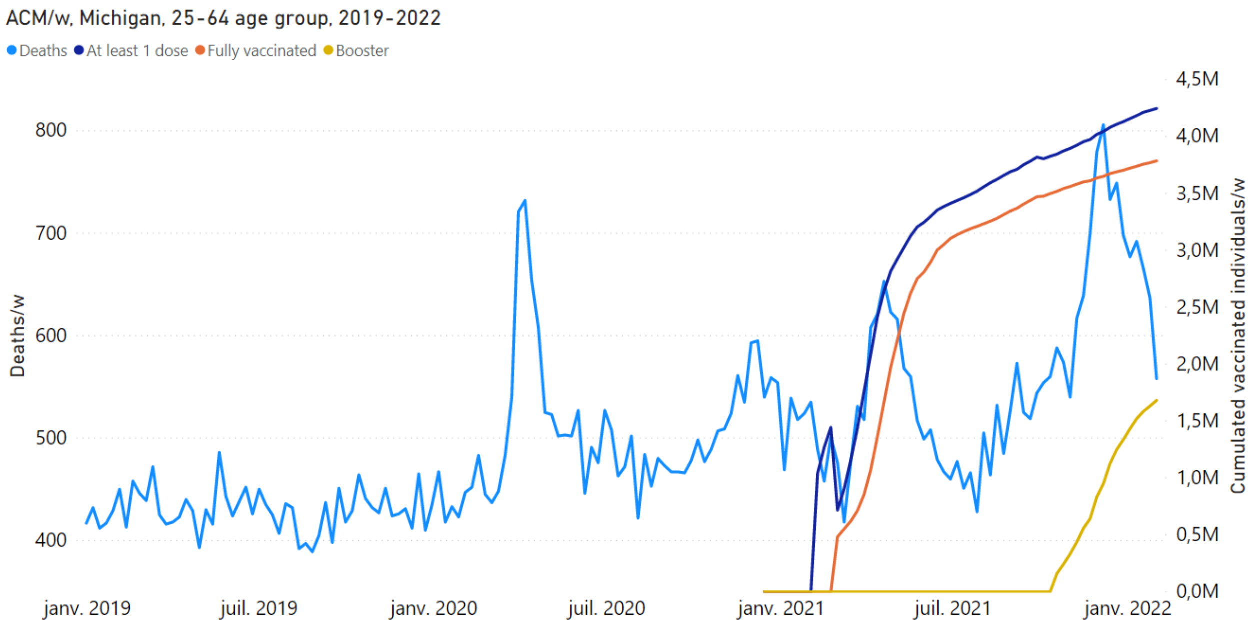
E


ACM/w, Louisiana, 25-64 age group, 2019-2022
Deaths
At least 1 dose
Fully vaccinated
Booster
Deaths/w
500
450
400
350
300
250
200
janv. 2019
juil. 2019
janv. 2020
juil. 2020
janv. 2021
juil. 2021
janv. 2022
2,0M
1,5M
1,0M
0,5M
0,0M
Cumulated vaccinated individuals/w

F


ACM/w, Louisiana, 65+ age group, 2019-2022
Deaths
At least 1 dose
Fully vaccinated
Booster
Deaths/w
1 100
1 000
900
800
700
600
500
janv. 2019
juil. 2019
janv. 2020
juil. 2020
janv. 2021
juil. 2021
janv. 2022
0,7M
0,6M
0,5M
0,4M
0,3M
0,2M
0,1M
0,0M
Cumulated vaccinated individuals/w

G



H

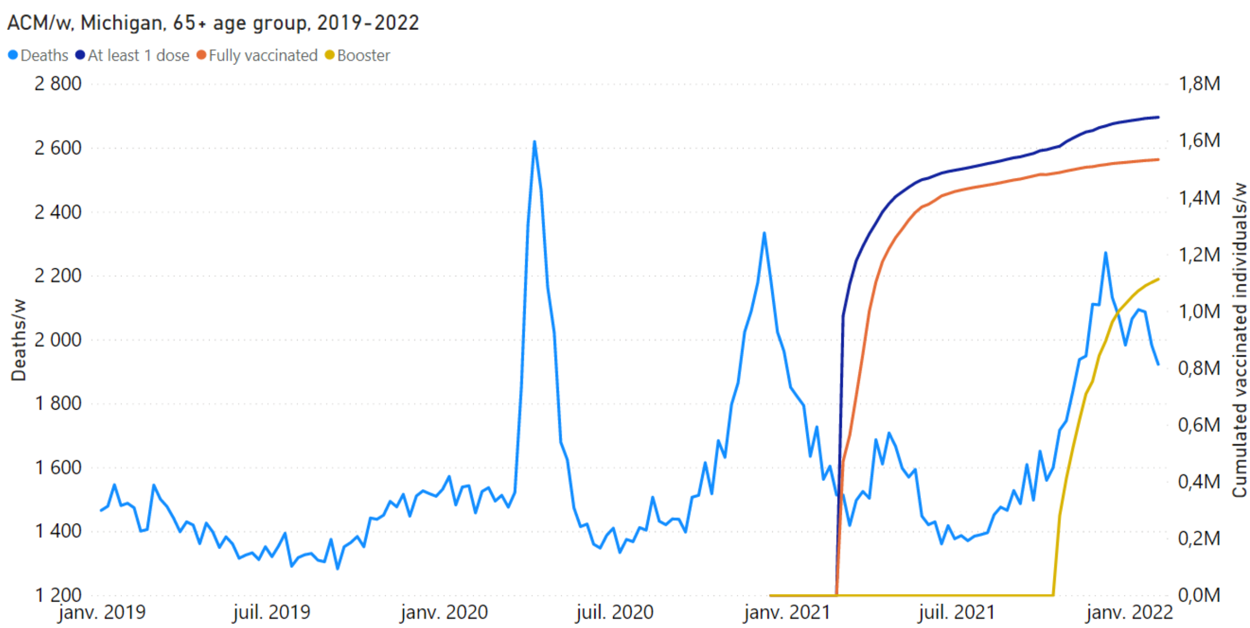


Figure 11 illustrates the late-summer-2021 peak in ACM/w for the states of Alabama, Mississippi, Georgia, Florida and Louisiana; and the unique spring-2021 (April-centered) peak in ACM/w occurring for Michigan.

Here, the “modest but significant stepwise increase in 1st-dose vaccine delivery, which is synchronous with the late-summer-2021 peak in ACM, visible for all ages and for the

25-44 and 45-64 years age groups (Figure 10A, C, D)" discussed above for the whole USA is now examined through the ACM/w and cumulative vaccine dose delivery by week data for the states of Alabama, Mississippi, Georgia, Florida and Louisiana, where the feature is prominent (Figure 11A, B, C, D, E, F), in the 25-64 years age group in particular. These five states are examples of states in which the late-summer-2021 peak is the most intense feature (largest peak) in the ACM/w data. In each case, the synchronous stepwise increase in cumulative vaccine dose delivery is evident.

This association between late-summer-2021 peak and stepwise increase in vaccine dose delivery is present throughout all the states: Where this is a most prominent late-summer-2021 peak there is an evident synchronous stepwise increase in vaccine dose delivery, and *vice versa*. The case of the state of Michigan shows a counter example: There is no late-summer-2021 peak and there is no stepwise increase in vaccination (Figure 11G, H).

However, the case of Michigan is shown for an additional reason: Michigan is the only state that has a spring-2021 (April-centered) peak in ACM/w (Figure 11G, H). This is arguably the most remarkable feature in all of the ACM data for the USA, since it occurs only in one state and does not correspond to a local intense summer heatwave phenomenon.

Michigan's said spring-2021 peak in ACM/w occurs synchronously with Michigan's fastest increase in vaccine dose delivery for 18-64 year olds (Figure 11G). It occurs when the vaccination campaign was "turned on" for this age group. This is also the time (April-2021) when, for this age group, for the whole USA, vaccine delivery was at its highest, and all reported vaccine adverse effects, including death, peaked (Hickey and Rancourt, 2022; their Figure S2). The Janssen-shot deliveries (shots administered), in particular, peaked strongly in approximately April-2021 (whole USA) (Hickey and Rancourt, 2022; their Figure S1), and were CDC-recommended to be "paused", and then re-authorized at approximately that time, also (FDA, 2021, 2022).

For Michigan, therefore, one is tempted to directly assign the unique spring-2021 peak in mortality as directly caused by the vaccine injections. The vaccine fatality toxicity per dose would need to be approximately 10 times greater than the known value for non-immunocompromised subjects (Hickey and Rancourt, 2022; their Table 1). However, if immunocompromised young adults (stressed and mentally disabled, and such, see below) were captured by the vaccination campaign, then the causal link is entirely possible.

Coming back to the big picture: The massive vaccination campaign in the USA did not reduce all-cause mortality to a pre-covid-period level, overall or in any of the age groups; nor does it appear to have substantially increased ACM during the vaccination campaign, compared to the pre-vaccination period of the covid period (Figure 10).

In the next section, we use the method described above (in section 3.2.2) to quantitatively assess whether the vaccination campaign measurably affected integrated ACM.

3.3.3. Quantifying excess mortality of the pre-vaccination and vaccination periods of the covid period, by age group

We adapt our method described in section 3.2.2 and use the ACM/w data of Figure 5 to quantify the excess mortality of the vaccination period "to date", compared to the excess mortality of the pre-vaccination period of the covid period, as follows.

The idea is to test whether there is a significant systematic increase in mortality, by state and by age group, occurring after the large increase in vaccination injections, compared to the (equal duration) part of the covid period prior to the surge in vaccination delivery, and compared to a pre-covid period of same duration occurring immediately prior to the 11 March 2020 start of the covid period.

For a given age group, we add all the weekly deaths together, for the weeks of 22 February 2021 (week-8 of 2021, inflection point of the vaccination period) through to the latest useable week (week-5 of 2022, beginning of February 2022). This is a total for 50 weeks (the vaccination period "to date"). In analogy with our previously introduced notation (above in section 3.2.2), we call this total "w50c". Then we perform a similar total for the 1st-prior 50-week period, immediately preceding the vaccination period, for the 50 weeks up to and including week-7 of 2021. We call this total "w50c-1". These two 50-week periods of the covid period, divide the covid period into equal-duration pre-vaccination (w50c-1) and vaccination (w50c) periods, which can be visualized with the help of Figure 10A and Figure 12 (below). And we do the same for the 2nd-prior 50-week period, and we call this total "w50c-2". We continue moving back in time, to the end of the useable data in 50-week periods: w50c-3, etc.

Figure 12 shows the graph of "w50c-x" versus time, together with the ACM/w for the USA where each 50-week period is distinguished using a different color.

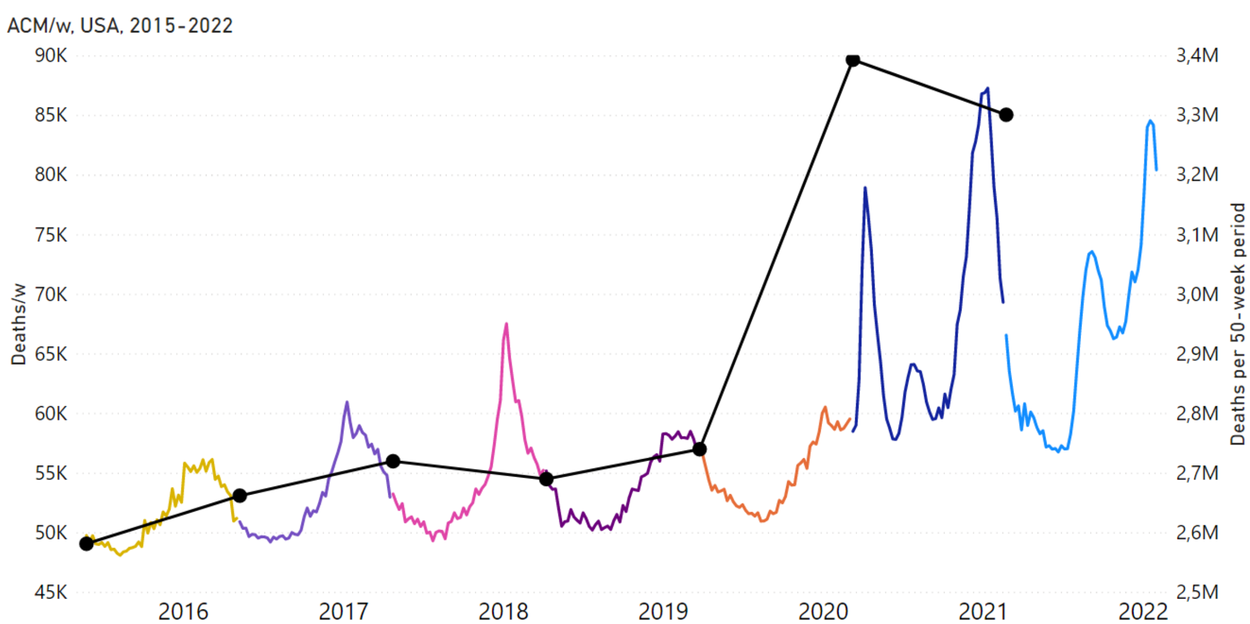


Figure 12. All-cause mortality by week (colors) and by 50-week period (black) in the USA from 2015 to 2022. Data are displayed from week-21 of 2015 to week-5 of 2022. The different colors indicate the successive 50-week periods. The light-blue color corresponds to the vaccination period of the covid period. The dark-blue color corresponds to the pre-vaccination period of the covid period. All the other colors are in the pre-covid period. The black dots show

the integrated ACM on these 50-week periods. Data were retrieved from CDC (CDC, 2022b), as described in Table 1.

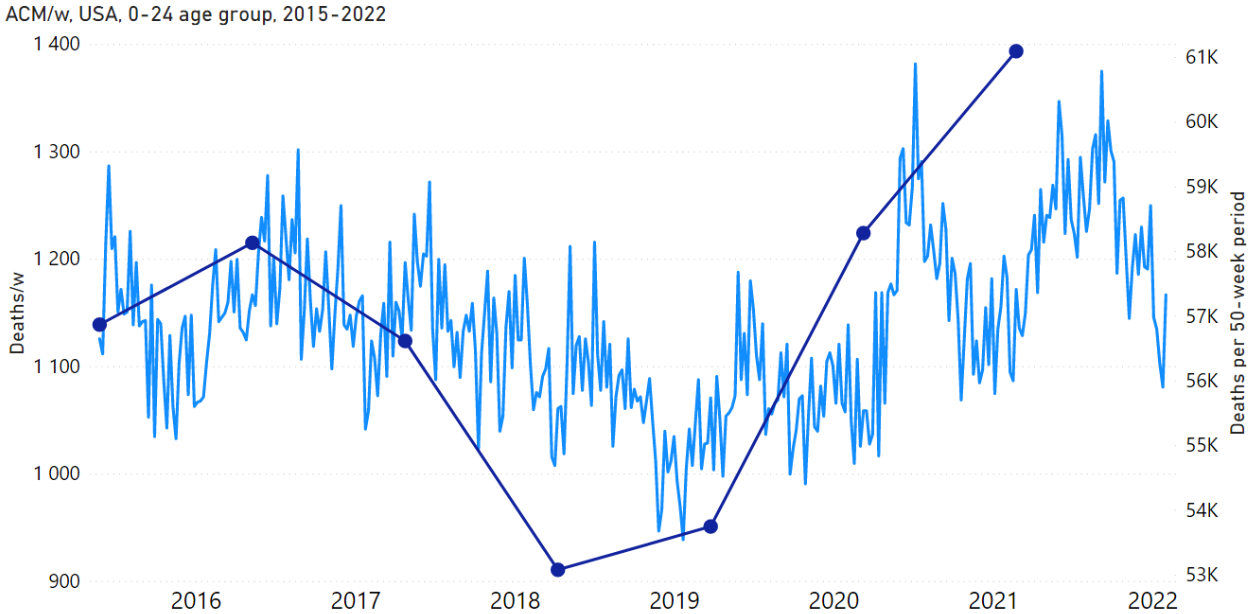
Equivalents to Figure 12 (without the color-code) for each of the states of the USA can be found in Appendix A.

Contrary to what would be expected if we assumed that the injections themselves induced a large (dominant) measurable positive or negative change in ACM, over a 50-week integration period the integrated ACM in the vaccination period of the covid period is comparable to and lower than in the pre-vaccination period of the covid period, for the USA as a whole (Figure 12). Indeed, there is a much greater and discontinuous change in ACM in going between the pre-covid period and the covid period than in going between the pre-vaccination period of the covid period and the vaccination period of the covid period.

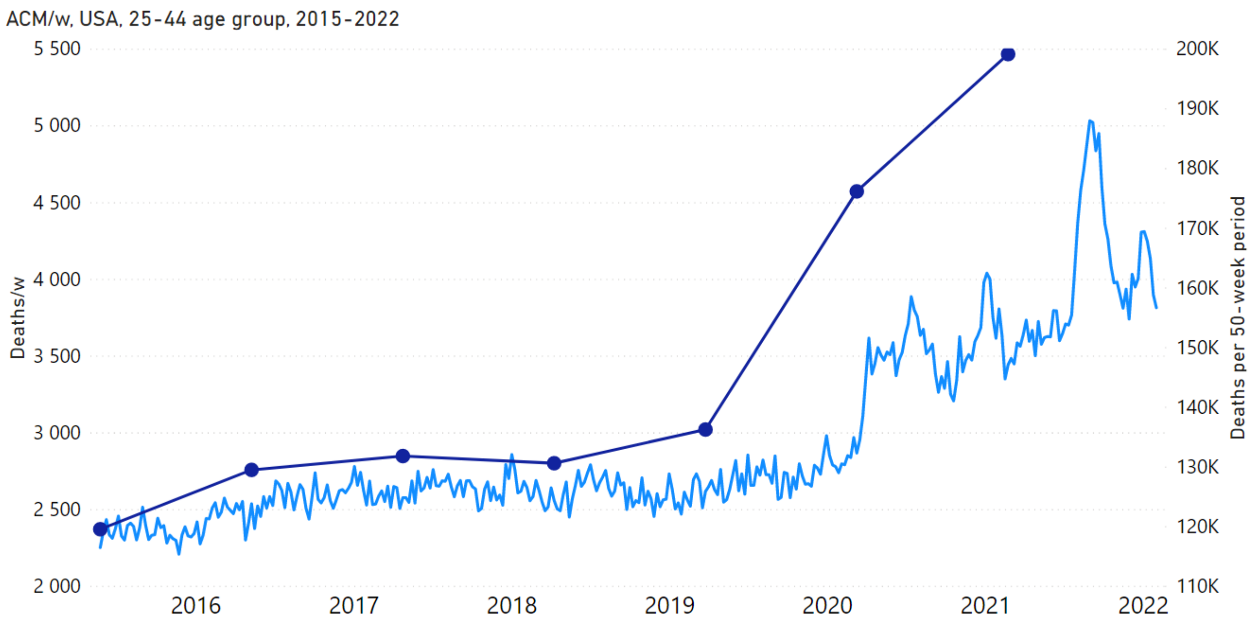
The mortality data (Figure 12) can be resolved by age group, which is shown, as follows, in Figure 13.

Figure 13. All-cause mortality by week (light-blue) and by 50-week period (dark-blue) in the USA from 2015 to 2022, for each of the age groups. Data are displayed from week-21 of 2015 to week-5 of 2022. Panels below: (A) for the 0-24 years age group; (B) for the 25-44 years age group; (C) for the 45-64 years age group; (D) for the 65-74 years age group; (E) for the 75-84 years age group; (F) for the 85+ years age group. Data were retrieved from CDC (CDC, 2022b), as described in Table 1.

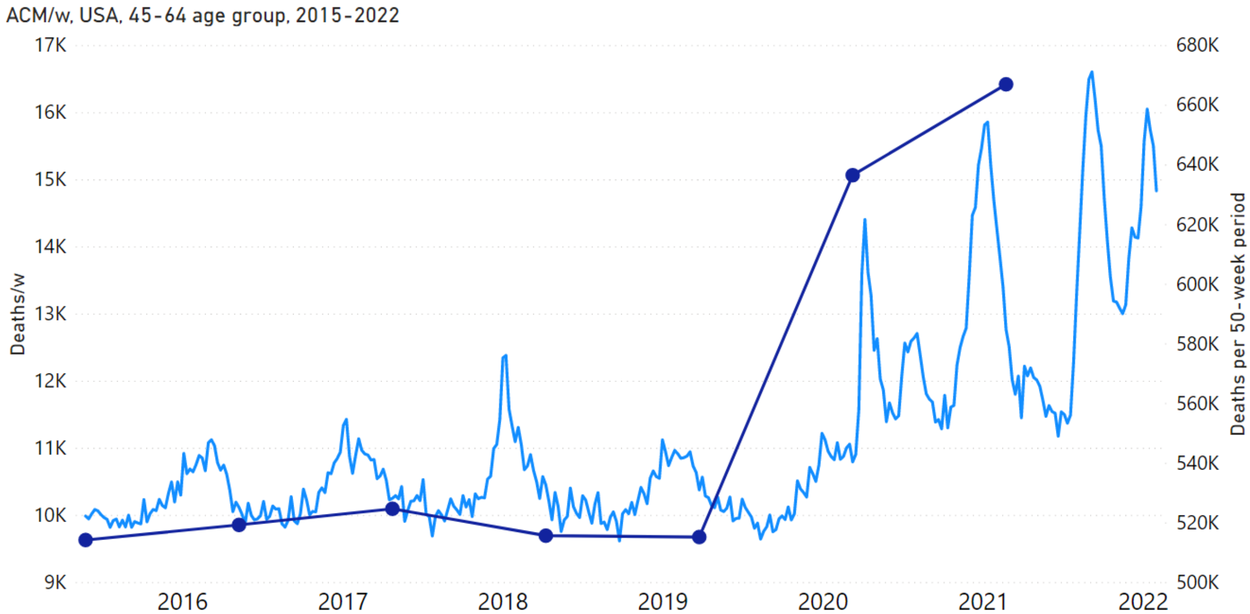
A


ACM/w, USA, 0-24 age group, 2015-2022
Deaths/w
Deaths per 50-week period
1 400
1 300
1 200
1 100
1 000
900
61K
60K
59K
58K
57K
56K
55K
54K
53K
2016
2017
2018
2019
2020
2021
2022

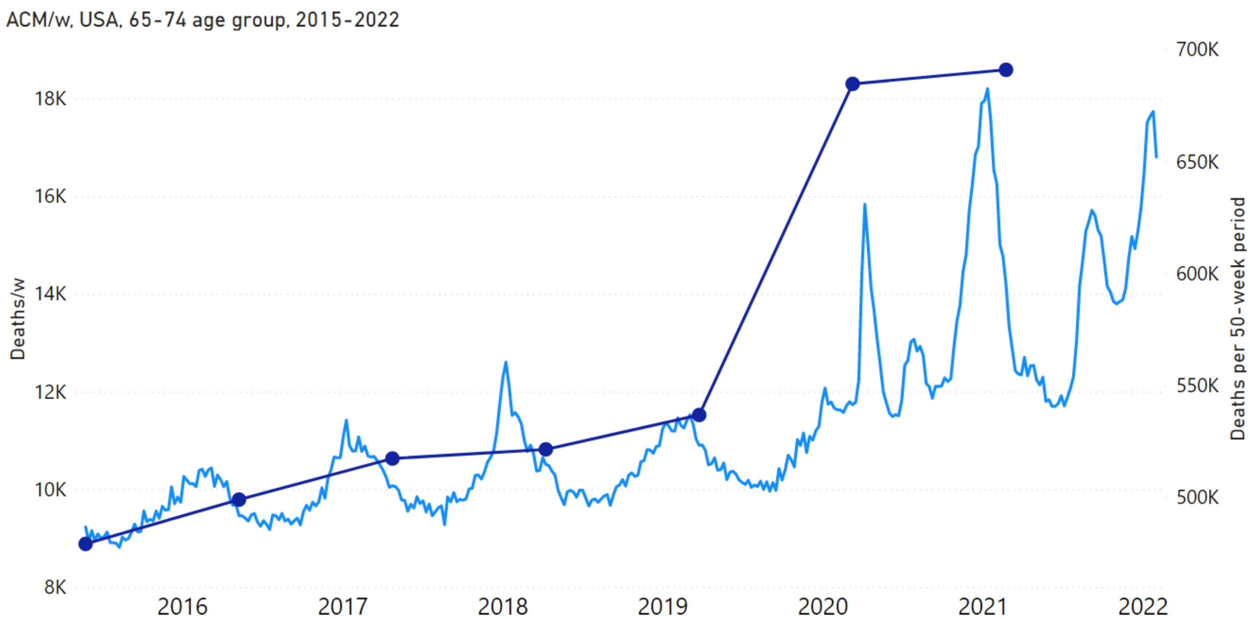
B


ACM/w, USA, 25-44 age group, 2015-2022
Deaths/w
Deaths per 50-week period
5 500
5 000
4 500
4 000
3 500
3 000
2 500
2 000
200K
190K
180K
170K
160K
150K
140K
130K
120K
110K
2016
2017
2018
2019
2020
2021
2022

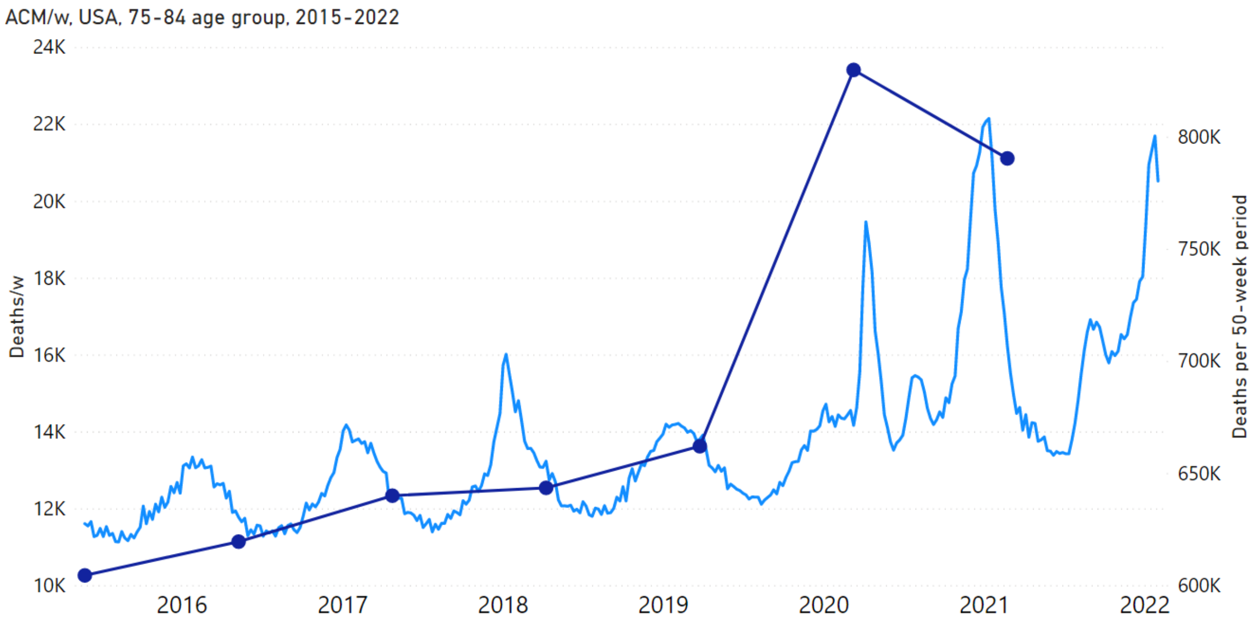
C


ACM/w, USA, 45-64 age group, 2015-2022
17K
16K
15K
14K
13K
12K
11K
10K
9K
Deaths/w
680K
660K
640K
620K
600K
580K
560K
540K
520K
500K
Deaths per 50-week period
2016
2017
2018
2019
2020
2021
2022

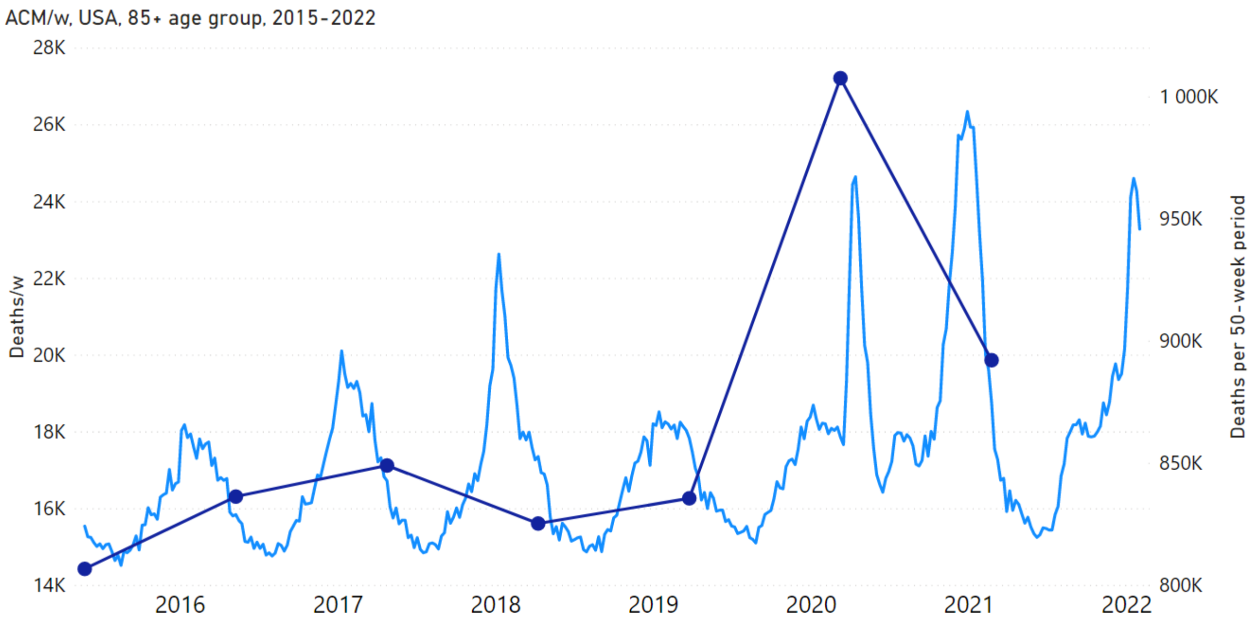
D


ACM/w, USA, 65-74 age group, 2015-2022
18K
16K
14K
12K
10K
8K
Deaths/w
700K
650K
600K
550K
500K
Deaths per 50-week period
2016
2017
2018
2019
2020
2021
2022

E



F



The ACM by 50-week period resolved by age group shows that integrated ACM is higher in the vaccination period of the covid period than in the pre-vaccination period of the covid period for all the younger age groups, under 75 years old (Figure 13A, B, C, D).

The integrated mortality by consecutive 50-week periods is shown for all the age groups together in Figure 14, by normalizing all the 50-week periods by the first 50-week period for each age group.

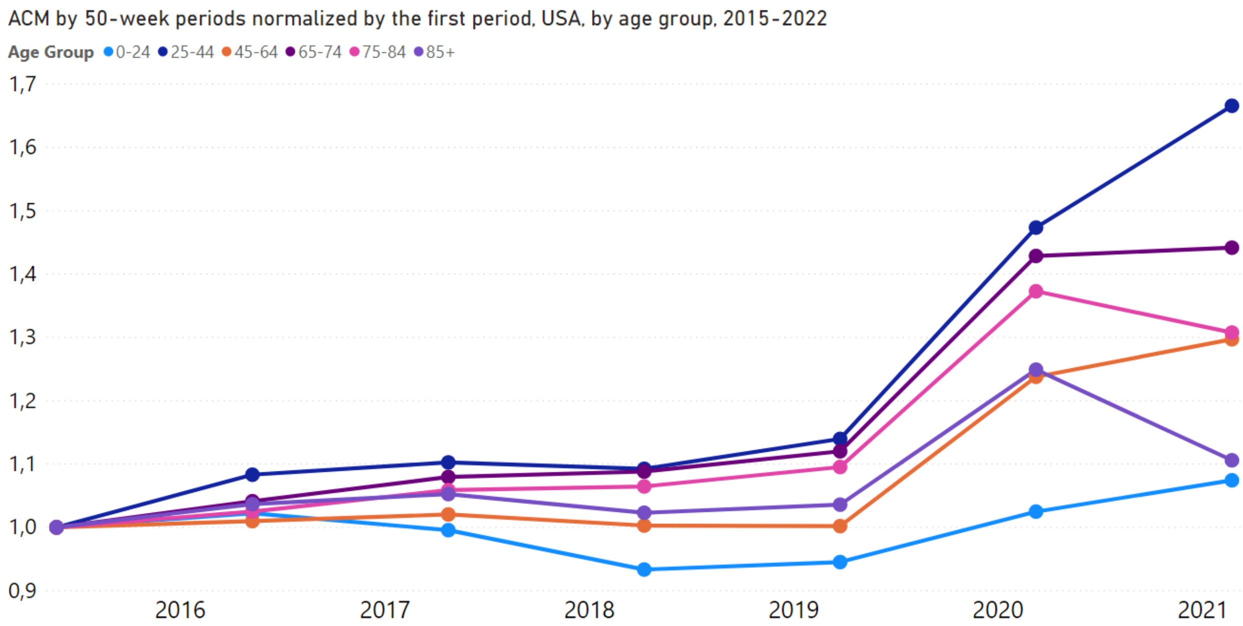


Figure 14. All-cause mortality by 50-week period normalized by the first 50-week period in the USA, from 2015 to 2022, for each of the age groups. Data are displayed from week-21 of 2015 to week-8 of 2021 (beginning of the vaccination period). ACM data were retrieved from CDC (CDC, 2022b), as described in Table 1.

The only age groups for which ACM in the vaccination period of the covid period is lower than ACM in the pre-vaccination period of the covid period are the 75-84 and 85+ age groups. All the other age groups show otherwise (Figure 14).

In order to quantify and directly compare the pre-vaccination period and the vaccination period within the covid period, we define the following quantities:

pVax-pCVD/pCVD = (w50c-1 - w50c-2) / w50c-2, expressed as a percentage, (9)

and

Vax-pCVD/pCVD = (w50c - w50c-2) / w50c-2, expressed as a percentage, (10)

Where w50c is the integrated ACM of the vaccination period of the covid period (50 weeks), w50c-1 the integrated ACM of the pre-vaccination period of the covid period (50 weeks) and w50c-2 the integrated ACM of the first pre-covid period of 50 weeks (immediately preceding the covid period).

Table 4 contains the calculated vaccination-period excess mortality (Vax-pCVD) and pre-vaccination-period excess mortality (pVax-pCVD) of the covid period, for each age group for the USA, and for the entire USA ("Total"), and the relative changes also, using each equation described above (Equations 9 and 10), as percentages of the pre-covid-period reference values (w50c-2).

Age Group	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
0-24	61 336	58 285	53 751	4 534	7 585	8,44 %	14,11 %
25-44	199 698	176 183	136 281	39 902	63 417	29,28 %	46,53 %
45-64	668 308	636 579	515 280	121 299	153 028	23,54 %	29,70 %
65-74	692 322	684 913	537 036	147 877	155 286	27,54 %	28,92 %
75-84	791 625	830 068	662 236	167 832	129 389	25,34 %	19,54 %
85+	893 194	1 007 727	835 708	172 019	57 486	20,58 %	6,88 %
Total	**3 306 483**	**3 393 755**	**2 740 292**	**653 463**	**566 191**	**23,85 %**	**20,66 %**

Table 4. Estimated excess mortality of the pre-vaccination and vaccination periods of the covid period in the USA, by age group. w50c is the total deaths during the vaccination period of the covid period (from week-8 of 2021 to week-5 of 2022, included). w50c-1 is the total deaths during the pre-vaccination period of the covid period (from week-11 of 2020 to week-7 of 2021, included). w50c-2 is the total deaths during the pre-covid period (from week-13 of 2019 to week-10 of 2020, included). pVax-pCVD and Vax-pCVD correspond to the excess mortality in the pre-vaccination period of the covid period and to the excess mortality in the vaccination period of the covid period, respectively. pVax-pCVD/pCVD and Vax-pCVD/pCVD correspond to the relative changes, as percentages of the pre-covid-period mortality, calculated from Equation 9 and Equation 10, respectively. ACM data were retrieved from CDC (CDC, 2022b), as described in Table 1.

Equivalents to Table 4 for each of the states of the USA can be found in Appendix A.

The numbers in Table 4 are represented graphically in bar charts, below, and are discussed below.

Figure 15 shows those quantities together with the relative excess mortality change in the covid period (xDc(100)1%, Equation 7) for each of the age groups for the whole USA.

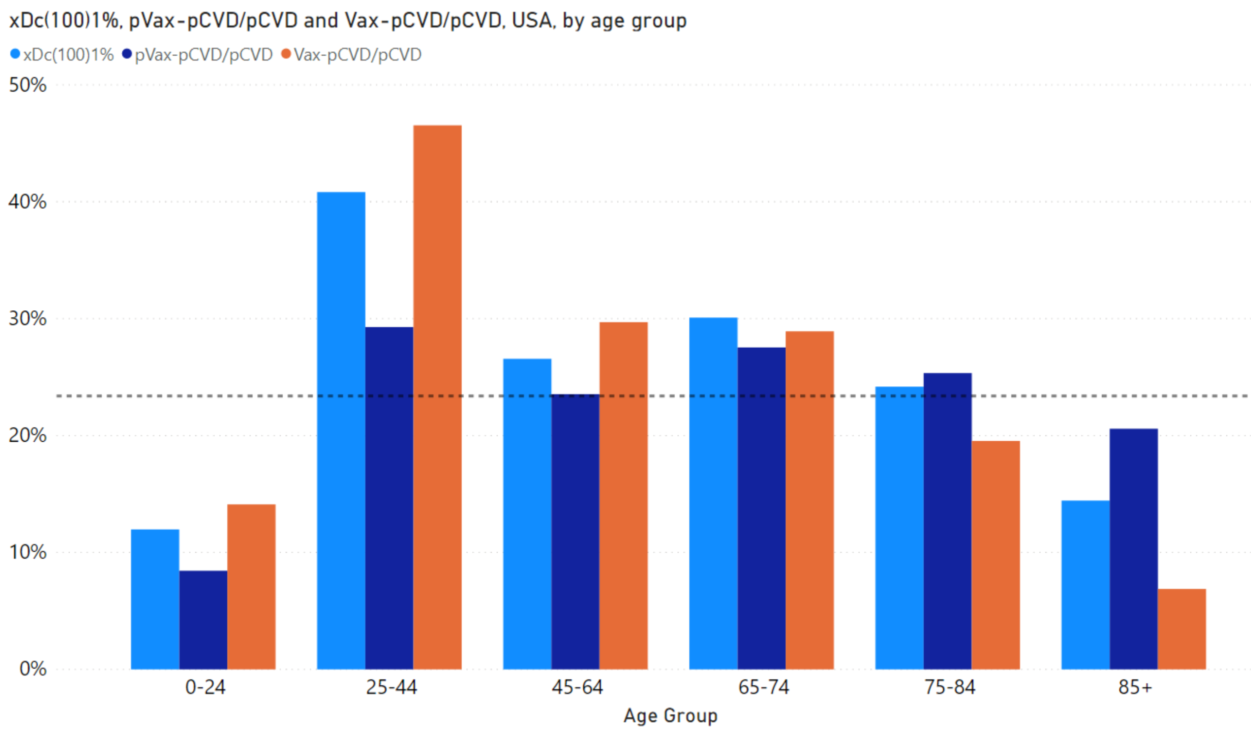


Figure 15. Excess mortality of the covid period (xDc(100)1%) (light-blue), of the pre-vaccination period of the covid period (pVax-pCVD/pCVD) (dark blue) and of the vaccination period of the covid period (Vax-pCVD/pCVD) (orange) in the USA, as percentages of the pre-covid-period mortality, by age group. The constant dashed line represents the value of xDc(100)1% for the whole USA. ACM data were retrieved from CDC (CDC, 2022b), as described in Table 1. xDc(100)1%, pVax-pCVD/pCVD and Vax-pCVD/pCVD are calculated from Equation 7, Equation 9 and Equation 10, respectively.

The excess mortality in the pre-vaccination period of the covid period is relatively lower than the excess mortality in the vaccination period of the covid period and lower than the excess mortality of the covid period for the younger age groups (0-24, 25-44, 45-64, 65-74) (Figure 15). The opposite is true for the older ages (75-84, 85+ years) (Figure 15). This qualitative difference can be interpreted as possibly associated to the vaccination program, along the lines discussed above (Figure 10; Figure 11), in relation to the late-summer-2021 peak and the synchronous modest stepwise increase in cumulative vaccine dose delivery (administered). However, it is also possible that the said qualitative difference results instead (or concomitantly) as being due to the impacts of cumulative socio-economic pressures. Younger adults will have more resilience than older adults, such that the deadly toll of life-changing circumstances will take longer to materialize.

Next, we look at the excess mortality in the pre-vaccination period of the covid period and in the vaccination period of the covid period at the state level.

3.3.4. Excess mortality of the pre-vaccination and vaccination periods of the covid period, by state

Figure 16 shows USA maps of the covid-period pre-vaccination-period relative excess mortality (pVax-pCVD/pCVD) (Panel A) and of the covid-period vaccination-period relative excess mortality (Vax-pCVD/pCVD) (Panel B), as relative changes in percentages of the pre-covid-period mortality by state.

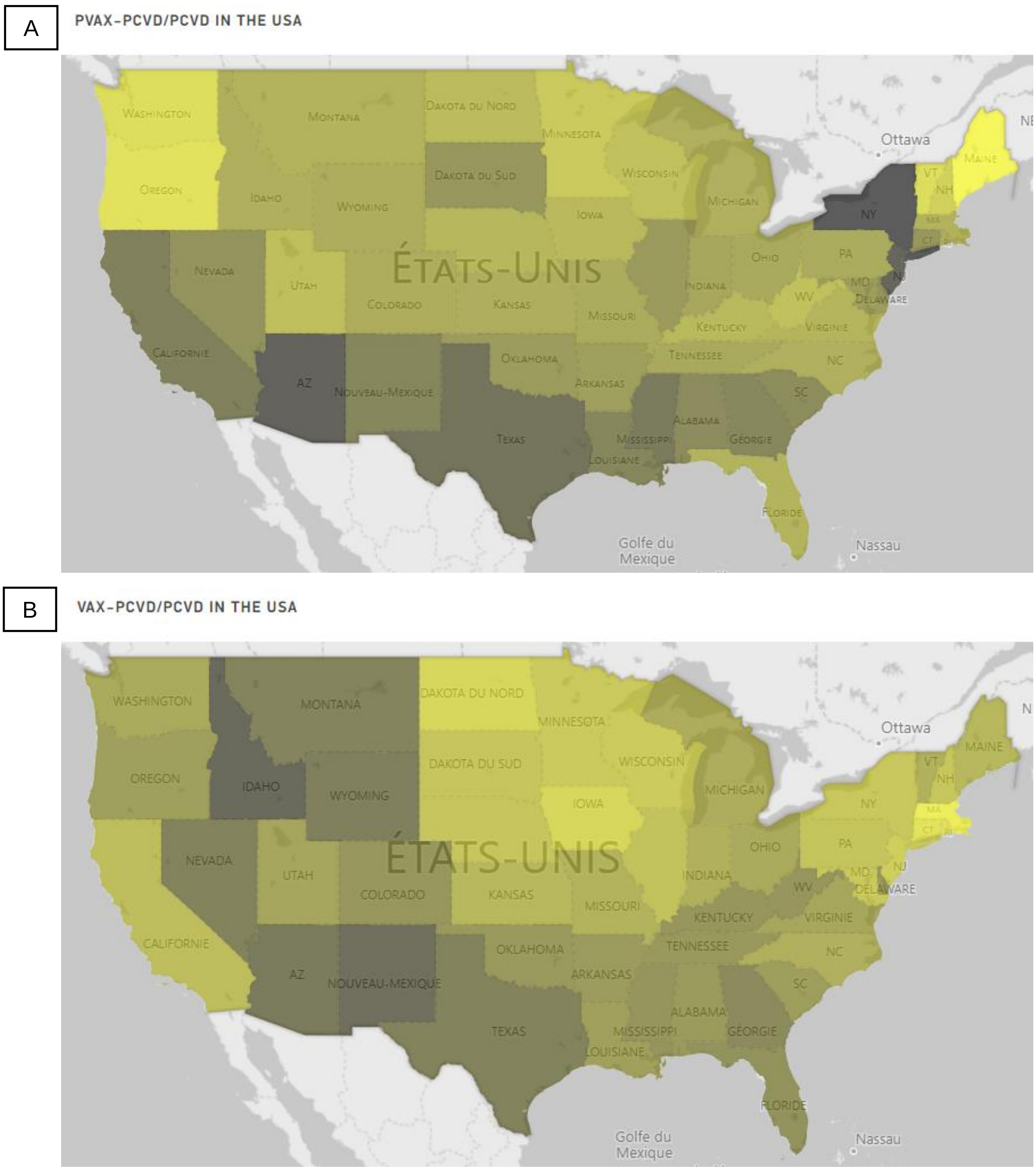


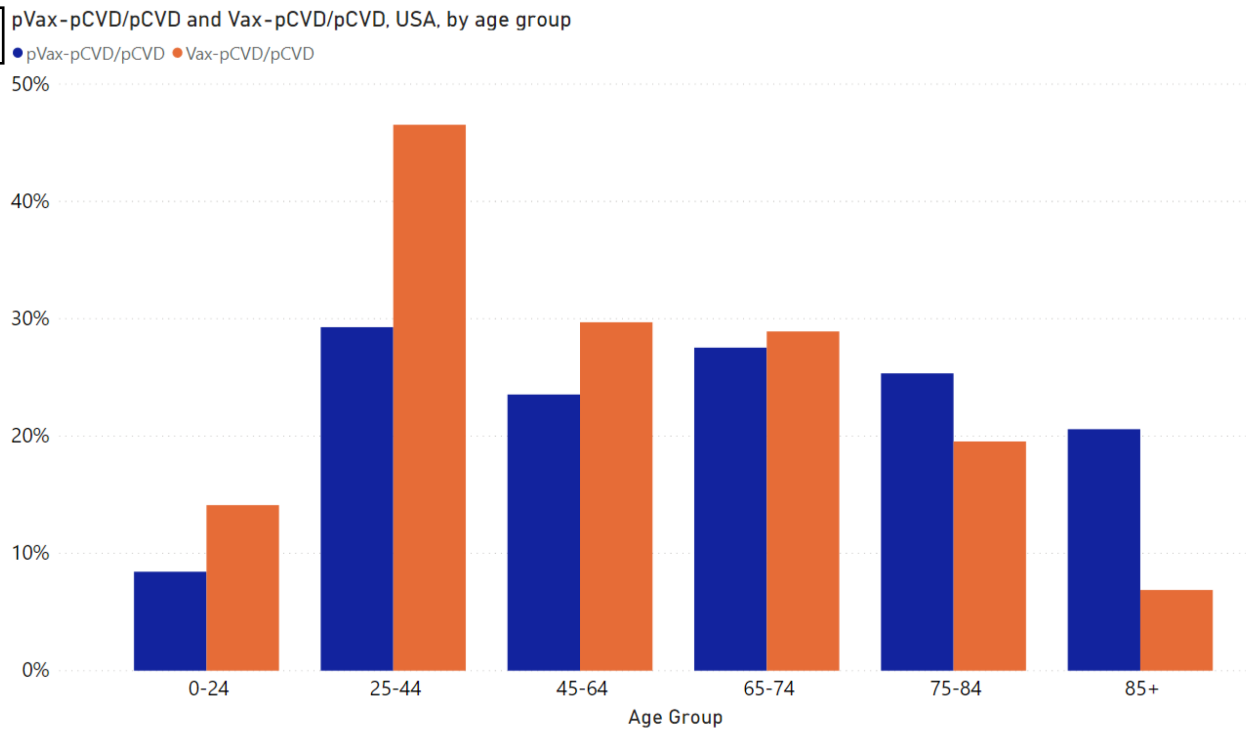
Figure 16. Maps of the excess mortality in the pre-vaccination period of the covid period (panel A) and in the vaccination period of the covid period (panel B) in the USA, as percentages of the pre-covid-period mortality. Alaska and Hawaii are excluded. The darker the color (black), the more intense is the relative change. ACM data were retrieved from CDC

(CDC, 2022b), as described in Table 1. pVax-pCVD/pCVD and Vax-pCVD/pCVD are calculated from Equation 9 and Equation 10, respectively.

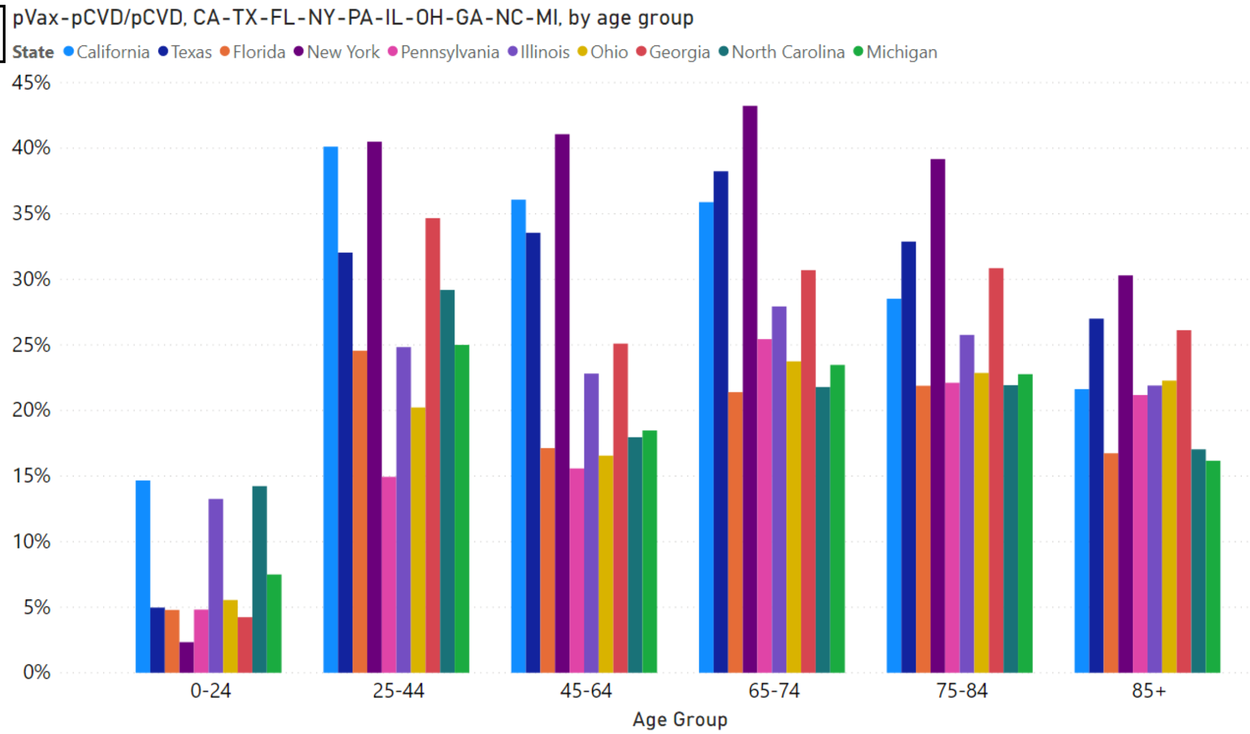
Figure 16 shows a striking “positive-negative” effect in which many states that have relatively large relative mortality in the first half of the covid period (Panel A) have a relatively small relative mortality in the second half of the covid period (Panel B), and *vice versa*. This suggests a long-term (2 year) “dry tinder effect” in which vulnerable populations are decimated early or late during the 100-week covid period, but that once decimated cannot be re-decimated.

Figure 17 shows the covid-period pre-vaccination-period excess mortality (Equation 9) and the covid-period vaccination-period excess mortality (Equation 10) as percentages of the pre-covid-period mortality by age group, for the whole USA (Panel A), and for the ten most populous states (Panels B and C), ordered from the most populous to the less populous (US Census Bureau, 2022a): California, Texas, Florida, New York, Pennsylvania, Illinois, Ohio, Georgia, North Carolina and Michigan.

A



B



C

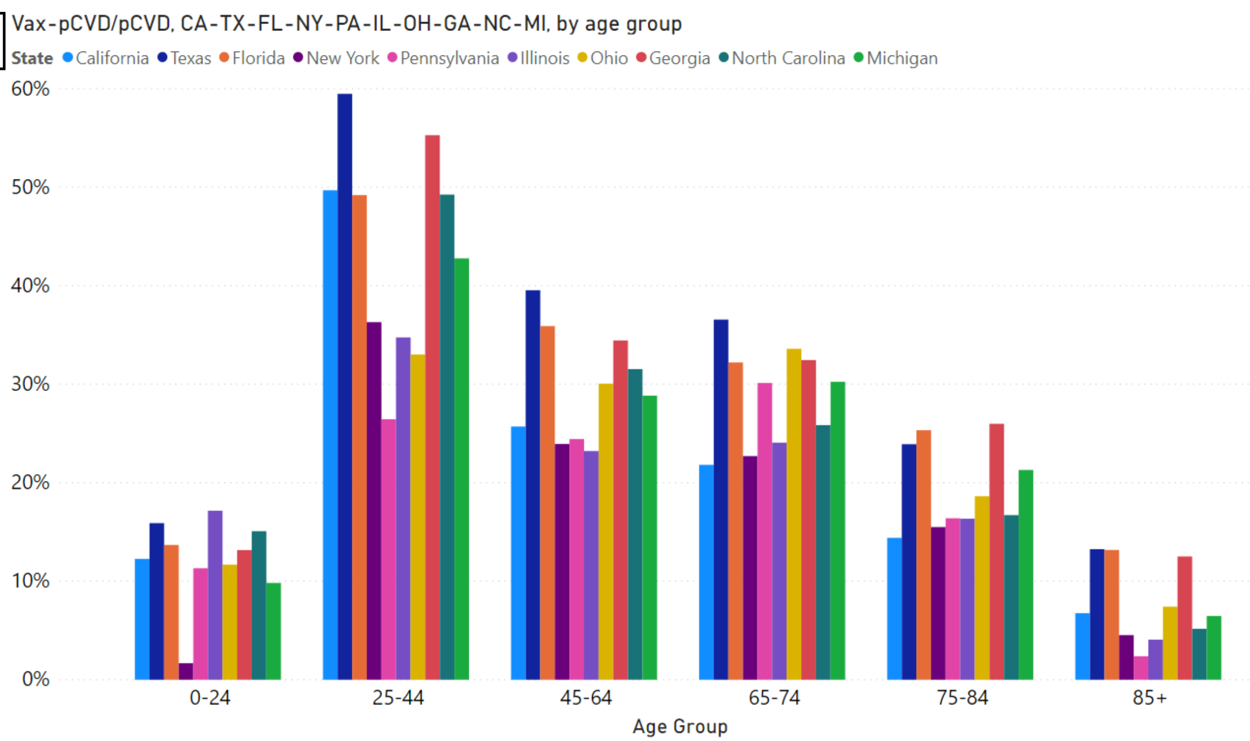


Figure 17. Excess mortality in the pre-vaccination period of the covid period (pVax-pCVD/pCVD) and in the vaccination period of the covid period (Vax-pCVD/pCVD) in the USA (Panel A) and in the ten most populous states of the USA (from left to right in each band: California, Texas, Florida, New York, Pennsylvania, Illinois, Ohio, Georgia, North

Carolina, Michigan) for the pre-vaccination period of the covid period (Panel B) and for the vaccination period of the covid period (Panel C), as percentages of the pre-covid-period mortality, by age group. ACM data were retrieved from CDC (CDC, 2022b), as described in Table 1. pVax-pCVD/pCVD and Vax-pCVD/pCVD are calculated from Equation 9 and Equation 10, respectively.

Figure 15 and Figure 17 strikingly illustrate a large systematic change in going between the pre-vaccination period of the covid period (first 50 weeks) and the vaccination period of the covid period (second 50 weeks): The age structure of relative excess mortality changes significantly, from being largely uniform with age (pre-vaccination) to being highly weighted towards young adults (vaccination).

Regarding the evident change in age structure of the relative mortality in going from the pre-vaccination period of the covid period into the vaccination period of the covid period (Figure 17), the same possible interpretations apply as discussed above for Figure 15: The said change in age structure can be interpreted as possibly associated to the vaccination program, along the lines discussed above (Figure 10; Figure 11), in relation to the late-summer-2021 peak and the synchronous modest stepwise increase in cumulative vaccine dose delivery (administered). However, it is also possible that the said change in age structure results instead (or concomitantly) as being due to the impacts of cumulative socio-economic pressures. Younger adults will have more resilience than older adults, such that the deadly toll of life-changing circumstances will take longer to materialize. Both of these hypotheses (resilience in youth and vaccine assault of vulnerable-group individuals), in turn, are consistent with the fact that the prevalence of serious mental illness is large and highly skewed towards young adults in the USA (NIMH, 2022).

In the next section, we explore the differential integrated mortality between the vaccination and pre-vaccination periods of the covid period at the state level.

3.3.5. Difference of vaccination and pre-vaccination mortality in the covid period, by age group and by state

For a given age group and state, we calculate the difference (Vax-pVax) between integrated mortality in the vaccination period of the covid period (w50c) and integrated mortality in the pre-vaccination period of the covid period (w50c-1):

$$\text{Vax-pVax} = \text{w50c} - \text{w50c-1} \qquad (11)$$

This difference (Vax-pVax) normalized by the pre-covid-period integrated mortality (w50c-2) is:

$$\text{Vax-pVax/pCVD} = (\text{w50c} - \text{w50c-1}) \ / \ \text{w50c-2}, \text{ expressed as a percentage,} \qquad (12)$$

Table 5 contains the calculated difference in mortality between the vaccination and pre-vaccination periods of the covid period (Vax-pVax), for each age group for the USA, and for the entire USA ("Total"), and the relative change also, as percentages of the pre-covid-period reference values (w50c-2).

Age Group	w50c	w50c-1	w50c-2	Vax-pVax	Vax-pVax/pCVD
0-24	61 336	58 285	53 751	3 051	5,68 %
25-44	199 698	176 183	136 281	23 515	17,25 %
45-64	668 308	636 579	515 280	31 729	6,16 %
65-74	692 322	684 913	537 036	7 409	1,38 %
75-84	791 625	830 068	662 236	-38 443	-5,81 %
85+	893 194	1 007 727	835 708	-114 533	-13,70 %
Total	**3 306 483**	**3 393 755**	**2 740 292**	**-87 272**	**-3,18 %**

Table 5. Difference of vaccination and pre-vaccination mortality in the covid period in the USA, by age group. w50c is the total deaths during the vaccination period of the covid period (from week-8 of 2021 to week-5 of 2022, included). w50c-1 is the total deaths during the pre-vaccination period of the covid period (from week-11 of 2020 to week-7 of 2021, included). w50c-2 is the total deaths during the pre-covid period (from week-13 of 2019 to week-10 of

2020, included). Vax-pVax corresponds to the difference between the vaccination-period mortality and the pre-vaccination-period mortality, calculated from Equation 11. Vax-pVax/pCVD corresponds to the relative change, as percentage of the pre-covid-period mortality, calculated from Equation 12. ACM data were retrieved from CDC (CDC, 2022b), as described in Table 1.

Equivalents to Table 5Table 4 for each of the states of the USA can be found in Appendix A.

In the covid period, vaccination-period ACM is greater than pre-vaccination-period ACM for younger people, and smaller for older people (Table 5). In terms of deaths predominantly caused by the vaccines, this would be opposite to the known exponential increase with age of vaccine-associated deaths (Hickey and Rancourt, 2022).

Figure 18 shows a USA map of the state-wise difference between vaccination and pre-vaccination mortality (Vax-pVax), as relative changes in percentage of the pre-covid-period mortality (Vax-pVax/pCVD).

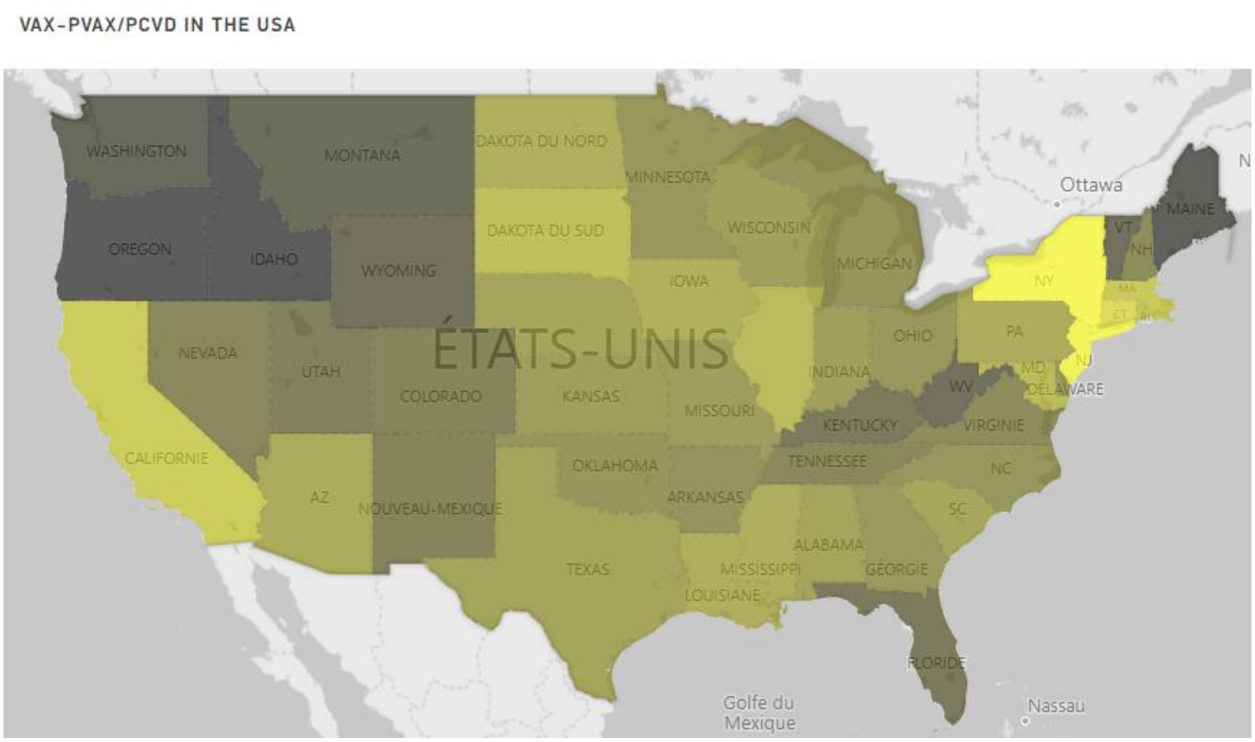


Figure 18. Map of the difference of vaccination and pre-vaccination mortality in the covid period in the USA, as percentages of the pre-covid-period mortality. Alaska and Hawaii are

excluded. The darker the color (black or yellow), the more intense is the relative change (positive or negative, respectively). ACM data were retrieved from CDC (CDC, 2022b), as described in Table 1. Vax-pVax/pCVD is calculated from Equation 12.

Figure 18 is a geographical representation of where (by state) the differences between the mortality per pre-covid mortality (pCVD) of the first half of the covid period (pVax; pre-vaccination period) and the second half of the covid period (Vax; vaccination period) are largest, both negative (pVax > Vax; darkest yellow) and positive (Vax > pVax; darkest grey). The known initial hot spots of New Jersey and New York are bright yellow, whereas the states with comparatively large late-covid-period mortality show up in dark grey: Maine, Oregon, Idaho, Washington, Florida…

In our view, it is not tenable to propose that the structure represented in Figure 18 arises from the national vaccination campaign as the dominant causal factor. There is no logical reason to propose, as the dominant excess-mortality-determining factor, that the vaccines saved lives in the states that have the largest initial (first 50 weeks of the covid period) mortality per capita or per pre-covid mortality and/or caused massive mortality per capita or per pre-covid mortality in the states that had relatively small initial covid-period mortality per capita. However, the map (Figure 18) does suggest a “dry tinder effect” for vulnerable populations, over the course of approximately two years under covid-period conditions, as discussed above for Figure 16.

Figure 19 shows the Vax-pVax/pCVD (Equation 12) values from Table 5 by age group, for the whole USA (Panel A), and for the ten most populous states (Panel B), ordered from the most populous to the less populous (US Census Bureau, 2022a): California, Texas, Florida, New York, Pennsylvania, Illinois, Ohio, Georgia, North Carolina and Michigan. The horizontal dashed line represents the value for the whole USA (all ages and all states).

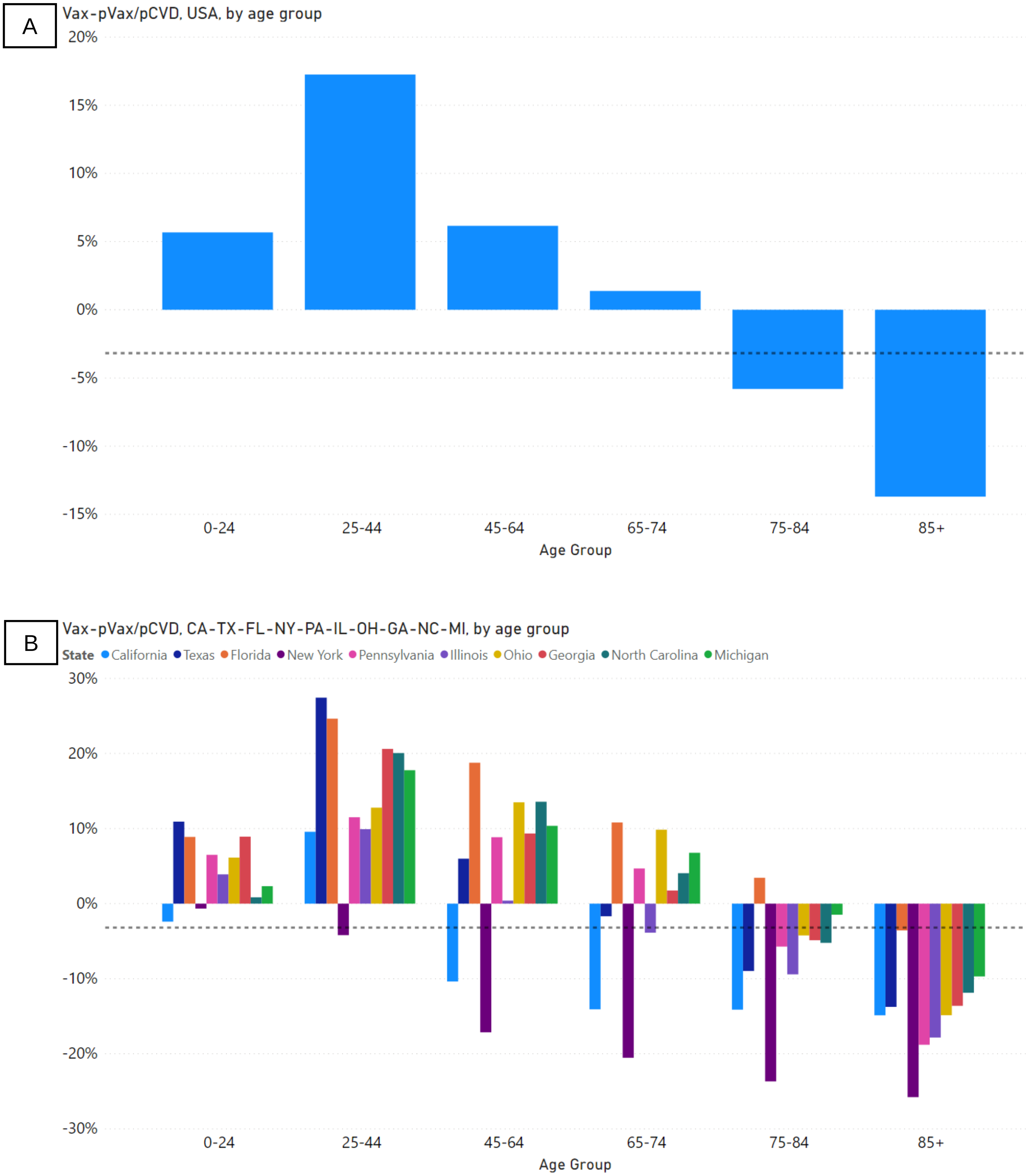


Figure 19. Difference of vaccination and pre-vaccination mortality in the covid period in the USA (panel A) and in the ten most populous states of the USA (from left to right in each band: California, Texas, Florida, New York, Pennsylvania, Illinois, Ohio, Georgia, North Carolina, Michigan) (panel B), as percentages of the pre-covid-period mortality, by age group. The constant dashed line represents the value for the whole USA. ACM data were

retrieved from CDC (CDC, 2022b), as described in Table 1. Vax-pVax/pCVD is calculated from Equation 12.

Figure 19 is another way (by difference) to illustrate the dramatic change in age structure of relative (i.e., age-group specific) excess mortality from being largely uniform with age (pre-vaccination) to being highly weighted towards young adults (vaccination), which is shown in Figure 17.

Figure 19 shows that more young adults died (relative to their population or to their pre-covid death rate) in the second half (Vax) of the covid period relative to the first half (pVax) of the covid period, for most states and for the whole USA. This is consistent with a long-term (2-year) “dry tinder effect” for elderly populations, and greater resilience against the assault of the covid-period conditions for younger populations, such as to take longer for mortality to be experienced in younger residents. It is also consistent with the hypothesis that immunocompromised young adults were captured by the vaccination campaign, including the so-called “vaccine equity” programs, which would also explain the large late-summer-2021 ACM peak for young adults discussed above. Both of these hypotheses, in turn, are consistent with the fact that the prevalence of serious mental illness is large and highly skewed towards young adults in the USA (NIMH, 2022).

Therefore, from all of the above, it does not appear that the USA vaccination campaign has had a dominant impact, positive or negative, on integrated all-cause mortality, although it may have participated or predominantly caused the change in age structure of mortality risk, and may have contributed to maintaining a large covid-period ACM. The changes in mortality per pre-covid mortality, which occur between the first (pVax) and second (Vax) halves of the covid period may be due to temporal changes in both quantity (“dry tinder effect”) and quality (age, resilience) of the vulnerable populations during a sustained covid-period assault on living conditions, and may have been significantly modulated by vaccine-campaign capture of immunocompromised young adults from vulnerable groups. In order to explore these hypotheses, regarding vulnerable groups, we next quantify excess mortality per capita for the entire 100-week covid period and examine its correlations with various socio-economic factors, in the following section.

3.4. Associations of excess mortality of the covid period with socio-geo-economic variables

In our previous article (Rancourt, Baudin and Mercier, 2021b), we described associations of integrated excess (with respect to an extrapolated summer baseline mortality) all-cause mortality per capita in anomalous features (cvp1, smp1, cvp2, smp2) of all-cause mortality by time in the covid period with socio-geo-economic and climatic parameters:

> "[…] we have shown is that, in the COVID-era, during summer-2020 (smp1), fall-winter-2020-2021 (cvp2) and summer-2021 (smp2), combined factors including poverty, obesity and hot climate became deadly associations for excess (above-SB) deaths, beyond the deaths that would have occurred from the pre-COVID-era background of preexisting risk factors."

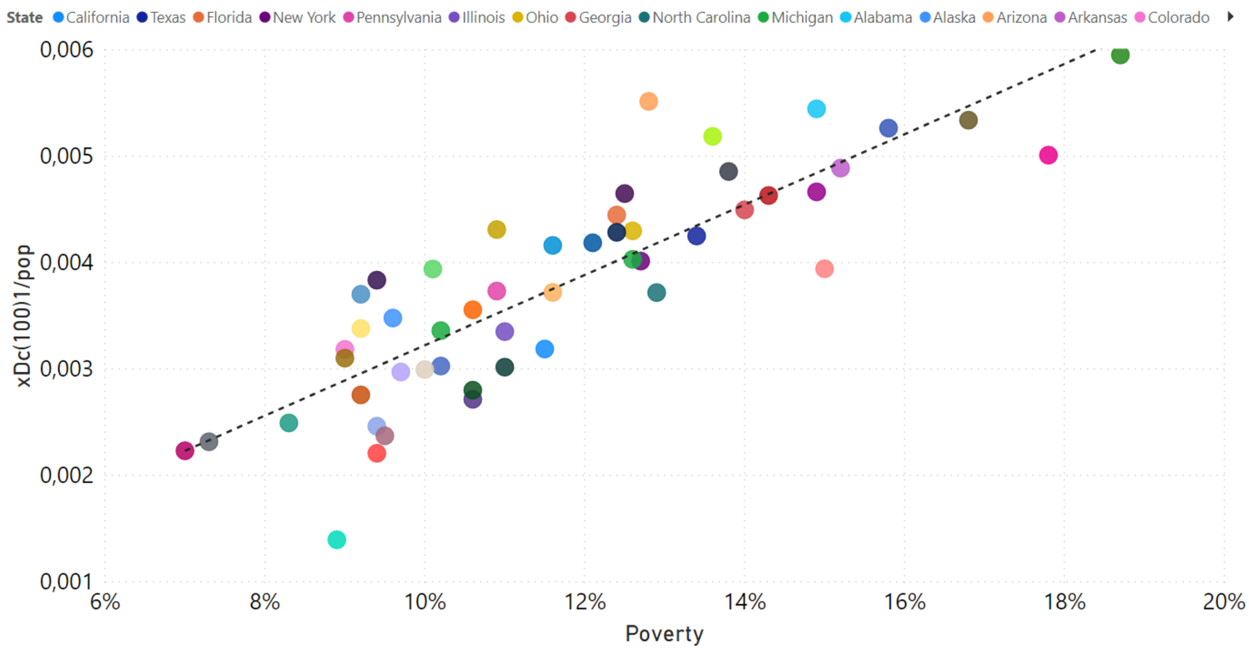
Therefore, here again we examine associations with such factors.

The following factors normalized by state population are tested against the quantified excess mortality of the covid period (xDc(100)1) normalized by the state population:

- Poverty
- Median Household Income (MHI)
- Obesity
- Population aged 65 and over (and 75+, and 85+)
- Supplemental Security Income (SSI)
- Social Security Disability Insurance (SSDI)
- Disability

Figure 20 shows the scatter plot for poverty (on two different scales, A and B), defined as the estimated percentage of the population of people of all ages living in poverty (US Census Bureau, 2022b). The Y-axis is the fraction xDc(100)1/pop, the 100-week covid-period excess mortality by population, which is the "100-week covid-period fatality ratio" for the USA population.

A



B

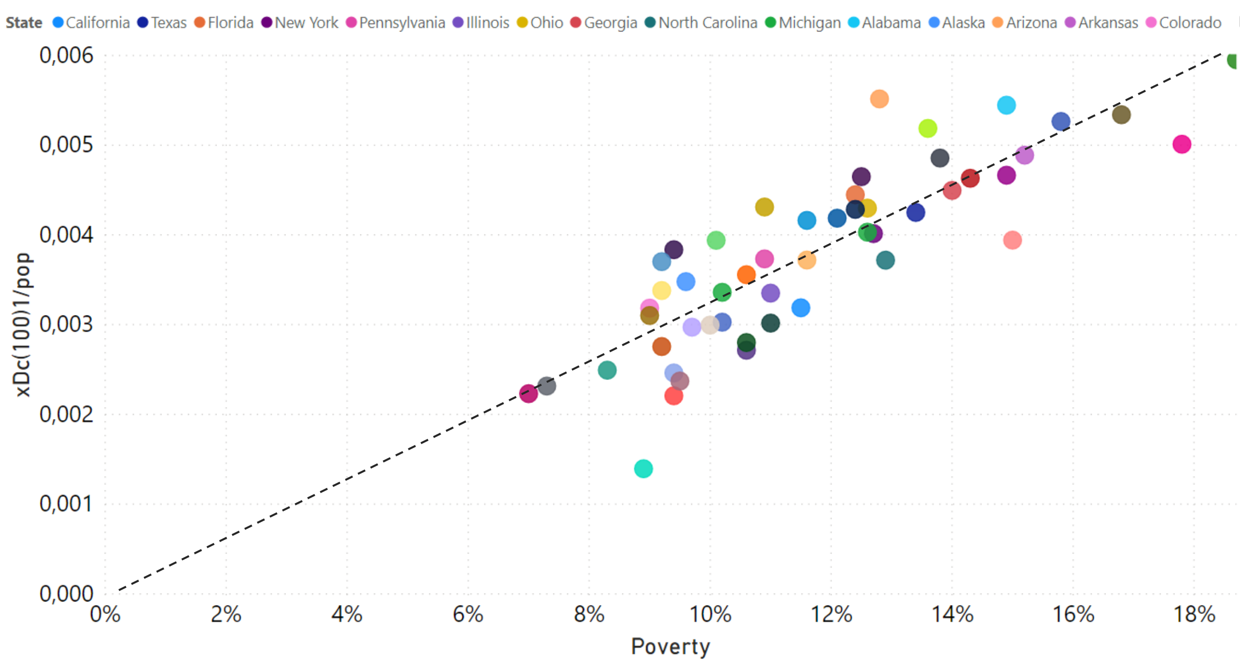


Figure 20. Excess mortality of the covid period normalized by population versus poverty in the USA. The axes are optimized for the dataset (Panel A) and for the intercept between trend line and X-axis (Panel B). Each point is for one state of the USA. The parameters of the least squares fitted linear trend line are given in Table 6. The color-code of the 51 states is shown in section 2. Data were retrieved as described in Table 1. xDc(100)1 is calculated from Equation 5.

Figure 20 is a striking result. Such a result is rarely so clear in epidemiological studies. The Pearson correlation coefficient is r = +0.86 (Table 6). Beyond this "very strong" correlation, we note that the least squares fitted straight line passes virtually through the origin (Table 6), implying that the integrated excess mortality per capita per state for the whole 100-week covid period (i.e., what we have termed the "100-week covid-period fatality ratio" for the USA population) is directly proportional to poverty of the state, not merely very strongly correlated to poverty. Such proportionality suggests a fundamental relationship, which is causal in nature; in which poverty captures or is an accurate proxy for the dominant factor or factors that determine mortality arising from all the conditions occuring during the covid period.

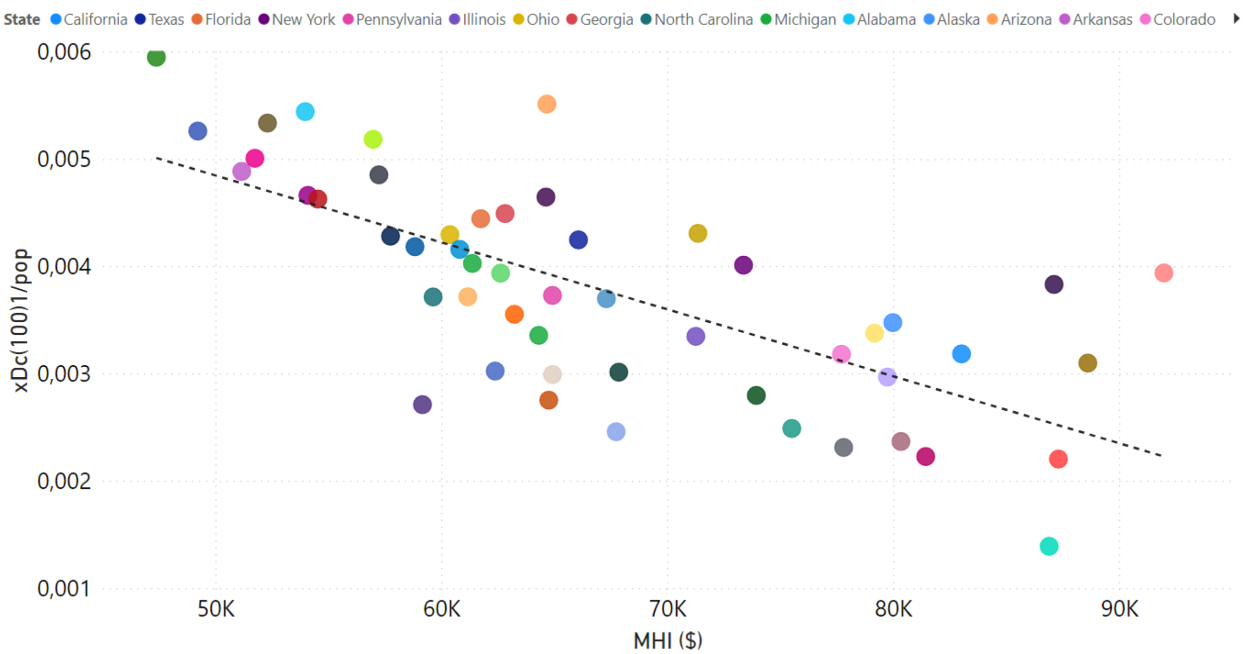
The said proportionality (Figure 20) means that a state with zero poverty would have experienced zero excess mortality in the 100-week covid period, and that doubling state-wise poverty (the fraction of state residents living in poverty) doubles excess mortality in the 100-week covid period, for example.

Furthermore, we note that it is unlikely that this strong epidemiological relationship with poverty arises from a viral respiratory disease. The classic development of a viral respiratory disease, leading to death, is one in which the infection fatality ratio is approximately exponential with age, with the main co-factors being comorbidity, not economic hardship itself, irrespective of age. There is no known viral respiratory disease in which the pathogen targets poverty, while being insensitive to age (see scatter plot versus age of the state population, Figure 23 below).

Figure 21 shows the scatter plot for median household income (MHI) (on two different scales, A and B), defined as the estimated median household income in US dollars (US

Census Bureau, 2022b). The Y-axis is the fraction xDc(100)1/pop, the 100-week covid-period excess mortality by population, which is the “100-week covid-period fatality ratio” for the USA population.

A



B

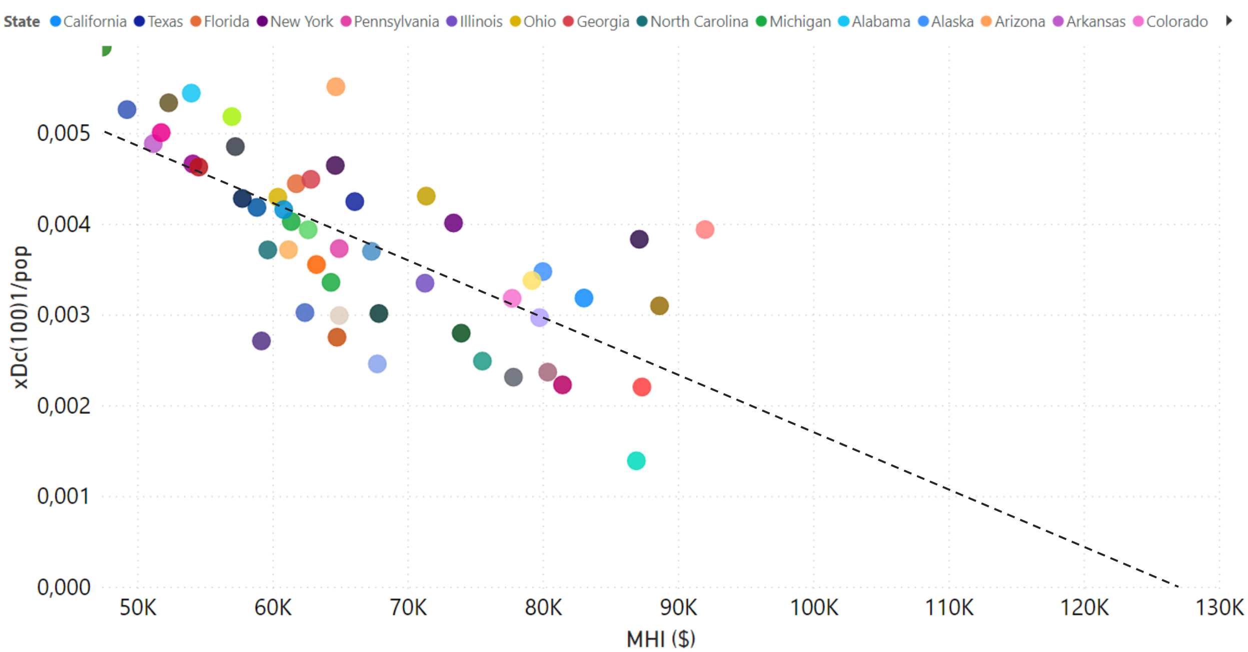


Figure 21. Excess mortality of the covid period normalized by population versus median household income (MHI) in the USA. The axes are optimized for the dataset (Panel A) and for the intercept between trend line and X-axis (Panel B). Each point is for one state of the USA.

The parameters of the least squares fitted linear trend line are given in Table 6. The color-code of the 51 states is shown in section 2. Data were retrieved as described in Table 1. xDc(100)1 is calculated from Equation 5.

Here, the Pearson correlation coefficient is r = −0.71 (“strong”) (Table 6). The graph (Figure 21) suggests that a USA state with a MHI of approximately $130K or more would have zero excess mortality integrated over the 100-week covid period. Likewise, the states with smallest MHI attain a “100-week covid-period fatality ratio” of approximately 0.005, or 0.5%, which is very large, since this is over and above non-covid-induced mortality for such states.

Income (Figure 21) and poverty (Figure 20) are clearly determinative factors predicting excess 100-week covid-period mortality in a state of the USA, occuring since a pandemic was announced on 11 March 2020 by the WHO.

Figure 22 shows the scatter plot for obesity, defined as the prevalence of self-reported obesity among U.S. adults (CDC, 2021). The Y-axis is the fraction xDc(100)1/pop, the 100-week covid-period excess mortality by population, which is the “100-week covid-period fatality ratio” for the USA population.

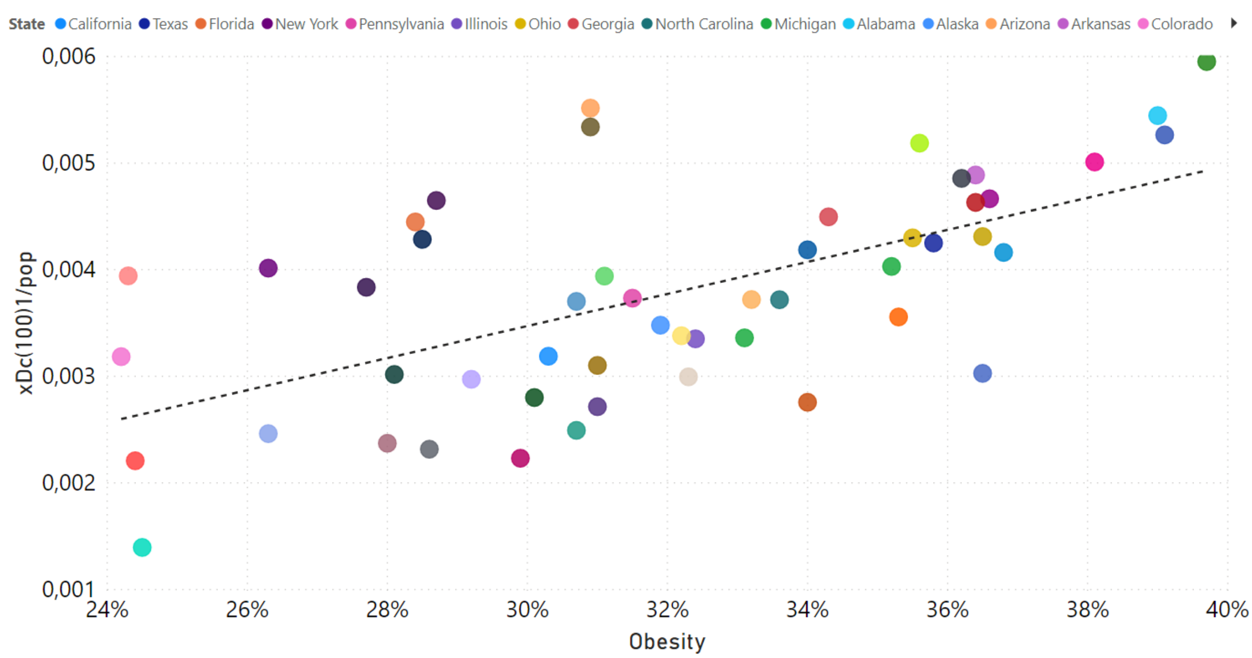


Figure 22. Excess mortality of the covid period normalized by population versus obesity in the USA. Each point is for one state of the USA. The parameters of the least squares fitted linear trend line are given in Table 6. The color-code of the 51 states is shown in section 2. Data were retrieved as described in Table 1. xDc(100)1 is calculated from Equation 5.

Here the positive correlation is “strong”, although less than for MHI, at r = +0.62 (Table 6). The least squares fitted straight line suggests that a USA state that would have an obesity rate of approximately 7% or less would have zero excess 100-week covid-period mortality. This implies that certain groups of obese residents do not contribute to 100-week covid-period excess mortality, presumably wealthy obese residents, for example.

Figure 23 shows the scatter plot for the proportion of the population aged 65 years old and over. The Y-axis is the fraction xDc(100)1/pop, the 100-week covid-period excess mortality by population, which is the “100-week covid-period fatality ratio” for the USA population.

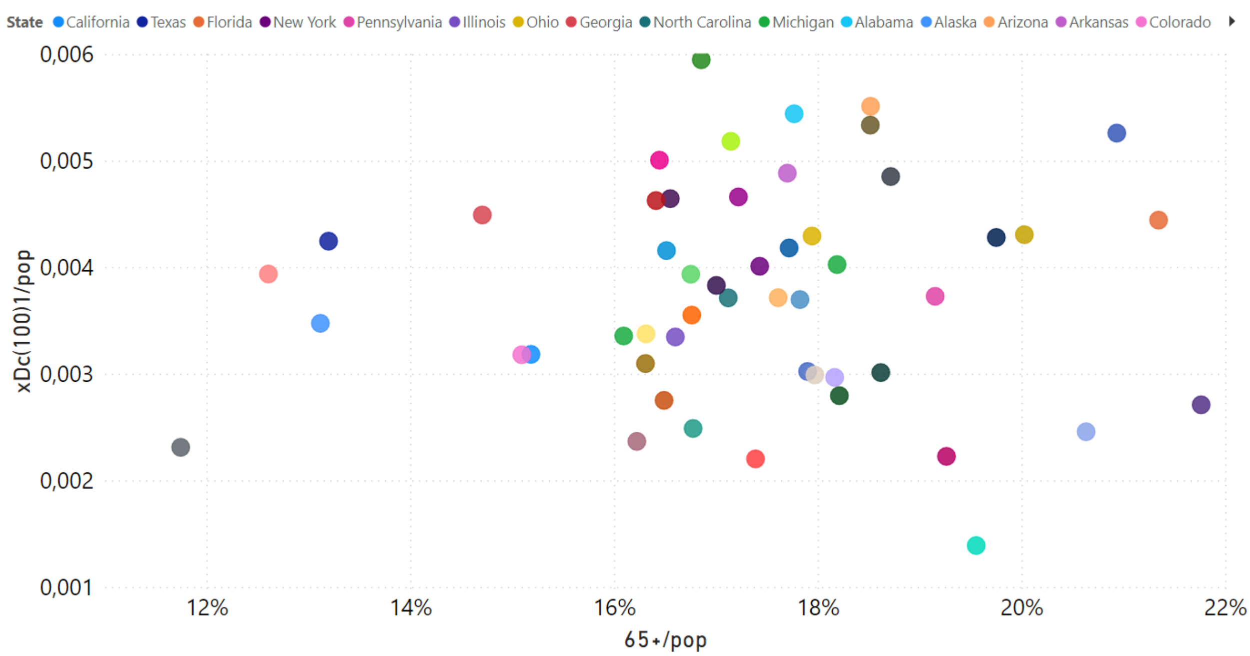


Figure 23. Excess mortality of the covid period normalized by population versus the proportion of people aged 65 and over in the USA. Each point is for one state of the USA. The color-code of the 51 states is shown in section 2. Data were retrieved as described in Table 1. xDc(100)1 is calculated from Equation 5.

There is no significant correlation (r = +0.046, “very weak”, Table 6). This is also true for the proportion of the population aged 75 years old and over (75+/pop) and for the proportion of the population aged 85 years old and over (85+/pop) (data not shown). Excess all-cause mortality of the 100-week covid period in the USA has no relation to old age, on a state-wise basis.

This lack of correlation with age again shows that the excess mortality is not consistent with having been caused by a viral respiratory disease, including COVID-19, since the known infection fatality ratios are exponential with age (Elo *et al.*, 2022; Sorensen *et al.*, 2022).

Other factors — which we did not consider in our previous article (Rancourt, Baudin and Mercier, 2021b) — are Supplemental Security Income (SSI) and Social Security Disability Insurance (SSDI). Those factors are state-provided benefits in case of disability or blindness (SSA, 2020). They can be interpreted as indicators or proxies for the proportion of frail populations in the USA. Whitaker (Whitaker, 2015) has interpreted that the majority of SSI and SSDI recipients can be classified as mentally disabled and receiving prescription psychiatric medication. He reports that some of these drugs are definitely associated with obesity. See also a current report about the prevalence of mental illness in the USA (NIMH, 2022).

Figure 24 shows the proportion of people receiving SSI versus the proportion of people receiving SSDI by state.

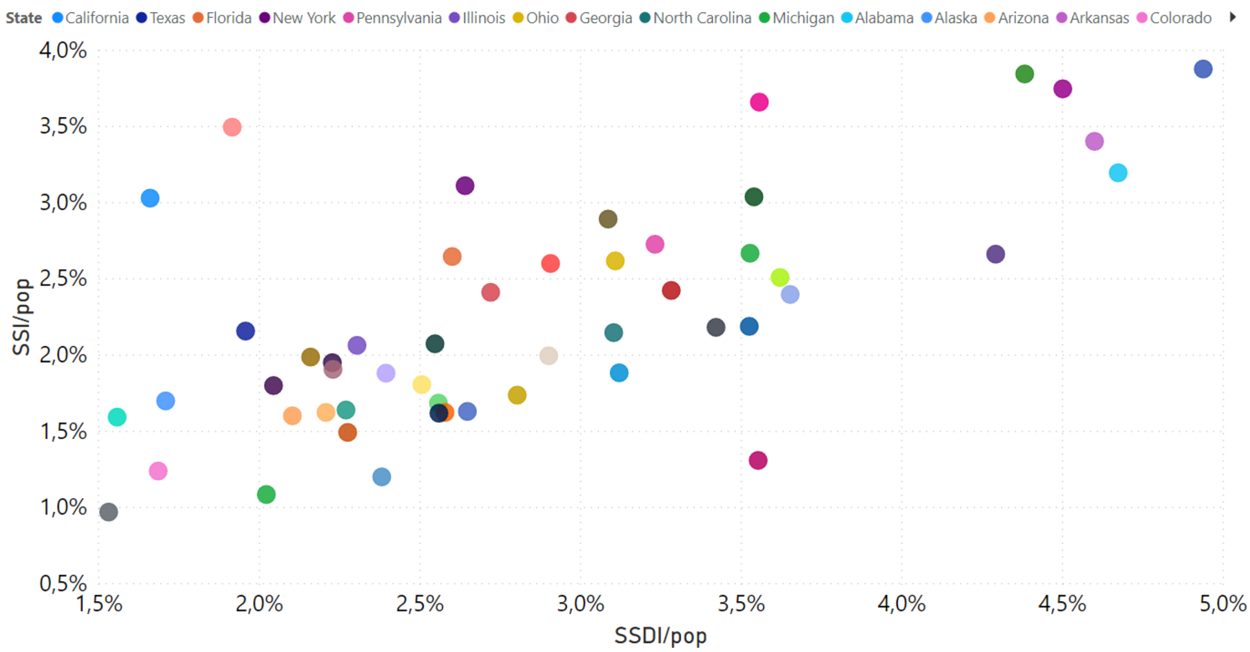


Figure 24. SSI recipients normalized by population versus SSDI recipients normalized by population in the USA. Each point is for one state of the USA. The color-code of the 51 states is shown in section 2. Data were retrieved as described in Table 1.

Although SSI and SSDI are independent programs, they are positively correlated to each other, showing that states that have more of one type of recipients also have more of the other type of recipients. Also, the two programs are not mutually exclusive, as some people called “concurrent” are eligible for both (SSA, 2020), and there is an approximately 10% overlap (data not shown).

Figure 25 shows the scatter plot for SSI recipients by population (SSA, 2022a). The Y-axis is the fraction xDc(100)1/pop, the 100-week covid-period excess mortality by population, which is the “100-week covid-period fatality ratio” for the USA population.

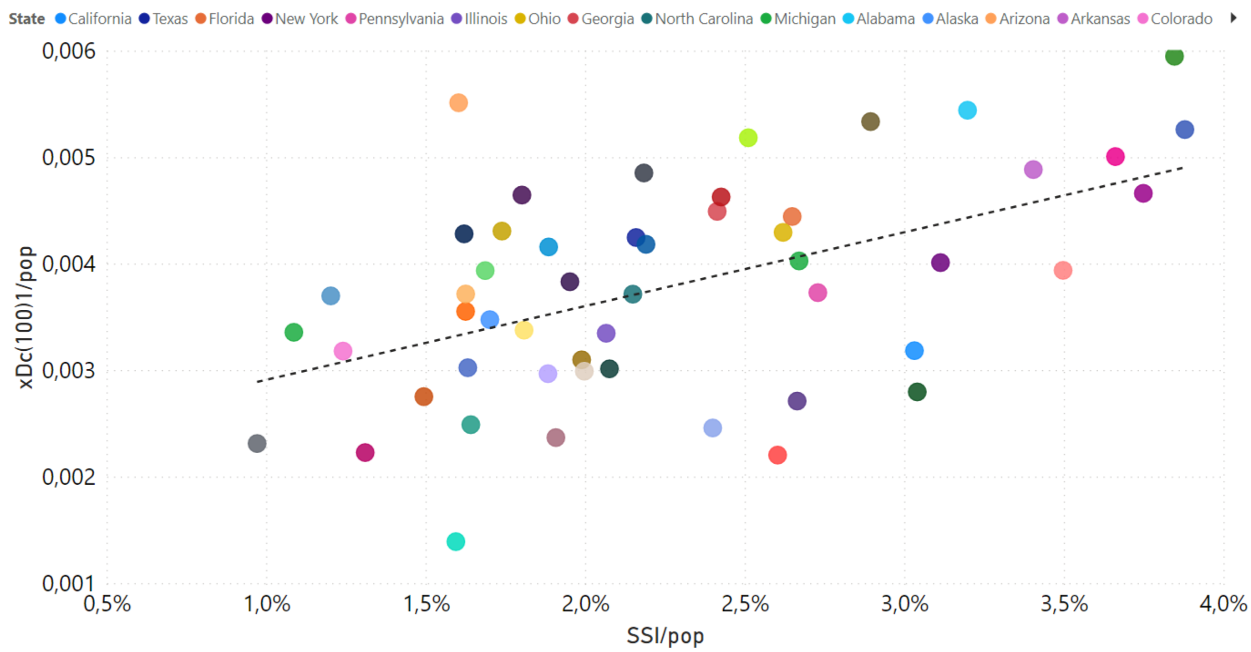


Figure 25. Excess mortality of the covid period normalized by population versus SSI recipients normalized by population in the USA. Each point is for one state of the USA. The parameters of the least squares fitted linear trend line are given in Table 6. The color-code of the 51 states is shown in section 2. Data were retrieved as described in Table 1. xDc(100)1 is calculated from Equation 5.

Here, the Pearson correlation coefficient is r = +0.51 ("moderate") (Table 6). The graph (Figure 25) suggests that a USA state with a SSI/pop of zero would nonetheless have a "100-week covid-period fatality ratio" of approximately 0.2%. This implies that the SSI population cannot account for all the excess mortality in the 100-week covid period: Other groups must also contribute to the said excess mortality.

Figure 26 shows the scatter plot for SSDI recipients by population, defined as the number of all disabled SSDI beneficiaries aged 18-64 (SSA, 2022b). The Y-axis is the fraction xDc(100)1/pop, the 100-week covid-period excess mortality by population, which is the "100-week covid-period fatality ratio" for the USA population.

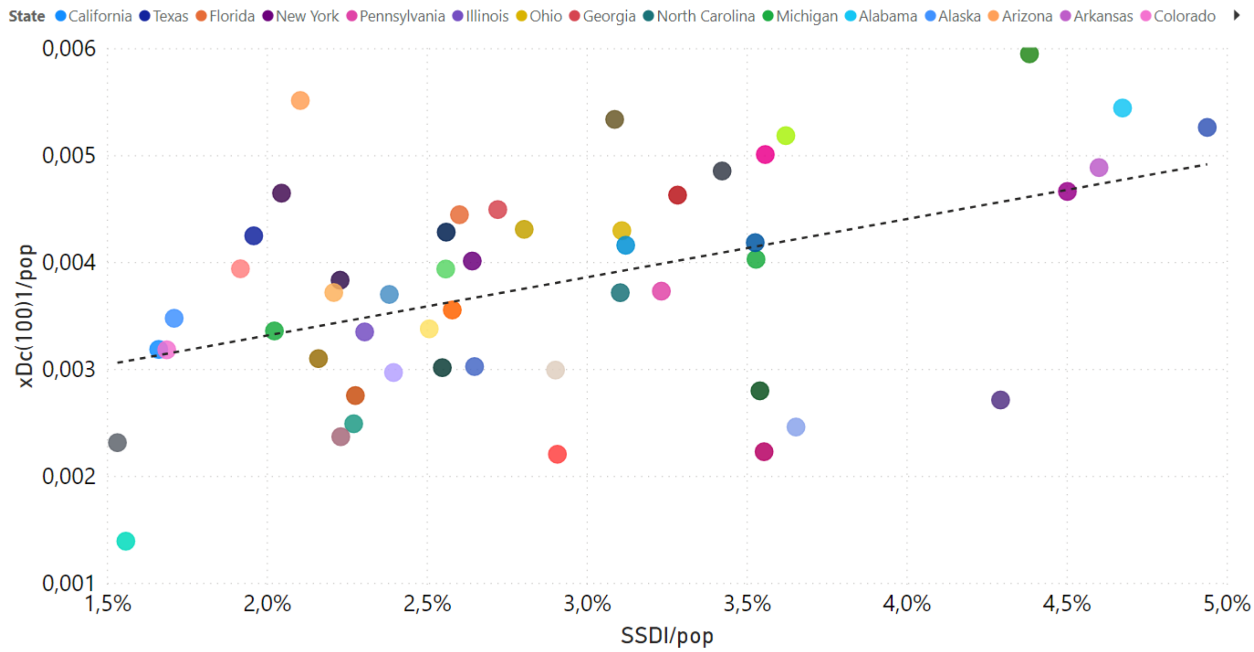


Figure 26. Excess mortality of the covid period normalized by population versus SSDI recipients normalized by population in the USA. Each point is for one state of the USA. The parameters of the least squares fitted linear trend line are given in Table 6. The color-code of the 51 states is shown in section 2. Data were retrieved as described in Table 1. xDc(100)1 is calculated from Equation 5.

Here, the Pearson correlation coefficient is r = +0.47 (“moderate”) (Table 6). The graph (Figure 26) suggests that a USA state with a SSDI/pop of zero would nonetheless have a “100-week covid-period fatality ratio” of approximately 0.2%. Like with the population of SSI recipients (Figure 25), this implies that the SSDI population cannot account for all the excess mortality in the 100-week covid period. Other groups must also contribute to the said excess mortality.

Figure 27 shows the scatter plot for disability, defined as the percentage of Americans living with a disability (Disabled World, 2020). Disability is defined as a long-lasting sensory, physical, mental, or emotional condition or conditions that make it difficult for a person to do functional or participatory activities such as seeing, hearing, walking, climbing stairs, learning, remembering, concentrating, dressing, bathing, going outside the home, or working at a job. The Y-axis is the fraction xDc(100)1/pop, the 100-week covid-period excess mortality by population, which is the “100-week covid-period fatality ratio” for the USA population.

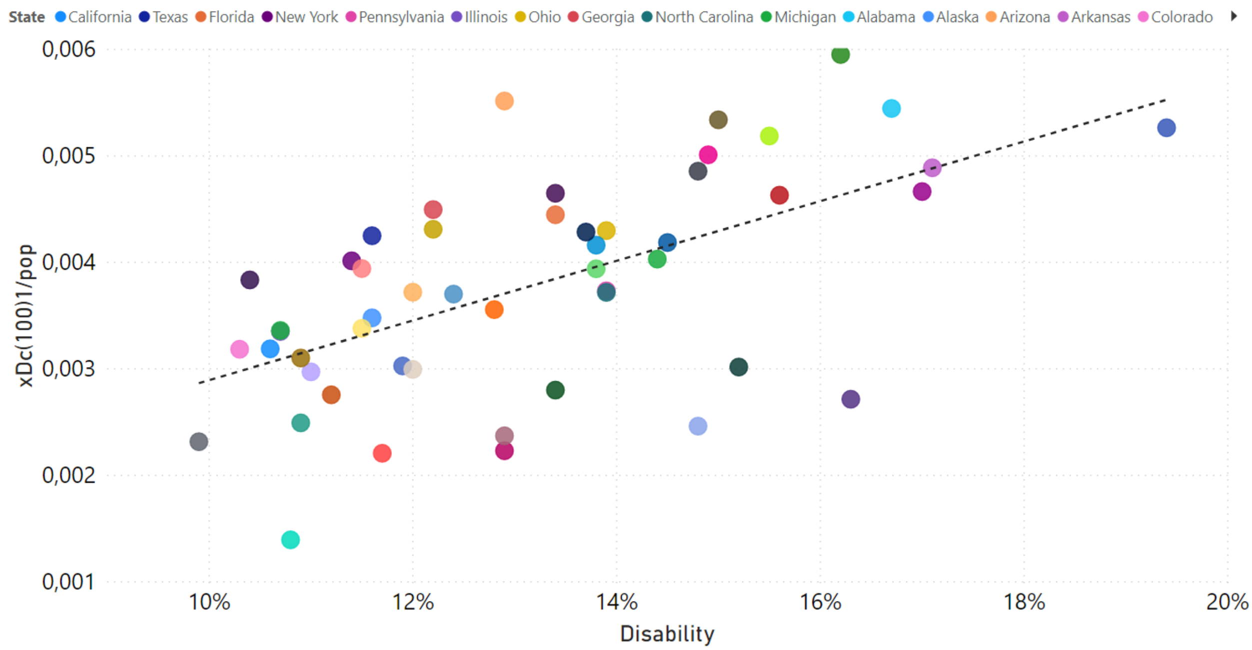


Figure 27. Excess mortality of the covid period normalized by population versus disability in the USA. Each point is for one state of the USA. The 8 apparent bottom outliers are: Hawaii, Massachusetts, New Hampshire, Washington, Rhode Island, Vermont, Oregon, and Maine. The color-code of the 51 states is shown in section 2. The parameters of the least squares fitted linear trend line are given in Table 6. Data were retrieved as described in Table 1. xDc(100)1 is calculated from Equation 5.

Here, the Pearson correlation coefficient is r = +0.59 (“moderate”) (Table 6). The graph (Figure 27) suggests that a USA state with no one living with a disability would have a near-zero “100-week covid-period fatality ratio” (estimated at 0.01%). This is similar to the situation with poverty (Figure 20), in that if there were no disabled persons in the USA, the excess ACM of the covid period would have been essentially zero.

Table 6 gives parameters of the correlations discussed above.

Factor (units)	Slope (units)	Intercept	Pearson coefficient (r)	Strength (Evans, 1996)
Poverty (%)	+0.0331 (per %)	-0.00008	+0.855	Very strong
MHI ($)	-6E-08 (per $)	+0.008	-0.706	Strong
Obesity (%)	+0.0152 (per %)	-0.0011	+0.618	Strong
65+/pop (%)	+0.0023 (per %)	+0.0034	+0.046	Negligible to very weak
SSI/pop (%)	+0.069 (per %)	+0.0022	+0.512	Moderate
SSDI/pop (%)	+0.0546 (per %)	+0.0022	+0.466	Moderate
Disability (%)	+0.028 (per %)	+0.0001	+0.590	Moderate

Table 6. Parameters of the least squares fitted straight lines for xDc(100)1/pop (Y-axis) versus Factor (X-axis), where xDc(100)1/pop is dimensionless. Here: xDc(100)1/pop = Slope x Factor + Intercept.

In this article, we did not apply a strict separation between sections, which would exclude any discussion of results in the Results section, in order to facilitate appreciation for the often novel features of the data being presented.

In the next section, we continue, organize and supplement our discussion of the above results.

4. Discussion

4.1. All-cause mortality in the covid period in the USA: Sudden onset and heterogeneity by state

The covid period in the USA discontinuously starts immediately after the WHO's 11 March 2020 declaration of a pandemic, and is a period exhibiting extraordinarily large and time-wise (by week, by month, by season) anomalous ACM, compared to the historic record since at least 1999 (Figure 1). The sudden discontinuity is synchronous everywhere that it occurs, and its occurrence (presence and magnitude) is highly heterogeneous across state, provincial, regional and national jurisdictions, in North America and Europe, where the best ACM by time data is available (Rancourt, 2020; Rancourt, Baudin and Mercier, 2020, 2021a, 2021b; Johnson and Rancourt, 2022).

Such a large discontinuity, into a qualitatively different long-term (2-year) regime of ACM behaviour, has previously not been observed in epidemiology, so clearly. The break occurs between two regimes of ACM, between two distinct types of mortality behaviours by time, by age group and in terms of heterogeneity by jurisdiction, and it occurs at or near the date (11 March 2020) of the WHO's declaration of a pandemic; which is the date at which hospital, care-home and public health protocols were discontinuously, somewhat permanently and broadly changed, while lockdowns (jurisdiction-wide shelter-in-place or stay-at-home orders) were often and heterogeneously (by state) applied soon after this same date (Johnson and Rancourt, 2022), accompanied by massive restructuring of local economic activity.

Rancourt (Rancourt, 2020) seems to have been the first to point out this discontinuity in ACM by time and to have associated it to the measures installed on or near 11 March 2020, rather than to a pandemic spread of a contagious disease. We have discussed this break in detail previously, following Rancourt, and further associated it with the imposed structural changes in the society and the economy (Rancourt, Baudin and Mercier, 2020, 2021a, 2021b).

The heterogeneity by jurisdiction of the ACM by time behaviour following the said discontinuity is a striking phenomenon compared to remarkably uniform behaviour of ACM by time across jurisdictions, indeed across continents (at mid-latitudes), in pre-covid time (before 11 March 2020) (Rancourt, Baudin and Mercier, 2020). One has to go back to 1918 to observe a possibly similar phenomenon, at a time when less data was available (Rancourt, Baudin and Mercier, 2021b). In the USA, there are particularly large state-to-state differences in ACM by time behaviour during the covid period, compared to very similar state-to-state behaviour in pre-covid time (Rancourt, Baudin and Mercier, 2021b). For example, Johnson and Rancourt (Johnson and Rancourt, 2022) find covid-period health-status-adjusted integrated ACM per capita to vary by approximately 20% from state to state for the covid period, while a state-to-state variation of only approximately 2% occurs for corresponding integration windows prior to 11 March 2020 (their Figure 7).

The USA state-wise heterogeneity in ACM behaviour is a further demonstration of the abrupt change in ACM regime that occurred on or near 11 March 2020. Given the complexities of the comparative behaviours between states, there is no substitute for showing the all-ages data for each of the states. This is done for the ACM/w data in Appendix A.

We previously showed that in the USA the ACM by time and by state jurisdiction in the covid period is contrary to the expected behaviour for a viral respiratory disease pandemic, and that the extra deaths, when and where they occur in the USA, were likely due to the government and medical responses, including constructive denial of treatment of an unprecedented bacterial pneumonia epidemic that predominantly affected poor and obese individuals living in hot-climate states (Rancourt, Baudin and Mercier, 2021b).

More specifically, we proposed the following interpretive scheme:

- The covid response and measures created stressful socio-economic, regulatory and institutional conditions. For example, studies report increased unemployment and worsening mental health (Czeisler *et al.*, 2020; Jewell *et al.*, 2020; Giuntella *et al.*, 2021). This would result in chronic psychological stress in many individuals, during the covid period.

- As we have discussed and reviewed previously (Rancourt, Baudin and Mercier, 2021a), chronic stress debilitates the immune system and is arguably the dominant determinant of individual health (Cohen, Tyrrell and Smith, 1991; Ader and Cohen, 1993; Cohen *et al.*, 1997; Sapolsky, 2005; Cohen, Janicki-Deverts and Miller, 2007; Dhabhar, 2014; Prenderville *et al.*, 2015). Furthermore, the molecular and physiological mechanisms for suppression of the immune system by experienced chronic stress are being elucidated more and more (Devi *et al.*, 2021; Udit, Blake and Chiu, 2022).
- In terms of assigning actual cause of death for covid-period excess mortality in the USA, we argued that bacterial pneumonia was a likely candidate, attacking vulnerable groups subjected to debilitating stress, during a massive pneumonia epidemic evident in the CDC data, combined with a dramatic drop in antibiotic prescriptions (Rancourt, Baudin and Mercier, 2021b). The said pneumonia epidemic is also seen, directly or indirectly, in other studies (Di Gennaro *et al.*, 2021; Bradley *et al.*, 2022).
- Further studies have since established a sustained drop in antibiotic prescriptions (e.g., (Buehrle *et al.*, 2021; King *et al.*, 2021; Kitano *et al.*, 2021; Van Laethem *et al.*, 2021, 2022; Gisselsson-Solen and Hermansson, 2022; Givon-Lavi *et al.*, 2022; Gottesman *et al.*, 2022; Knight *et al.*, 2022; Winglee *et al.*, 2022).

Those conclusions are supported by the present study, which has the added benefits of:

- month-wise time-resolved ACM by age group and by sex back to 1999;
- more recent consolidated week-wise time-resolved ACM, up to and including week-5 of 2022;
- closer examination by age group; and
- cumulative vaccine dose delivery data time-resolved by week, by injection series or status, by age group and by state.

In particular, the correlations between xDc(100)1/pop (the 100-week covid-period excess mortality by population, which is the "100-week covid-period fatality ratio" for the USA population) and poverty (Figure 20), median household income (MHI, Figure 21), obesity (Figure 22), SSI/pop (SSI recipients per population) (Figure 25), SSDI/pop (SSDI recipients per population) (Figure 26), disability (Figure 27), and the absence of significant correlations with population fractions of elderly residents (Figure 23, and above discussion) (Table 6), provide compelling support for the said conclusions. For example, the absence of significant correlations with population fractions of elderly residents (65+, 75+, or 85+ years) is incompatible with the reported exponential age-dependence of the COVID-19 infection fatality ratio (Elo *et al.*, 2022; Sorensen *et al.*, 2022), and contrary to all the studies finding that the dominant factors are age and age-associated comorbidities for viral respiratory diseases, including COVID-19. Whereas, no known respiratory-disease virus specifically targets residents living in poverty (Figure 20), irrespective of age (Figure 23).

4.2. Late-summer-2021 anomalous mortality of young adults

The time-structure of the all-cause mortality by month (ACM/m) from 2000, into the covid period, by age group is shown in Figure 4. Here, the relative magnitude of the covid-period excess mortality above the historic trend is particularly large for the age groups 25-34y (Figure 4C), 35-44y (Figure 4D), and 45-54y (Figure 4E).

See also Figure 7, Figure 9, Figure 10, Figure 11, Figure 13, Figure 15, Figure 17 and Figure 19. Basically, we observe the same age-group-differential and seasonal-differential ACM by time phenomena with higher time resolution and in more detail in the all-cause mortality by week (ACM/w).

Similarly with the ACM/m (Figure 4) data, and as is evident from Table 3, the ACM/w (Figure 7) data also shows that the relative magnitude of the covid-period extra deaths above the historic trend is particularly large for the age group 25-44y (Figure 7B), and to a lesser degree 45-64y (Figure 7C), especially the late-summer-2021 feature (smp2).

These covid-period young-adult age group large excesses in ACM by time, especially in the late-summer-2021 (smp2) feature, are a central feature of mortality during the covid period in the USA.

The age-group-dependent relative magnitude of the covid-period excess mortality is contrary to the age dependence of mortality for viral respiratory diseases, including that reported for COVID-19, in which mortality strongly increases exponentially or near-exponentially with age (Elo *et al.*, 2022; Sorensen *et al.*, 2022).

These results are contrary to, incompatible with, and irreconcilable with an interpretation in which excess mortality (by age-group) in the covid period in the USA is mostly or predominantly caused by COVID-19; or any known viral respiratory disease (see Rancourt et al.'s discussion about the 1918 declared pandemic (Rancourt, Baudin and Mercier, 2021b), and references therein). Either one must admit that the declared COVID-19 pandemic is not the main cause of death to explain the excess mortality data, or ignore the well-established data showing that COVID-19-assigned mortality increases exponentially or near-exponentially with age, and that young people essentially (comparatively) do not die from COVID-19, as the primary assigned cause of death in a controlled clinical and laboratory verified setting.

Furthermore, relative mortality is particularly large for the late-summer-2021 feature (smp2) in the 35-44y age group (Figure 4D), compared to any other time in the covid period, and more so than with any other age group. This feature (large smp2 in the 35-44y age group), however, is highly variable from state to state, being prominent or very prominent in states such as Texas, Florida, Georgia, North Carolina, South Carolina, Alabama, Arkansas, Hawaii, Idaho, Kentucky, Louisiana, Mississippi, Missouri, Nevada, Oklahoma, Oregon, Tennessee, Washington, Virginia, West Virginia and Wyoming, while being absent in New York and New Jersey, intermediate in California, and mostly intermediate or absent in other states, while Michigan uniquely has a spring-2021 peak in mortality for that age group centered in April (Figure 11). The latter observations are confirmed in the ACM/w data for 25-64y age group (not shown). Generally, the 2020 and 2021 summers were most deadly in the Southern states, as previously described (Rancourt, Baudin and Mercier, 2021b). Such state-to-state heterogeneity is inconsistent with the pandemic paradigm of rapid spread, extensive coverage and complete immune susceptibility. It is more understandable in terms of the driving forces described above.

Coming back to age-groups: Why would this be? Why would mortality in this young-adult age group suddenly spike in late-summer-2021, in many states and as seen on the basis of the whole USA, to an unprecedented large value, after 18 months of the declared pandemic, compared to anything in the earlier covid period or the last 20 years, approximately doubling all-cause mortality for several months for 35-44 year olds (Figure 4D), both male and female (not shown)? See also Figure 7, Figure 9, Figure 10, Figure 11, Figure 13, Figure 15, Figure 17 and Figure 19.

In attempting to answer this question (Why are young adults dying more than ever in the second half of the covid period, and in the late-summer-2021 ACM peak in particular?), we submit that the answer is probably not "variants of concern", or any such theoretical proposal from immunology. Instead, we describe two preferred hypotheses to explain the observation:

i. The first is that young adults are more resilient than old adults against the cumulative impact of persistent covid-period conditions that cause chronic psychological stress that, in vulnerable groups, causes emergent or worsening immunodeficiency that enables death by bacterial pneumonia. In support of this hypothesis, one of the largest vulnerable groups in the USA — those afflicted by serious mental illness (5.6% adults = 14.2 million aged 18+, in 2020) — has a heavily skewed prevalence towards young adults (see below).
ii. The second is that the vaccination campaign, including the "vaccine equity" campaigns, captured many thus made immunocompromised young adults from vulnerable groups and that the vaccine challenge against many of these individuals constituted a significant comorbidity, which was absent in the first

(pre-vaccination) half of the covid period, thus increasing the death toll of young adults, overall, in the second (vaccination) half of the covid period.

Note that the second hypothesis (vaccine toxicity) relies on the conditions described in the first hypothesis (cumulative stress-induced immunodeficiency). This is because the vaccine toxicity for subjects who are not immunocompromised (fatality risk per dose, inferred from VAERS data) is too small to quantitatively explain the observed ACM increases that are synchronous with increases in vaccine-delivery (administered doses), assuming avoidance of immunocompromised subjects (see above, and below).

As mentioned above, we do not believe that any “variant of concern” (CDC, 2022e) emerging in 2021 could produce such a result in the mortality data, or that the explanation is viral. Rather, we prefer to propose that the same forces that appear to generally determine the exceptionally large excess mortality in the covid period in the USA — namely the impact on the immune systems of individuals in populations of those most vulnerable to psychological stress and social isolation during life-changing covid-period circumstances, combined with an essentially untreated mass bacterial-pneumonia epidemic (Rancourt, Baudin and Mercier, 2021b) — also largely determined the jurisdictional, age and time structures of excess mortality in the covid period, on the background of the demographics of highly vulnerable groups. Here, the hypothesis is that, while the “conditions = stress = immune-vulnerability = death from pneumonia” scenario existed from the very start of the covid period (Rancourt, Baudin and Mercier, 2021b), the prolonged conditions and associated chronic stress eventually has more relative impact on young adults that are more resilient at first, thus changing the age structure of mortality as the covid period advances.

We expect, therefore, that the change in age structure of mortality during the course of the covid period (Figure 15, Figure 17) is driven by such factors as a “dry tinder effect” among the elderly and differential youth resilience to chronic stressors (relative endurance over long periods), on the background of the demographics of highly vulnerable groups, rather than driven by the vaccination campaign *via* generalpopulation vaccine toxicity (fatality risk per dose for non-immunocompromised subjects) acting alone and irrespective of these circumstances.

There is also a cumulative effect on young adults, which is irreversible to some extent (Giuntella *et al.*, 2021). Our interpretation of Figure 15 is consistent with the fact that the hardships (expenses, housing and food insecurity) are sustained in the USA during the covid period (CBPP, 2022). In the words of the OECD (OECD, 2022):

> "The COVID-19 pandemic has triggered one of the worst jobs crises since the Great Depression. There is a real danger that the crisis will increase poverty and widen inequalities, with the impact felt for years to come."

Also, socio-economic factors may have caused young adults to have higher experienced stress in the second half of the covid period, compared to older adults. For example, pressures inducing bankruptcies and associated losses of livelihood and personal identity would increase as the restrictive conditions persist in many sectors, although analysis of the macroeconomic data is complex (Martos-Vila and Shi, 2022).

It is also possible that the age-structure change phenomenon partly results from or is significantly contributed to by vaccine-campaign (including so-called "vaccine equity" campaigns) capture of vulnerable young adults made immunocompromised by the said chronic psychological stress.

Both of the latter hypotheses (relative resilience to stress of young adults in vulnerable groups and vaccine capture of young adults made immunocompromised by chronic stress) advanced to explain the increased skewness of mortality towards young adults in the vaccination period (second half) of the covid period are consistent with the fact that the prevalence of serious mental illness is large and highly skewed towards young adults in the USA (NIMH, 2022). Indeed, the age distribution in covid-period fatality risk that we observe, which is skewed towards young adults in the vaccination period of the covid period (Figure 17), should be put in the context of the prevalence of serious mental illness, which was 14.2 million adults aged 18 or older in the USA in 2020, representing 5.6% of all USA adults, and which is highly skewed towards young adults (NIMH, 2022):

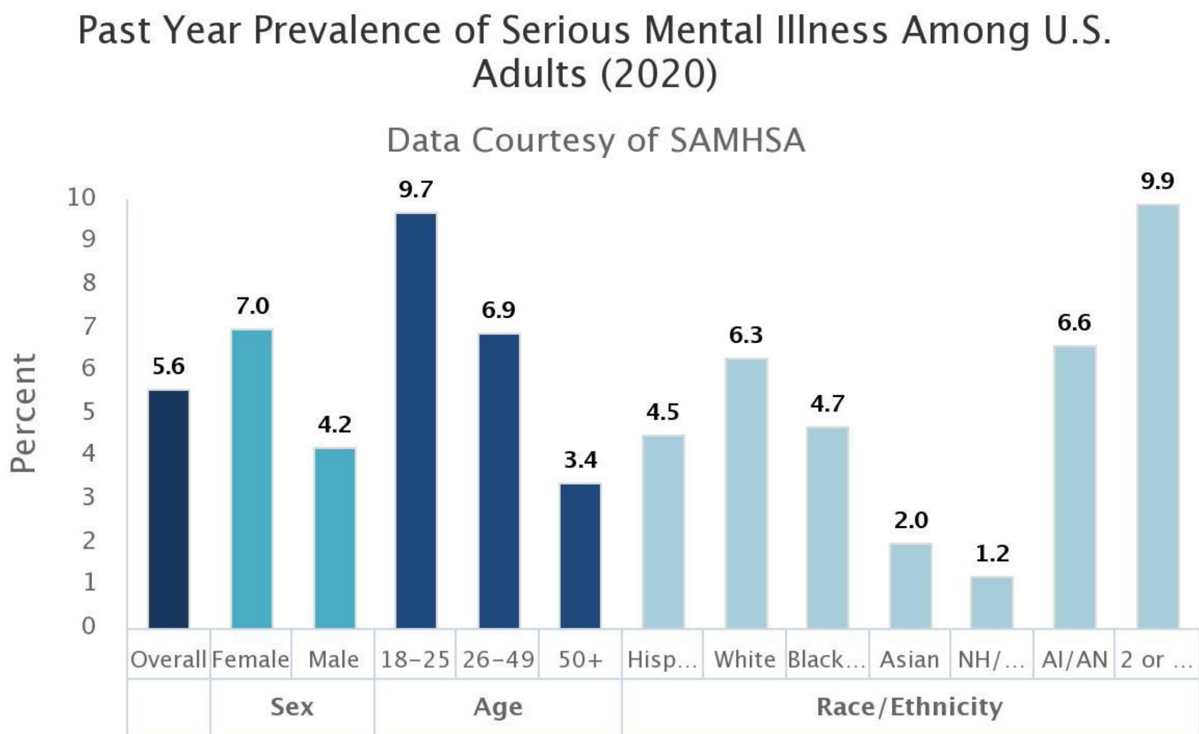


Figure 28. Prevalence of serious mental illness among U.S. adults in 2020. Data are shown for the entire USA (Overall), by sex (Female, Male), by age (18-25, 26-49, 50+) and by race/ethnicity (Hispanic, White, Black or African American, Asian, Native Hawaiian/Other Pacific Islander, American Indian/Alaskan Native, Two or more races). Serious mental illness is defined as a mental, behavioral, or emotional disorder resulting in serious functional impairment, which substantially interferes with or limits one or more major life activities. This figure is from NIMH (NIMH, 2022).

Basically, any model of excess mortality, which relies on the mentally disabled as a source group and serious mental illness as a major cofactor, will be biased towards mortality risk that is skewed towards young adults. It is well established that in the USA younger people are disproportionately affected by diagnosed mental disorders (Merikangas *et al.*, 2010).

We advance that the tragic excess deaths of 35-44 year olds (and 25-64 year olds) in late-summer-2021 in the USA, extraordinarily exhibited as an actual peak (smp2) in

ACM by time, for example, needs to be explained by specific health-status and socio-psycho-economic circumstances in the different jurisdictions, and not solely in terms of theoretical proposals from virology and immunology (e.g., “variants of concern”, etc.). The needed actual community-level field work is not being sufficiently funded or undertaken, to our knowledge.

4.3. Vaccination campaign

The time-resolved and age-group resolved vaccination campaign, together with the similarly resolved ACM/w show that the vaccination campaign did not reduce mortality during the covid period (Figure 10; Figure 11; Figure 12; Figure 13; Figure 14; Figure 16; Figure 17; Table 4; Table 5).

We conclude with a high degree of certainty that the COVID-19 vaccination campaign in the USA was ineffective in reducing all-cause mortality. The mass vaccination campaign was not justified in terms of reducing excess all-cause mortality. The large excess mortality of the covid period, far above the historic trend, was maintained irrespective of the unprecedented vaccination campaign.

Furthermore, the vaccination campaign may have affected the age structure of ACM by contributing to the deaths of young adults in vulnerable groups but the same dominant forces that caused the large excess ACM in the first (50-week, pre-vaccination) half of the covid period appear to have continued to cause the large excess ACM in the second (50-week, vaccination) half of the covid period.

In the ACM/w data (Figure 7), similarly to the ACM/m data (Figure 4), relative mortality is particularly large for the late-summer-2021 feature (smp2) in the 25-44y age group (Figure 7B), compared to any other time in the covid period, and more so than with any other age group. It is also anomalously large, to a lesser degree, for the age group 45-64y (Figure 7C).

This feature in ACM by time during the covid period (an exceptionally large late-summer-2021 peak, smp2) is highly variable from state to state (see above, Figure 11, and see Appendix A), and occurs after the majority of the main-series vaccination campaign has been mostly completed.

Nonetheless, is some or most of the exceptional mortality occurring in the late-summer-2021 period (smp2) consistent with having been caused by the vaccination campaign? Likewise, is any feature in ACM by time consistent with having been caused by the vaccination campaign?

Figure 10 allows a direct comparison, on the same time axis, of all-cause mortality by week and cumulative number of vaccinated individuals, by vaccine sequence (1st dose, fully vaccinated, booster), for separate age groups. Figure 11 allows the same for specific states.

A study of the Vaccine Adverse Event Reporting System (VAERS) data of the USA has shown that the deaths associated with the COVID-19 vaccine in the USA typically occur first in a large initial peak within 5 days or less following the injection; followed (~5 days to ~60 days post injection) by a shoulder of exponential decay in deaths, with a fitted half-life decay time typically in the range 13-30 days (Hickey and Rancourt, 2022; their figures S3 through S5).

This means that deaths associated with the injections in the USA occur essentially immediately following delivery of the injection (mostly within days, with a decaying residual risk of fatality lasting weeks).

In addition, it is usually postulated that the alleged life-saving benefits of the vaccine become operative 7-14 days from the time of injection, and should last several months, similarly to the 90 days or so of efficacy claimed for flu vaccines (Rambhia and Rambhia, 2019).

In this way, any measurable positive or negative impact of the vaccination campaign on death rate (all-cause mortality by week) should be temporally associated with times of large or maximum slope in cumulative vaccine dose delivery (or vaccinated status acquisition), if vaccine fatality toxicity is large enough (deleterious impact) or vaccine protection against death is large enough (positive impact).

An increase in mortality from the vaccination campaign would be seen within 5 days or so of a large slope in cumulative vaccine dose delivery, whereas a smaller mortality would be seen to follow a large slope in cumulative vaccine dose delivery (or vaccinated status acquisition) by a few weeks or more and should be persistent after having attained significant vaccine dose coverage.

As discussed above in presenting Figure 10 and Figure 11, there is a modest but significant stepwise increase in 1st-dose vaccine delivery (administration), which is synchronous with the late-summer-2021 peak in ACM, visible for all ages and for the 25-44 and 45-64 years age groups (Figure 10A, C, D). This temporal association is prominent in the data for many specific states (e.g., Figure 11), and cannot be dismissed as noise.

We estimate that, in order to achieve quantitative agreement between the outcome (late-summer-2021 peak integrated excess mortality) and factor (additional vaccine doses over the period of occurrence of the peak), the vaccine adverse-effect fatality toxicity per dose would need to be approximately 100 times the estimated non-immunocompromised fatality toxicity per dose (Hickey and Rancourt, 2022; their Table 1), assuming that only non-immunocompromised resident were injected. There are many more doses administered than deaths. This means that if immunocompromised residents from vulnerable groups were captured in the vaccination doses delivered in the relevant period, then it is possible that the late-summer-2021 mortality peak is entirely or partly due to vaccine challenge of vulnerable young adults.

In this regard, it is relevant that the so-called “vaccine equity” campaigns in the USA were operating in the relevant period:

- A *JAMA* Editorial of 29 January 2021, entitled “Vaccine Distribution—Equity Left Behind?” recommended, among other things “1. Prioritize vaccine distribution to zip codes that have been most severely affected by COVID-19 and that have high indexes of economic hardship”, and so on (Jean-Jacques and Bauchner, 2021).
- The *New York Times* provided extended reporting on county-wise vaccine coverage (*The New York Times*, 2022).
- Large foundations such as the Rand Corporation were significantly involved supporting “vaccine equity” programs (Faherty *et al.*, 2022).
- Louisiana, for example, had fully launched its comprehensive “vaccine equity” program, as did virtually all states to varying degrees (*Louisiana Launches Grassroots COVID Vaccine Campaign to Ensure No Community Gets Left Behind* | *Office of Governor John Bel Edwards*, 2021).

Similarly, as discussed above in introducing Figure 11, Michigan has a unique feature in its ACM by time data, not seen for any other state. Michigan has a unique April-2021-centered spring-2021 peak in ACM for young adults, which coincides with the large main onset of the vaccination campaign for these ages (Figure 11G, H). In this case, in order to achieve quantitative agreement between the outcome (spring-2021 peak integrated excess mortality) and factor (additional vaccine doses over the period of occurrence of the peak), the vaccine adverse-effect fatality toxicity per dose would need to be approximately 10 times the estimated non-immunocompromised fatality toxicity per dose (Hickey and Rancourt, 2022; their Table 1), assuming that only non-immunocompromised resident were injected. There are many more doses administered than deaths. This means that if immunocompromised residents of Michigan from vulnerable groups were captured in the vaccination doses delivered in the relevant period, then it is possible that the unique spring-2021 mortality peak for Michigan is entirely due to vaccine challenge of vulnerable young adults. We consider this to be the most likely hypothesis we can make, with the available information, to explain the unique spring-2021 mortality peak for Michigan. If the hypothesis is correct, then this demonstrates the principle that vaccine challenge of residents made immunocompromised by chronic stress can explain large features in ACM by time, in the covid-period and vaccine-campaign circumstances.

4.4. Looking ahead

Unavoidable questions are: “When will the covid period end?” and “Will ACM by time and by jurisdiction return to the pre-covid-period normal?”

We quickly looked at the latest ACM/w data for the USA, which appears to be reliable through to April-2022, in order to give tentative answers, looking forward.

The data (shown in Appendix C) has the 2021-2022 winter peak in ACM dropping precipitously in February-2022, down to a level, in March and April 2022, which is typical of pre-covid-period summer baseline values. Such a low value did not occur at any time in the USA in the covid period that we studied in the present article.

It would seem that, in terms of all-cause mortality, the covid period ended, at least momentarily, in March and April 2022. It will be interesting to see whether there will be a summer-2022 peak in ACM when more data becomes available.

Late reporting of mortality to the CDC could alter the above tentative observation.

5. Conclusion

Our results show the following overall large-scale features:

- All-cause mortality by time in the USA is heterogeneous by state and persistently far in excess of the recent historic decadal trend, starting immediately when a pandemic was declared by the WHO on 11 March 2020, and continuing throughout the entire covid period that we examined, up to the week ending on February 5, 2022 — with a total of 1.27M excess deaths (Figure 1, Figure 3, Figure 5, Figure 6; Table 2, Table 3).

- Throughout the covid period, all-cause mortality is heterogeneous by state and anomalous in its time (by week, by month) and seasonal variations, compared to historic behaviour. The anomalies include winter and summer peaks, which are highly variable in magnitude from year to year in the covid period, and from state to state (Figure 8, Figure 9; Appendix A); as we observed previously (Rancourt, Baudin and Mercier, 2021b). The broad "summer peaks" of ACM by time in 2020 and 2021 are of a nature that has not previously been observed in mortality data for the USA or any country, historically, since quality data has been available for more than 100 years. The anomalous heterogeneity by state in integrated mortality over the covid period was recently demonstrated by Johnson and Rancourt (Johnson and Rancourt, 2022; their Figure 7).

- Unlike for viral respiratory diseases, including the presumed SARS-CoV-2 virus itself (Elo *et al.*, 2022; Sorensen *et al.*, 2022), the covid-period excess mortality risk by age group is not predominantly confined to the elderly population; and the inferred age-group-specific infection fatality ratios are not exponential or near-exponential with age, as they would be (Table 2, Table 3, Figure 4, Figure 7, Figure 9). On the contrary, overall for the covid period, mortality risk is broadly distributed to all age groups and is significantly larger for younger adults compared to the eldest adults (Figure 9). The non-exponential-with-age (more age-uniform) distribution of mortality risk to all age groups holds for both the first half (pre-vaccination) and second half (vaccination) of the 100-week covid period (Figure 10, Figure 13, Figure 15, Figure 17, Table 4). The observed age-group distribution of all-cause mortality risk constitutes proof that the covid-period excess mortality cannot predominantly be due to the presumed SARS-CoV-2 virus or to any viral respiratory disease. The alternative would be to abandon the accepted body of research on mortality risk by age.

- Instead of the covid-period excess all-cause mortality risk being predominantly (or even moderately) determined by age of the population, the state-wise integrated excess all-cause mortality for the entire 100-week covid period normalized by state population (outcome) is correlated to socio-economic factors that are macro-indicators of state-wise resident vulnerability (Table 6):
    - The covid-period excess all-cause mortality risk is very strongly correlated to poverty (r = +0.86) (Figure 20).
    - The said mortality risk is strongly correlated to MHI (Median Household Income) (r = -0.71) (Figure 21).
    - The said mortality risk is strongly correlated to obesity (r = +0.62) (Figure 22).
    - The said mortality risk is not correlated simply to age of the population. This is shown for 65+ ages in Figure 23, and is maintained for 75+ and 85+ ages (not shown).
    - The said mortality risk is moderately correlated to the number of SSI (Supplemental Security Income) recipients by population (r = +0.51) (Figure 25).
    - The said mortality risk is moderately correlated to the number of SSDI (Social Security Disability Insurance) recipients by population (r = +0.47) (Figure 26).
    - Whitaker (Whitaker, 2015) has interpreted that the majority of SSI and SSDI recipients can be classified as mentally disabled and receiving prescription psychiatric medication.
    - The said mortality risk is moderately correlated to disability (r = +0.59) (Figure 27).

- Despite the fact that there are significant changes in age structure of ACM by time during the course of the covid period, the overall qualitative behaviour of ACM by time (anomalously large excess mortality and presence of anomalous summer and winter seasonal variations in ACM by time) and the 50-week-integrated excess ACM are not substantially different in the first half of the

100-week covid period (first 50 weeks of the covid period), in which there was essentially no vaccination campaign, and in the second half of the 100-week covid period (second 50 weeks of the covid period), in which most of the vaccination campaign was accomplished (Figure 4, Figure 7, Figure 13 , Figure 15, Figure 17, Figure 19). Therefore, the suddenly applied and massive vaccination campaign (Figure 10) did not induce a large change of regime from one type of ACM by time to another, on the scale of the dramatic change in regime from pre-covid to covid period.

- Regarding mortality averted by vaccination, the COVID-19 vaccination campaign in the USA did not cause any seasonally unambiguous temporally associated decrease in all-cause mortality, for all ages or in any age group (Figure 10; see also Figure 11). The vaccination campaign did not measurably cause any deaths to be averted. This is contrary to the notion that the vaccines are "effective" in reducing "serious illness" (and presumably death), becoming operative 7-14 days following the time of injection, with the protection presumably lasting at least several months.

- Therefore, although much messaging attention is directed towards life-saving consequences arising from the mass vaccination campaign in the USA, clearly such effects are both undetectable in all-cause mortality and necessarily small compared to the overwhelming harm from the extraordinary covid-period conditions themselves.

- Conversely, regarding vaccine-induced mortality, the COVID-19 vaccination campaign in the USA did not cause the 50-week-integrated excess ACM in the second half of the 100-week covid period (second 50 weeks of the covid period), in which most of the vaccination campaign was accomplished, to be systematically larger (systematically across all age groups, or all states) than in the first half of the 100-week covid period (first 50 weeks of the covid period), in which there was essentially no vaccination campaign. The persistent socio-economic, regulatory, institutional… changes associated with the covid period (relative to pre-covid behaviour) had a large effect compared to changes associated specifically with the period of the vaccination campaign, positive or negative (Figure 4, Figure 7, Figure 13 , Figure 15, Figure 17, Figure 19).

- Despite the fact that there is no large systematic effect of the vaccination campaign on either 50-week-integrated mortality or main qualitative features of ACM by time, positive or negative, we nonetheless detect significant seasonally unambiguous local temporal associations between increases in number of vaccinated residents and synchronous increases in all-cause mortality, for certain age groups, and most prominently in certain states:
    - The largest of these local temporal associations is seen in the data for the whole USA and all age groups, as an accelerated increase in cumulative number of residents having received at least one dose (or being fully vaccinated), which is synchronous with the late-summer-2021 surge in ACM by time (Figure 10A).
    - The said local temporal association is most evident for the 25-44 years age group (Figure 10C), also prominent for the 45-64 years age group (Figure 10D), and discernible for the 65-74 years age group (Figure 10E).
    - The said local temporal association is most prominent for the 25-64 years age group in Southern states — which typically have the smallest vaccination rates — including: Florida, Georgia, Louisiana, Mississippi and Alabama (Figure 11).
    - The special case of Michigan is also noteworthy (Figure 11G, H), as discussed above.

The latter observations lead us to conclude that the large changes in age structure of ACM by time (first half versus second half of the covid period) (esp. Figure 17) may be partly (see Discussion section) or largely due to aggressive “vaccine equity” campaigns that captured immunocompromised young adults in Southern states, thus causing disproportionate mortality among vulnerable young adults in late-summer-2021.

The entire picture of mortality during the covid period in the USA, which included implementation of the vaccination campaign after the first 50 weeks or so, can be modelled as:

covid-period socio-economic, regulatory, institutional… conditions

⟶ psychological stress / social isolation

⟶ severely suppressed immune system in most vulnerable residents (+ vaccine assault of thus immunocompromised vulnerable residents)

⟶ mortality from untreated bacterial pneumonia (+ vaccine-assault comorbidity) in most vulnerable residents

The model arises as follows.

- We infer from the temporal and jurisdictional characteristics of age-group-resolved excess ACM that large structural changes in the living and care conditions of residents of the USA — directly enacted by state and institutional players (including employers) during the covid period and including secondary consequences of the said directly enacted changes — are causally associated with the large and sustained excess mortality in the covid period.
- We infer from correlations with socio-economic factors that severe harm and death were induced by the said covid-period changes in particular classes of residents, such as isolated, sick, disabled, dependent, obese, poor, seriously mentally ill or elderly individuals; and of course residents who are co-afflicted by such conditions.

- We postulate that the mechanistic connection between the said covid-period changes and high risk of all-cause death in vulnerable residents is the well-established link between experienced psychological stress and social isolation (factor) and suppressed immunity, ill-health and death (outcome).
- We postulate that the end-point mechanistic cause of death in the thus immunocompromised vulnerable groups is bacterial pneumonia, in the midst of a recorded mass epidemic of bacterial pneumonia, at a time when antibiotic prescription rates showed an unprecedented decrease, in addition to aggressive vaccine challenge ("vaccine equity" programs) in late-summer-2021.

The model is developed and contextualized in more detail in the Results and Discussion sections. It provides a plausible and consistent explanation for all the aspects of the ACM data for the USA, including the large change in age structure of the ACM on entering the vaccination-campaign part of the covid period.

The model is predictive in that any type of comparable sudden socio-economic upheaval, such as war or a Great Depression, in societies with large pools of vulnerable residents, would give rise to this kind of large and rapid increase of mortality, targeting the most vulnerable, with bacterial pneumonia playing a major role. We have previously advanced that 1918 was such an episode in mid-latitude nations (Rancourt, Baudin and Mercier, 2021b).

In conclusion, in terms of all-cause mortality, the covid-period socio-economic, regulatory, institutional… conditions in the USA (from 11 March 2020 to week-5 of 2022) were in-effect a large-scale deadly assault against vulnerable groups, which killed approximately 1.27M members of the said groups. The temporal, jurisdictional and age-group characteristics of the mortality are incompatible with the excess mortality having been primarily caused by the presumed SARS-CoV-2 viral respiratory disease virus. In the absence of poverty or if the covid-period socio-economic, regulatory, institutional… conditions had not been imposed, there most probably would not have been excess mortality in the USA, which was essentially the case in neighbouring Canada (Rancourt, Baudin and Mercier, 2021b; their Section 4). The COVID-19 vaccination campaign, accomplished in the second half of the covid period, did not avert any deaths, and may have been a significant contributing factor causing excess mortality in vulnerable-group young adults during late-summer-2021.

In regard to the fundamental results of this study, we would recommend a transparent and accountable large-scale state, county and community level independent forensic investigation of the deaths, excluding the involvement of interested government agencies and private corporations. The mandate should include broad systemic considerations, in addition to specific circumstances, and the investigators should have the necessary powers and resources consistent with the magnitude and extent of the catastrophe, in the hope of preventing any similar public health disaster in the future.

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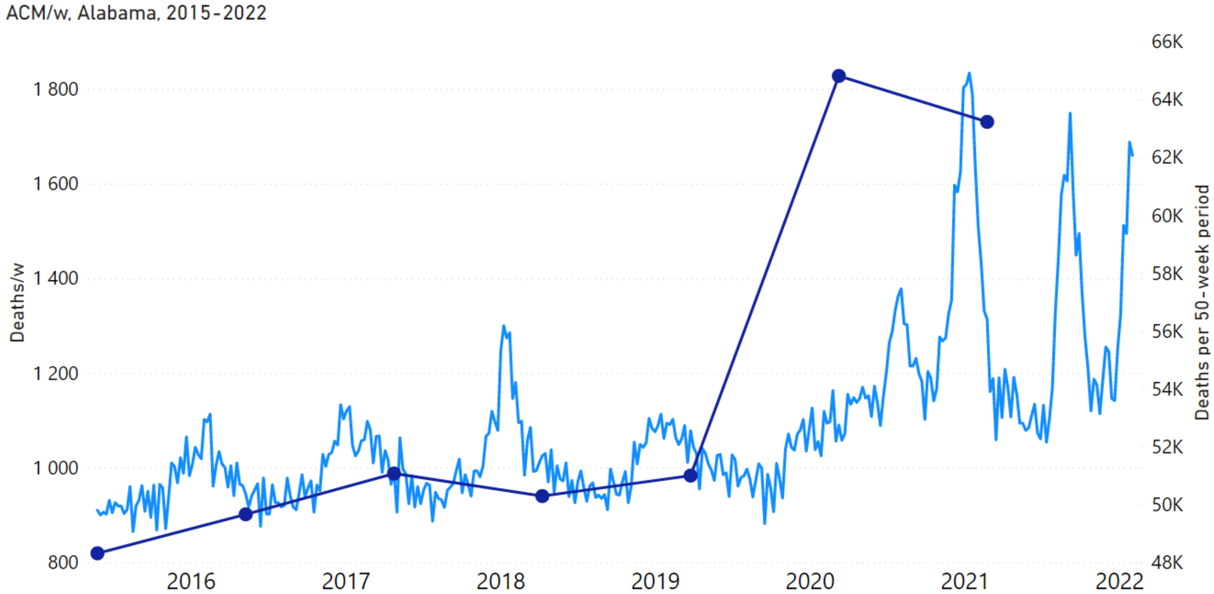
Appendix

The Appendix is in three parts:

- **Appendix A** shows for each state of the USA:
  - ACM/w versus time together with ACM by 50-week period, from 2015 to 2022 (equivalent to Figure 12 without the color-coded periods)
  - Excess mortality of the pre-vaccination and vaccination periods of the covid period, by age group (equivalent to Table 4Table 5)
  - Excess mortality of the covid period, by age group (equivalent to Table 3)
- **Appendix B** shows state-wise maps of poverty and obesity in the USA
- **Appendix C** shows ACM/w in the USA with most recent data, from 2015 to 2022

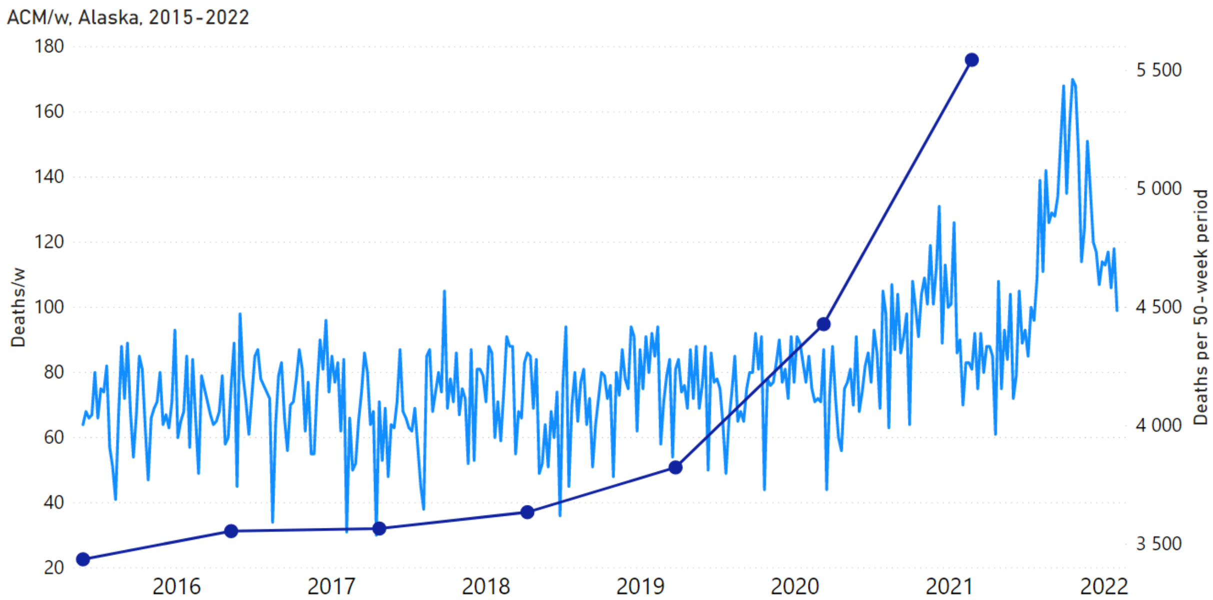
The states in Appendix A are ordered alphabetically.

Appendix A – ACM/w and by 50-week period, by state, 2015-2022



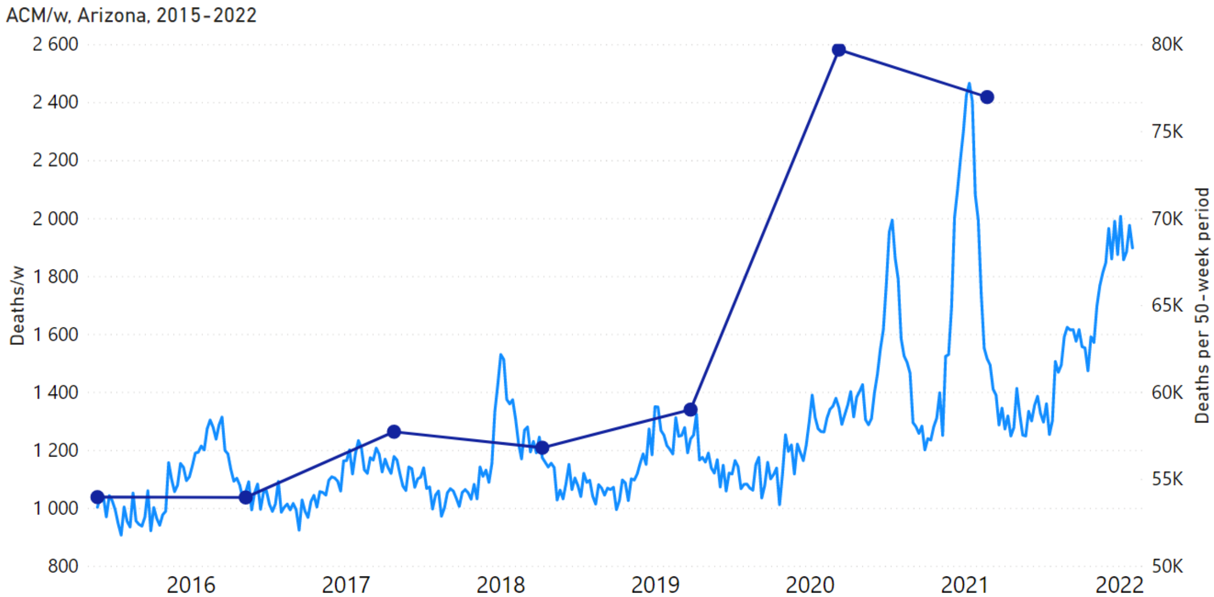
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Alabama**	**63 285**	**64 837**	**51 016**	**13 821**	**12 269**	**27,09 %**	**24,05 %**
0-24	1 406	1 278	1 257	21	149	1,67 %	11,85 %
25-44	4 124	3 569	2 785	784	1 339	28,15 %	48,08 %
45-64	14 580	13 643	10 908	2 735	3 672	25,07 %	33,66 %
65-74	14 557	14 404	11 148	3 256	3 409	29,21 %	30,58 %
75-84	15 247	16 541	12 570	3 971	2 677	31,59 %	21,30 %
85+	13 371	15 402	12 348	3 054	1 023	24,73 %	8,28 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Alabama**	**128 122**	**101 323**	**100 764**	**26 799**	**27 358**	**26,45 %**	**27,15 %**
0-24	2 684	2 399	2 599	285	85	11,88 %	3,27 %
25-44	7 693	5 501	5 643	2 192	2 050	39,85 %	36,33 %
45-64	28 223	21 520	22 021	6 703	6 202	31,15 %	28,16 %
65-74	28 961	21 897	21 240	7 064	7 721	32,26 %	36,35 %
75-84	31 788	25 293	24 520	6 495	7 268	25,68 %	29,64 %
85+	28 773	24 713	24 741	4 060	4 032	16,43 %	16,30 %



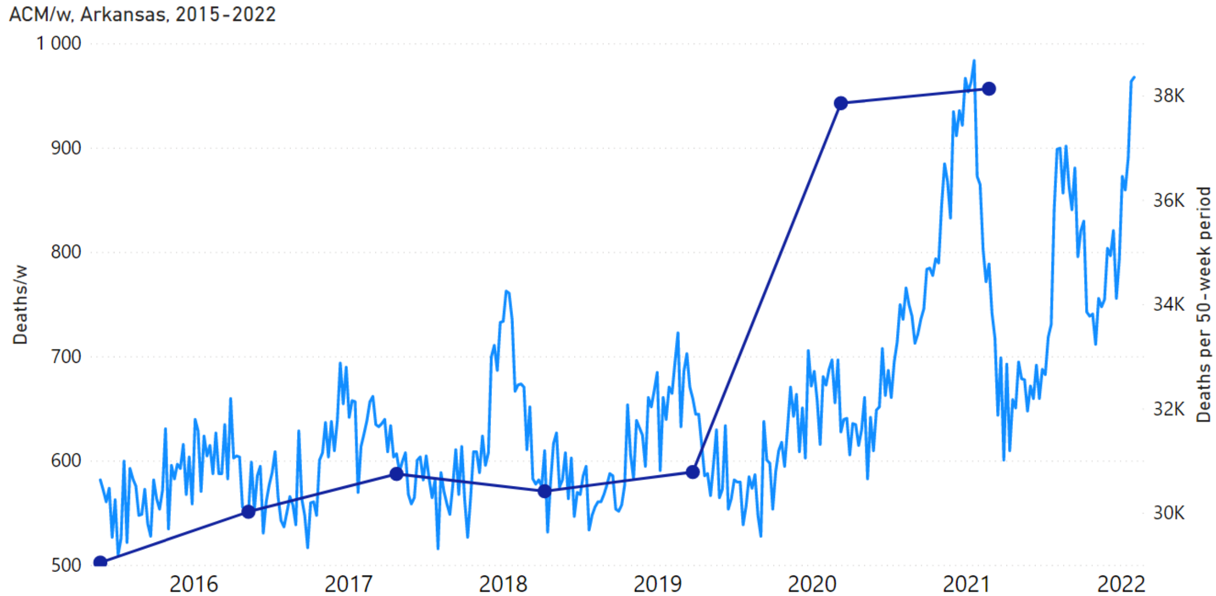
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Alaska	**5 574**	**4 429**	**3 824**	**605**	**1 750**	**15,82 %**	**45,76 %**
0-24			11	-11	-11	-100,00 %	-100,00 %
25-44	553	317	174	143	379	82,18 %	217,82 %
45-64	1 477	1 201	1 039	162	438	15,59 %	42,16 %
65-74	1 378	1 035	922	113	456	12,26 %	49,46 %
75-84	1 215	1 041	897	144	318	16,05 %	35,45 %
85+	951	835	781	54	170	6,91 %	21,77 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Alaska	**10 003**	**7 459**	**7 121**	**2 544**	**2 882**	**34,11 %**	**40,47 %**
0-24		11	11	-11	-11	-100,00 %	-100,00 %
25-44	870	300	324	570	546	190,00 %	168,52 %
45-64	2 678	2 104	2 208	574	470	27,28 %	21,29 %
65-74	2 413	1 820	1 687	593	726	32,58 %	43,03 %
75-84	2 256	1 767	1 510	489	746	27,67 %	49,40 %
85+	1 786	1 457	1 381	329	405	22,58 %	29,33 %



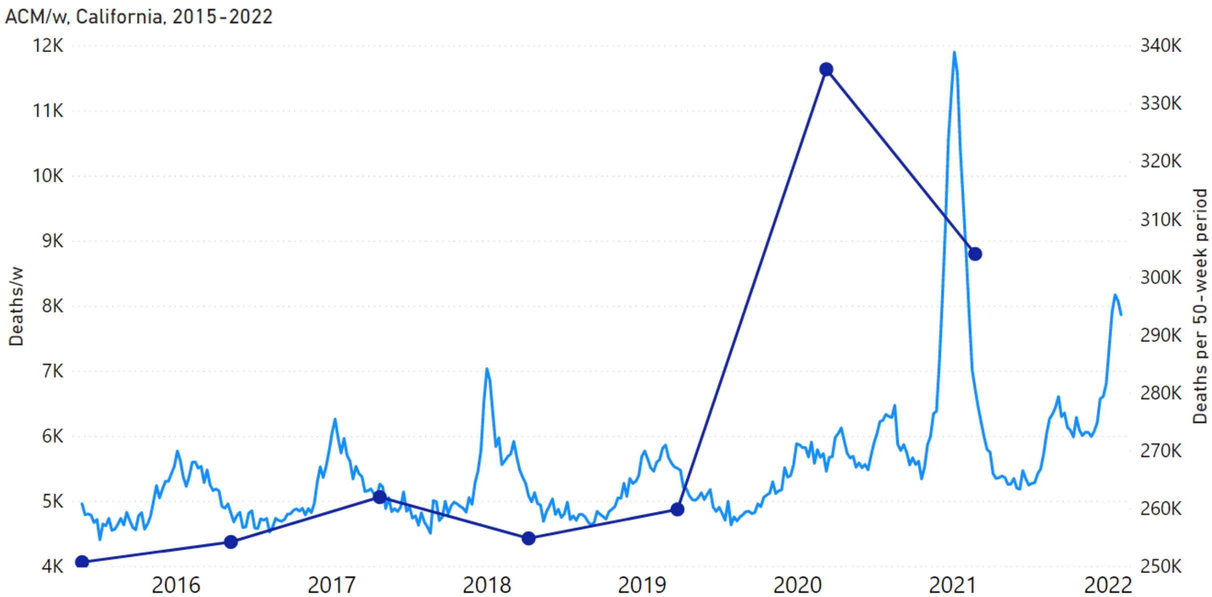
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Arizona	**77 054**	**79 720**	**59 017**	**20 703**	**18 037**	**35,08 %**	**30,56 %**
0-24	1 824	1 680	1 481	199	343	13,44 %	23,16 %
25-44	5 474	4 901	3 437	1 464	2 037	42,60 %	59,27 %
45-64	15 096	15 080	10 615	4 465	4 481	42,06 %	42,21 %
65-74	16 313	16 605	11 803	4 802	4 510	40,68 %	38,21 %
75-84	19 514	20 528	15 045	5 483	4 469	36,44 %	29,70 %
85+	18 833	20 926	16 636	4 290	2 197	25,79 %	13,21 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Arizona	**156 774**	**115 842**	**111 708**	**40 932**	**45 066**	**35,33 %**	**40,34 %**
0-24	3 504	3 005	2 801	499	703	16,61 %	25,10 %
25-44	10 375	6 590	6 040	3 785	4 335	57,44 %	71,77 %
45-64	30 176	21 229	20 940	8 947	9 236	42,15 %	44,11 %
65-74	32 918	22 977	21 975	9 941	10 943	43,27 %	49,80 %
75-84	40 042	29 379	27 485	10 663	12 557	36,29 %	45,69 %
85+	39 759	32 662	32 467	7 097	7 292	21,73 %	22,46 %



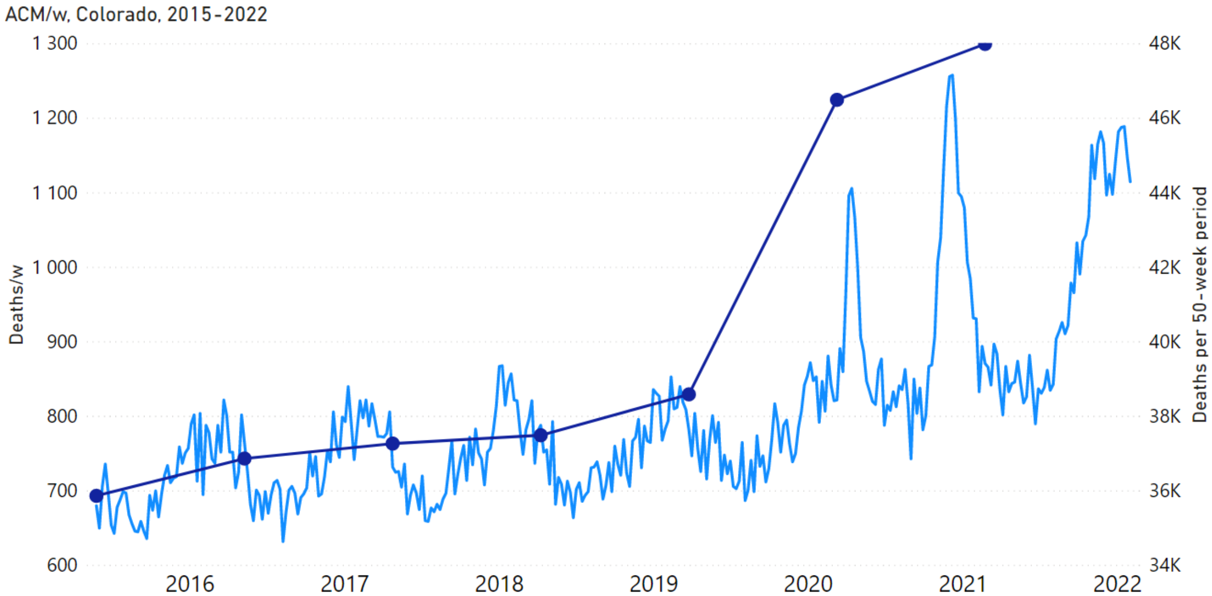
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Arkansas**	**38 165**	**37 863**	**30 791**	**7 072**	**7 374**	**22,97 %**	**23,95 %**
0-24	821	721	667	54	154	8,10 %	23,09 %
25-44	2 393	1 974	1 518	456	875	30,04 %	57,64 %
45-64	8 490	7 772	6 232	1 540	2 258	24,71 %	36,23 %
65-74	8 675	8 322	6 632	1 690	2 043	25,48 %	30,81 %
75-84	9 339	9 566	7 871	1 695	1 468	21,53 %	18,65 %
85+	8 447	9 508	7 871	1 637	576	20,80 %	7,32 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Arkansas**	**76 028**	**61 214**	**60 784**	**14 814**	**15 244**	**24,20 %**	**25,08 %**
0-24	1 542	1 239	1 291	303	251	24,46 %	19,44 %
25-44	4 367	3 026	3 021	1 341	1 346	44,32 %	44,55 %
45-64	16 262	12 616	12 855	3 646	3 407	28,90 %	26,50 %
65-74	16 997	13 042	12 807	3 955	4 190	30,33 %	32,72 %
75-84	18 905	15 754	15 037	3 151	3 868	20,00 %	25,72 %
85+	17 955	15 537	15 773	2 418	2 182	15,56 %	13,83 %



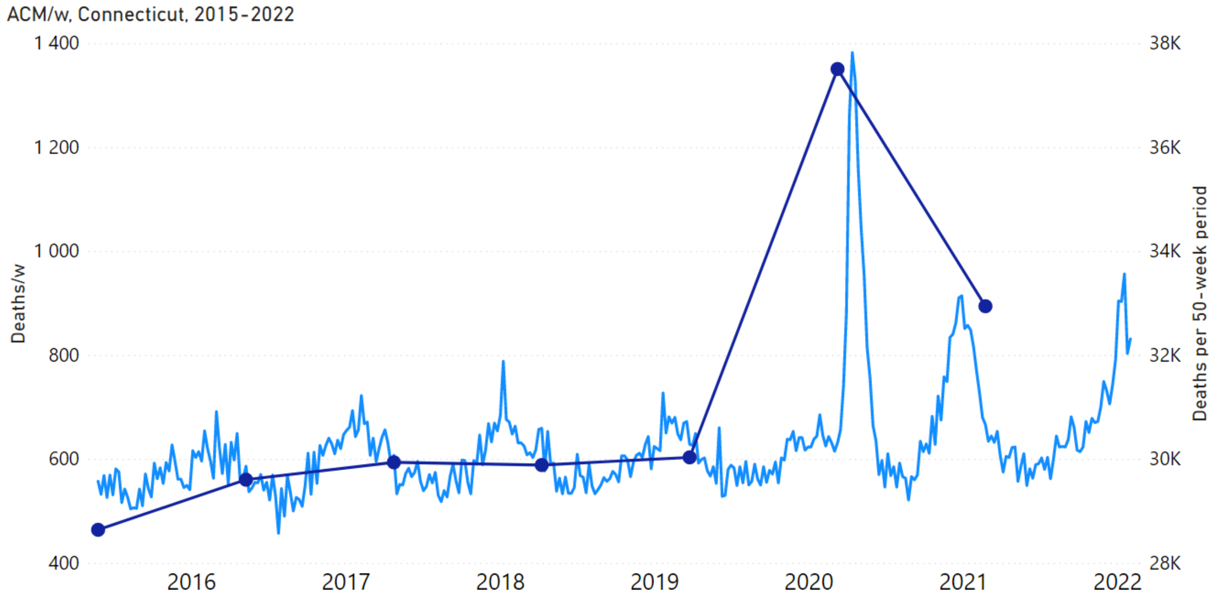
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
California	**304 271**	**335 996**	**259 882**	**76 114**	**44 389**	**29,29 %**	**17,08 %**
0-24	6 141	6 272	5 470	802	671	14,66 %	12,27 %
25-44	19 971	18 694	13 342	5 352	6 629	40,11 %	49,69 %
45-64	59 819	64 752	47 587	17 165	12 232	36,07 %	25,70 %
65-74	58 165	64 885	47 750	17 135	10 415	35,88 %	21,81 %
75-84	68 779	77 266	60 120	17 146	8 659	28,52 %	14,40 %
85+	91 396	104 127	85 613	18 514	5 783	21,63 %	6,75 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
California	**640 267**	**514 752**	**516 253**	**125 515**	**124 014**	**24,38 %**	**24,02 %**
0-24	12 413	10 837	11 720	1 576	693	14,54 %	5,91 %
25-44	38 665	25 834	24 117	12 831	14 548	49,67 %	60,32 %
45-64	124 571	95 294	96 943	29 277	27 628	30,72 %	28,50 %
65-74	123 050	94 336	91 863	28 714	31 187	30,44 %	33,95 %
75-84	146 045	118 457	116 313	27 588	29 732	23,29 %	25,56 %
85+	195 523	169 994	175 297	25 529	20 226	15,02 %	11,54 %



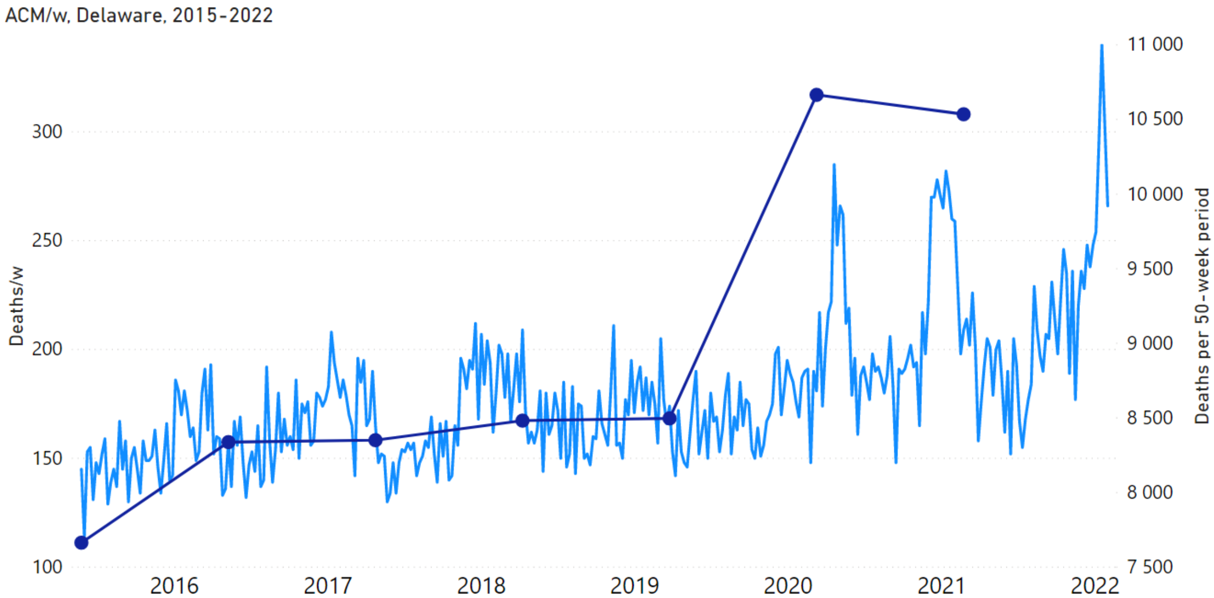
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Colorado**	**48 081**	**46 498**	**38 591**	**7 907**	**9 490**	**20,49 %**	**24,59 %**
0-24	1 210	1 159	1 045	114	165	10,91 %	15,79 %
25-44	3 775	3 175	2 516	659	1 259	26,19 %	50,04 %
45-64	9 580	8 505	7 265	1 240	2 315	17,07 %	31,87 %
65-74	9 768	9 003	7 362	1 641	2 406	22,29 %	32,68 %
75-84	11 130	10 861	8 820	2 041	2 310	23,14 %	26,19 %
85+	12 618	13 795	11 583	2 212	1 035	19,10 %	8,94 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Colorado**	**94 579**	**76 084**	**74 138**	**18 495**	**20 441**	**24,31 %**	**27,57 %**
0-24	2 369	2 064	2 091	305	278	14,78 %	13,30 %
25-44	6 950	4 895	4 486	2 055	2 464	41,98 %	54,93 %
45-64	18 085	14 573	14 595	3 512	3 490	24,10 %	23,91 %
65-74	18 771	14 370	13 396	4 401	5 375	30,63 %	40,12 %
75-84	21 991	17 284	16 518	4 707	5 473	27,23 %	33,13 %
85+	26 413	22 898	23 052	3 515	3 361	15,35 %	14,58 %



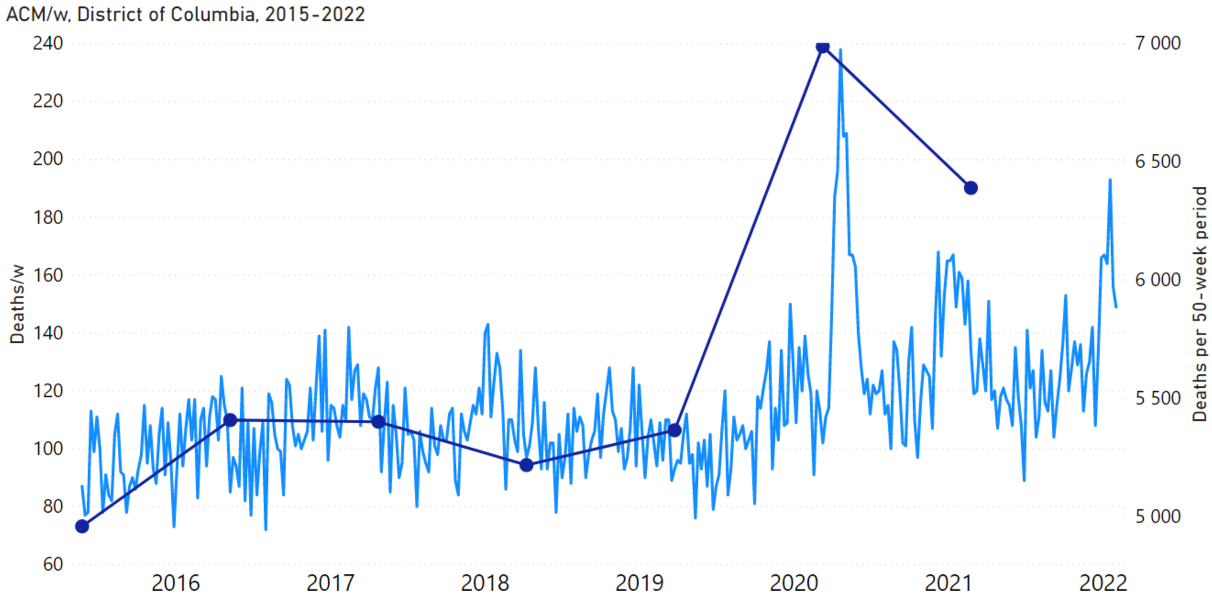
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Connecticut	**32 992**	**37 514**	**30 041**	**7 473**	**2 951**	**24,88 %**	**9,82 %**
0-24	249	178	179	-1	70	-0,56 %	39,11 %
25-44	1 692	1 604	1 369	235	323	17,17 %	23,59 %
45-64	5 812	6 074	4 825	1 249	987	25,89 %	20,46 %
65-74	5 781	6 268	4 984	1 284	797	25,76 %	15,99 %
75-84	7 893	8 926	6 913	2 013	980	29,12 %	14,18 %
85+	11 565	14 464	11 771	2 693	-206	22,88 %	-1,75 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Connecticut	**70 506**	**59 934**	**59 556**	**10 572**	**10 950**	**17,64 %**	**18,39 %**
0-24	427	360	404	67	23	18,61 %	5,69 %
25-44	3 296	2 629	2 430	667	866	25,37 %	35,64 %
45-64	11 886	9 675	9 517	2 211	2 369	22,85 %	24,89 %
65-74	12 049	9 768	9 596	2 281	2 453	23,35 %	25,56 %
75-84	16 819	13 833	13 254	2 986	3 565	21,59 %	26,90 %
85+	26 029	23 669	24 355	2 360	1 674	9,97 %	6,87 %



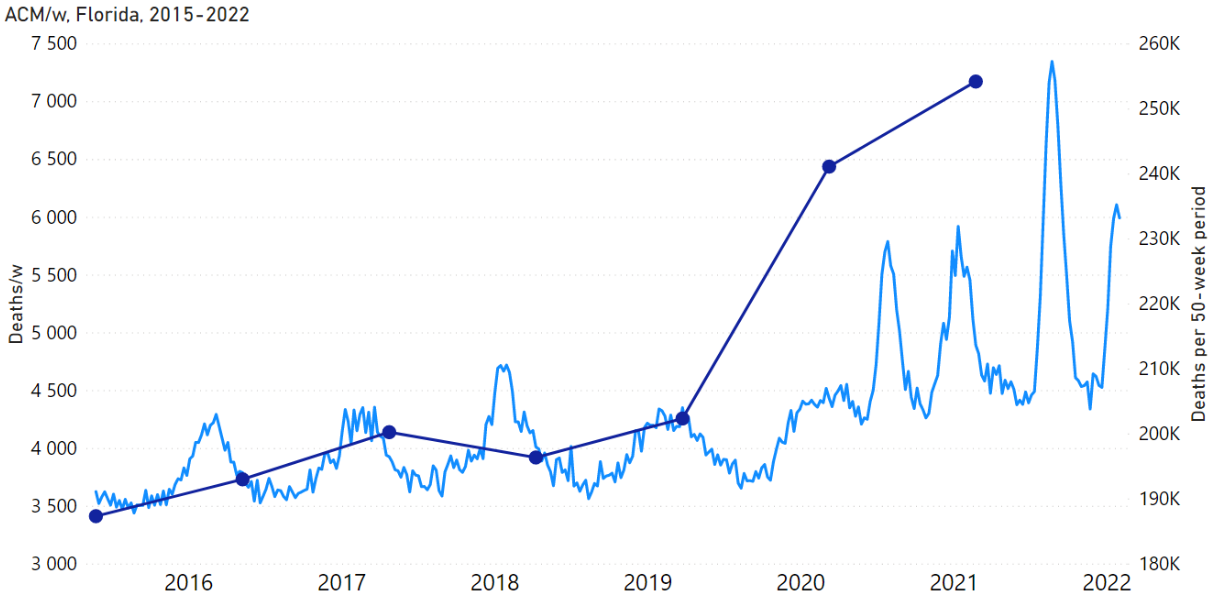
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Delaware	**10 568**	**10 665**	**8 497**	**2 168**	**2 071**	**25,51 %**	**24,37 %**
25-44	468	340	344	-4	124	-1,16 %	36,05 %
45-64	2 080	1 927	1 627	300	453	18,44 %	27,84 %
65-74	2 364	2 271	1 721	550	643	31,96 %	37,36 %
75-84	2 750	2 849	2 173	676	577	31,11 %	26,55 %
85+	2 906	3 278	2 632	646	274	24,54 %	10,41 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Delaware	**21 233**	**16 979**	**16 689**	**4 254**	**4 544**	**25,05 %**	**27,23 %**
0-24			23		-23		-100,00 %
25-44	808	573	342	235	466	41,01 %	136,26 %
45-64	4 007	3 224	3 399	783	608	24,29 %	17,89 %
65-74	4 635	3 433	3 485	1 202	1 150	35,01 %	33,00 %
75-84	5 599	4 387	4 211	1 212	1 388	27,63 %	32,96 %
85+	6 184	5 362	5 229	822	955	15,33 %	18,26 %



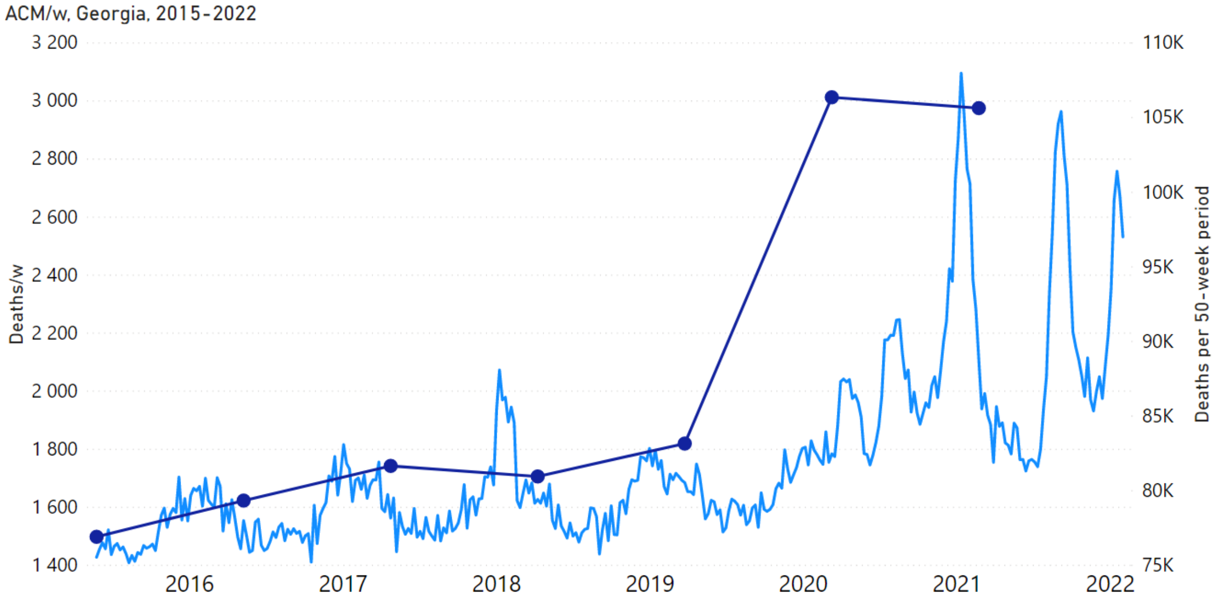
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
District of Columbia	**6 408**	**6 989**	**5 367**	**1 622**	**1 041**	**30,22 %**	**19,40 %**
0-24	11	11	24	-13	-13	-54,17 %	-54,17 %
25-44	538	398	187	211	351	112,83 %	187,70 %
45-64	1 826	2 017	1 596	421	230	26,38 %	14,41 %
65-74	1 549	1 711	1 285	426	264	33,15 %	20,54 %
75-84	1 266	1 377	1 095	282	171	25,75 %	15,62 %
85+	1 218	1 475	1 180	295	38	25,00 %	3,22 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
District of Columbia	**13 397**	**10 587**	**10 813**	**2 810**	**2 584**	**26,54 %**	**23,90 %**
0-24	22	36	59	-14	-37	-38,89 %	-62,71 %
25-44	936	347	291	589	645	169,74 %	221,65 %
45-64	3 843	3 175	3 319	668	524	21,04 %	15,79 %
65-74	3 260	2 511	2 509	749	751	29,83 %	29,93 %
75-84	2 643	2 141	2 145	502	498	23,45 %	23,22 %
85+	2 693	2 377	2 490	316	203	13,29 %	8,15 %



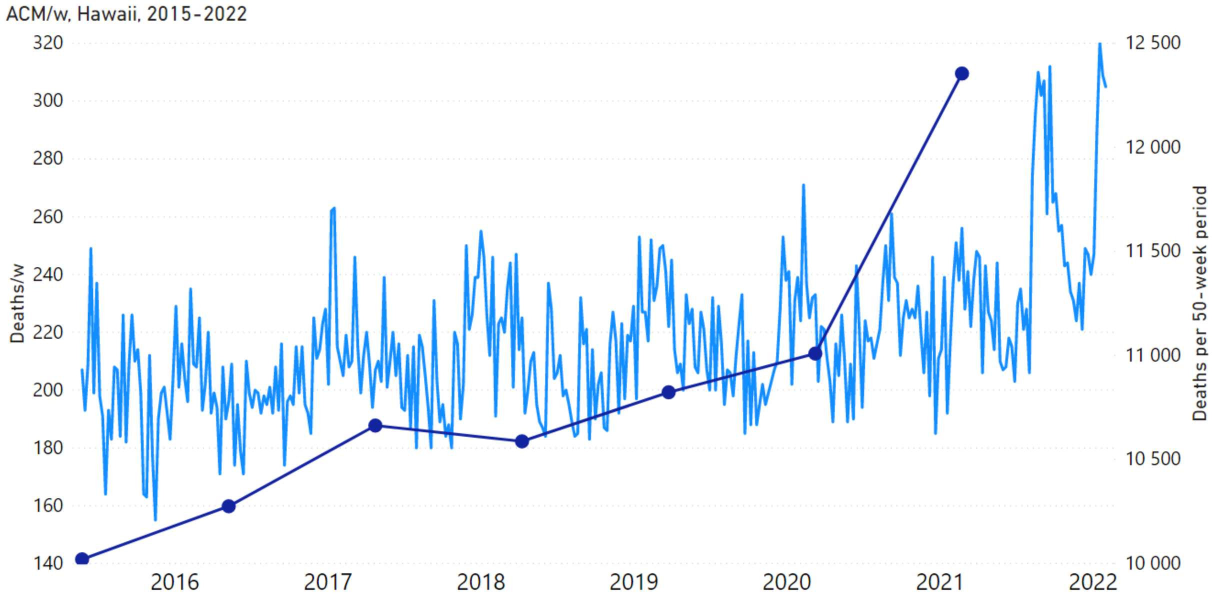
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Florida	**254 311**	**241 142**	**202 396**	**38 746**	**51 915**	**19,14 %**	**25,65 %**
0-24	4 246	3 914	3 735	179	511	4,79 %	13,68 %
25-44	14 563	12 158	9 761	2 397	4 802	24,56 %	49,20 %
45-64	48 930	42 173	36 005	6 168	12 925	17,13 %	35,90 %
65-74	51 262	47 070	38 774	8 296	12 488	21,40 %	32,21 %
75-84	63 449	61 704	50 625	11 079	12 824	21,88 %	25,33 %
85+	71 861	74 123	63 496	10 627	8 365	16,74 %	13,17 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Florida	**495 453**	**398 793**	**393 327**	**96 660**	**102 126**	**24,24 %**	**25,96 %**
0-24	8 160	7 465	7 756	695	404	9,31 %	5,21 %
25-44	26 721	18 935	18 746	7 786	7 975	41,12 %	42,54 %
45-64	91 103	72 034	72 573	19 069	18 530	26,47 %	25,53 %
65-74	98 332	76 374	73 622	21 958	24 710	28,75 %	33,56 %
75-84	125 153	99 095	94 775	26 058	30 378	26,30 %	32,05 %
85+	145 984	124 890	125 855	21 094	20 129	16,89 %	15,99 %



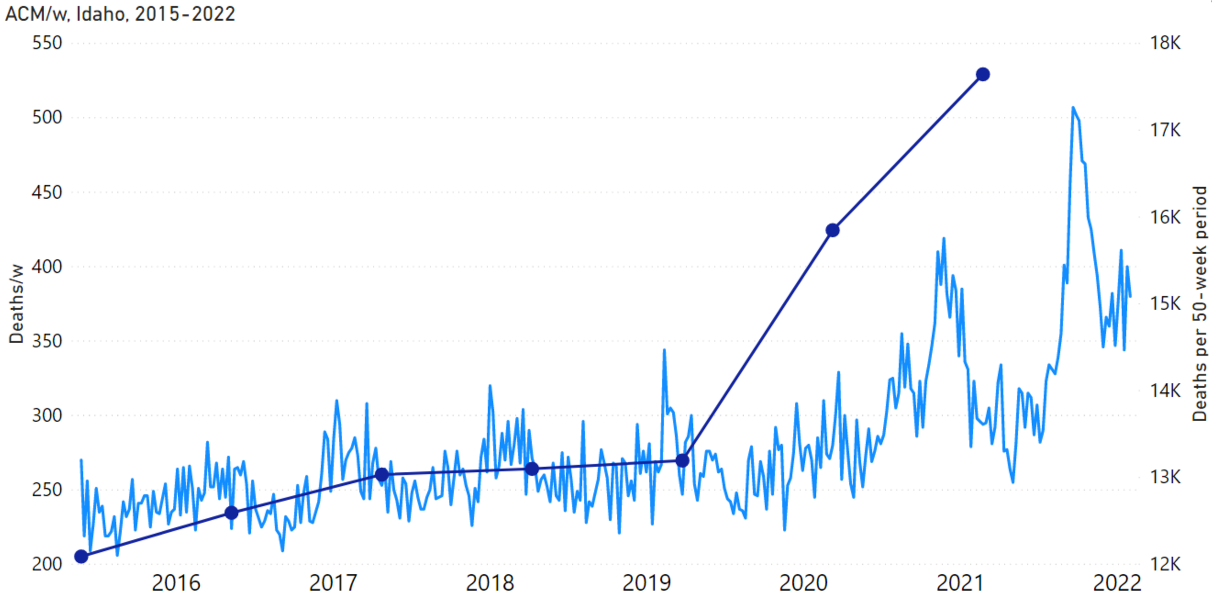
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Georgia**	**105 894**	**106 369**	**83 159**	**23 210**	**22 735**	**27,91 %**	**27,34 %**
0-24	2 536	2 336	2 241	95	295	4,24 %	13,16 %
25-44	7 315	6 344	4 711	1 633	2 604	34,66 %	55,27 %
45-64	24 759	23 038	18 416	4 622	6 343	25,10 %	34,44 %
65-74	23 743	23 429	17 926	5 503	5 817	30,70 %	32,45 %
75-84	25 142	26 114	19 957	6 157	5 185	30,85 %	25,98 %
85+	22 399	25 108	19 908	5 200	2 491	26,12 %	12,51 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Georgia**	**212 263**	**164 114**	**161 001**	**48 149**	**51 262**	**29,34 %**	**31,84 %**
0-24	4 872	4 485	4 718	387	154	8,63 %	3,26 %
25-44	13 659	9 269	9 126	4 390	4 533	47,36 %	49,67 %
45-64	47 797	36 462	36 733	11 335	11 064	31,09 %	30,12 %
65-74	47 172	35 484	33 934	11 688	13 238	32,94 %	39,01 %
75-84	51 256	38 993	37 373	12 263	13 883	31,45 %	37,15 %
85+	47 507	39 421	39 117	8 086	8 390	20,51 %	21,45 %



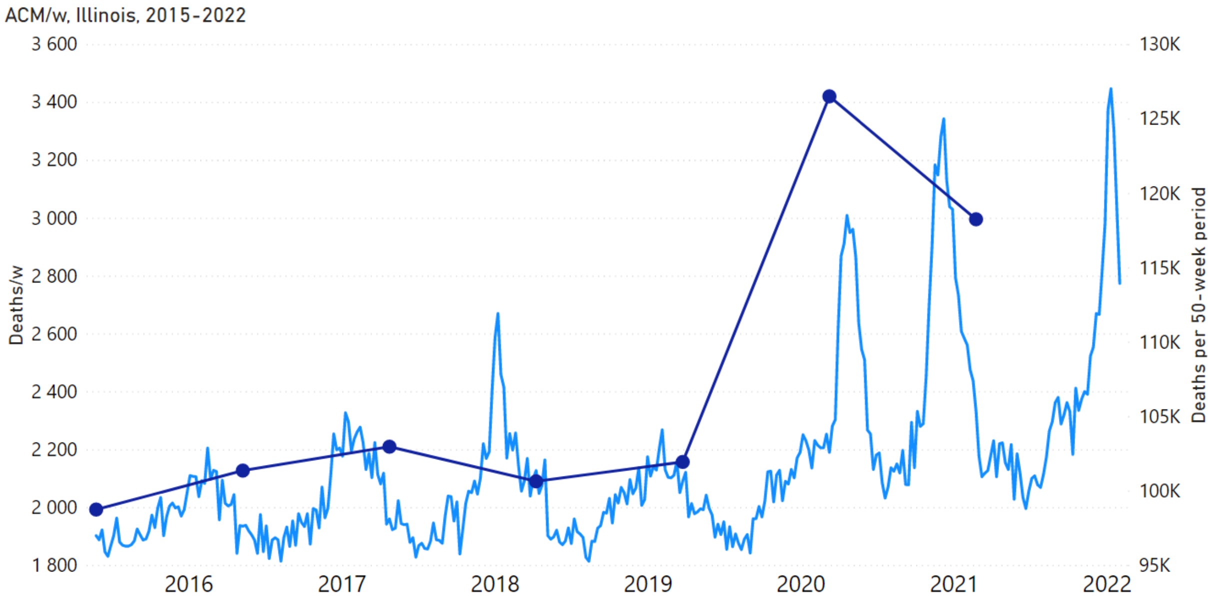
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Hawaii	**12 364**	**11 009**	**10 823**	**186**	**1 541**	**1,72 %**	**14,24 %**
25-44	439	260	285	-25	154	-8,77 %	54,04 %
45-64	2 300	2 002	1 955	47	345	2,40 %	17,65 %
65-74	2 509	2 256	2 068	188	441	9,09 %	21,32 %
75-84	2 747	2 448	2 299	149	448	6,48 %	19,49 %
85+	4 369	4 043	4 216	-173	153	-4,10 %	3,63 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Hawaii	**23 373**	**21 410**	**20 938**	**1 963**	**2 435**	**9,17 %**	**11,63 %**
0-24		13	11	-13	-11	-100,00 %	-100,00 %
25-44	699	505	386	194	313	38,42 %	81,09 %
45-64	4 302	3 901	3 888	401	414	10,28 %	10,65 %
65-74	4 765	4 173	3 986	592	779	14,19 %	19,54 %
75-84	5 195	4 568	4 512	627	683	13,73 %	15,14 %
85+	8 412	8 250	8 155	162	257	1,96 %	3,15 %



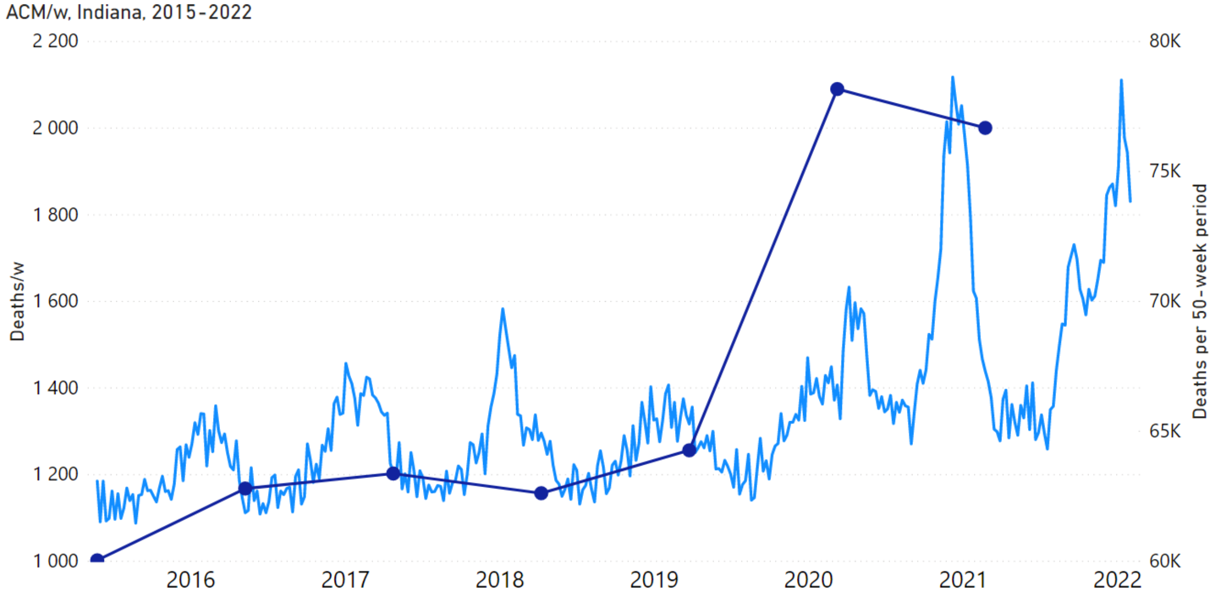
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Idaho**	**17 644**	**15 848**	**13 195**	**2 653**	**4 449**	**20,11 %**	**33,72 %**
0-24	85	92	35	57	50	162,86 %	142,86 %
25-44	885	710	342	368	543	107,60 %	158,77 %
45-64	3 203	2 631	2 216	415	987	18,73 %	44,54 %
65-74	3 838	3 234	2 647	587	1 191	22,18 %	44,99 %
75-84	4 638	4 292	3 670	622	968	16,95 %	26,38 %
85+	4 995	4 889	4 285	604	710	14,10 %	16,57 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Idaho**	**33 492**	**26 294**	**25 626**	**7 198**	**7 866**	**27,38 %**	**30,70 %**
0-24	177	76	109	101	68	132,89 %	62,39 %
25-44	1 595	784	861	811	734	103,44 %	85,25 %
45-64	5 834	4 436	4 482	1 398	1 352	31,51 %	30,17 %
65-74	7 072	5 334	5 034	1 738	2 038	32,58 %	40,48 %
75-84	8 930	7 136	6 777	1 794	2 153	25,14 %	31,77 %
85+	9 884	8 528	8 363	1 356	1 521	15,90 %	18,19 %



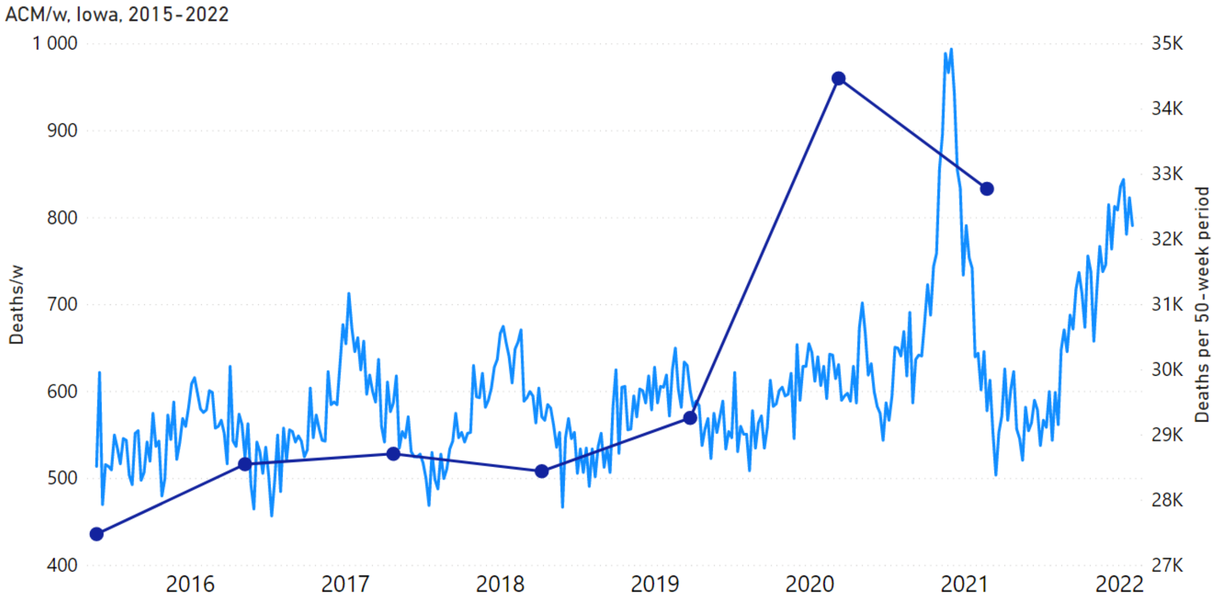
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Illinois	**118 278**	**126 531**	**101 962**	**24 569**	**16 316**	**24,10 %**	**16,00 %**
0-24	2 342	2 264	1 999	265	343	13,26 %	17,16 %
25-44	6 561	6 078	4 869	1 209	1 692	24,83 %	34,75 %
45-64	23 031	22 956	18 692	4 264	4 339	22,81 %	23,21 %
65-74	24 066	24 816	19 398	5 418	4 668	27,93 %	24,06 %
75-84	27 993	30 258	24 060	6 198	3 933	25,76 %	16,35 %
85+	34 285	40 159	32 944	7 215	1 341	21,90 %	4,07 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Illinois	**244 809**	**202 621**	**204 365**	**42 188**	**40 444**	**20,82 %**	**19,79 %**
0-24	4 606	4 153	4 871	453	-265	10,91 %	-5,44 %
25-44	12 639	9 618	9 432	3 021	3 207	31,41 %	34,00 %
45-64	45 987	37 349	37 681	8 638	8 306	23,13 %	22,04 %
65-74	48 882	37 890	36 761	10 992	12 121	29,01 %	32,97 %
75-84	58 251	47 770	47 456	10 481	10 795	21,94 %	22,75 %
85+	74 444	65 841	68 164	8 603	6 280	13,07 %	9,21 %



State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Indiana**	**76 829**	**78 173**	**64 270**	**13 903**	**12 559**	**21,63 %**	**19,54 %**
0-24	1 665	1 604	1 416	188	249	13,28 %	17,58 %
25-44	4 644	4 151	3 271	880	1 373	26,90 %	41,97 %
45-64	15 699	14 535	12 203	2 332	3 496	19,11 %	28,65 %
65-74	16 899	15 906	13 091	2 815	3 808	21,50 %	29,09 %
75-84	18 571	19 361	15 660	3 701	2 911	23,63 %	18,59 %
85+	19 351	22 616	18 629	3 987	722	21,40 %	3,88 %

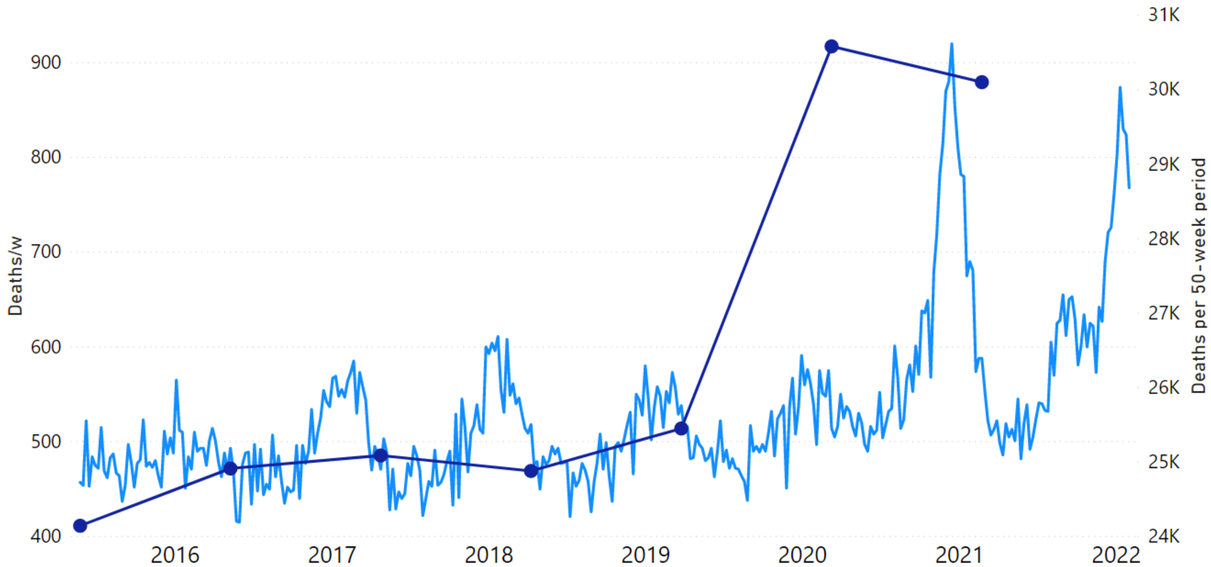
State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Indiana**	**155 002**	**126 889**	**126 175**	**28 113**	**28 827**	**22,16 %**	**22,85 %**
0-24	3 269	2 867	3 072	402	197	14,02 %	6,41 %
25-44	8 795	6 374	6 500	2 421	2 295	37,98 %	35,31 %
45-64	30 234	24 538	24 912	5 696	5 322	23,21 %	21,36 %
65-74	32 805	25 463	23 769	7 342	9 036	28,83 %	38,02 %
75-84	37 932	30 788	30 109	7 144	7 823	23,20 %	25,98 %
85+	41 967	36 859	37 813	5 108	4 154	13,86 %	10,99 %



State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Iowa	**32 816**	**34 471**	**29 263**	**5 208**	**3 553**	**17,80 %**	**12,14 %**
0-24	158	286	241	45	-83	18,67 %	-34,44 %
25-44	1 331	1 264	1 034	230	297	22,24 %	28,72 %
45-64	5 695	5 394	4 761	633	934	13,30 %	19,62 %
65-74	6 725	6 485	5 255	1 230	1 470	23,41 %	27,97 %
75-84	8 171	8 417	7 205	1 212	966	16,82 %	13,41 %
85+	10 736	12 625	10 767	1 858	-31	17,26 %	-0,29 %

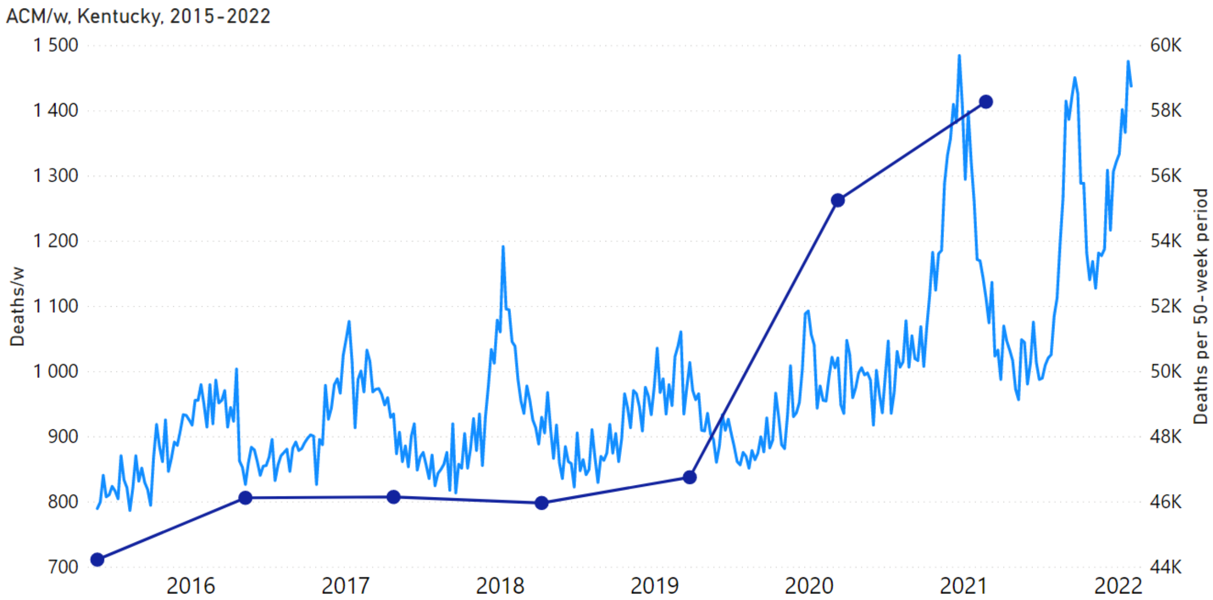
State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Iowa	**67 287**	**57 708**	**57 265**	**9 579**	**10 022**	**16,60 %**	**17,50 %**
0-24	444	461	689	-17	-245	-3,69 %	-35,56 %
25-44	2 595	1 979	1 871	616	724	31,13 %	38,70 %
45-64	11 089	9 371	9 268	1 718	1 821	18,33 %	19,65 %
65-74	13 210	10 376	9 819	2 834	3 391	27,31 %	34,54 %
75-84	16 588	14 159	13 598	2 429	2 990	17,16 %	21,99 %
85+	23 361	21 362	22 020	1 999	1 341	9,36 %	6,09 %

ACM/w, Kansas, 2015-2022



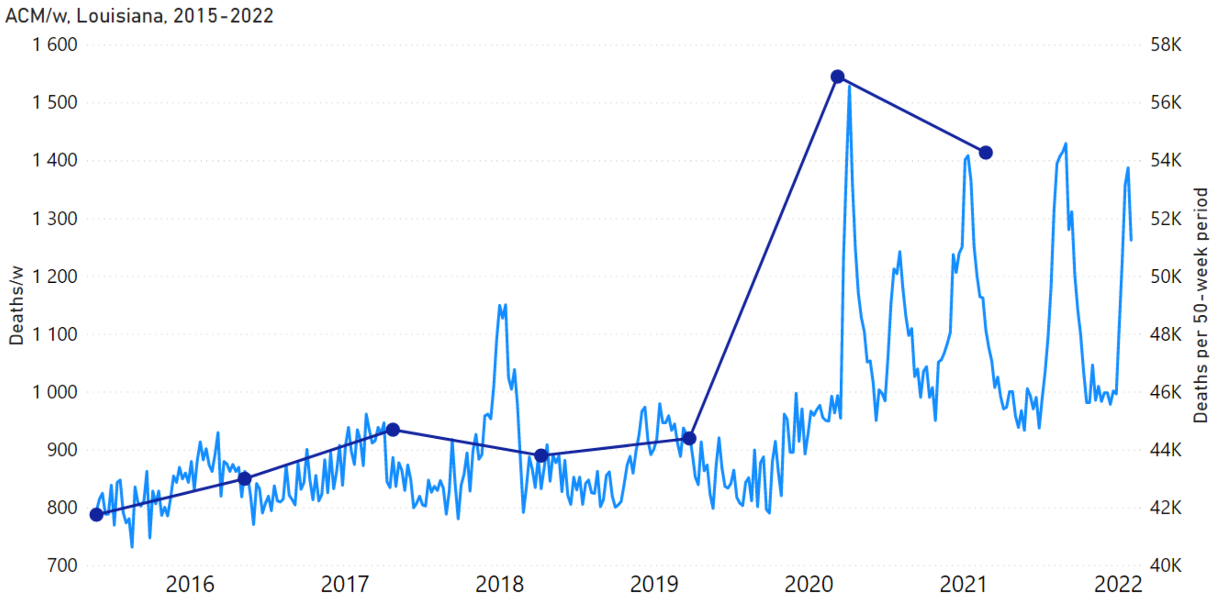
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Kansas	**30 110**	**30 583**	**25 450**	**5 133**	**4 660**	**20,17 %**	**18,31 %**
0-24	458	409	356	53	102	14,89 %	28,65 %
25-44	1 653	1 410	1 133	277	520	24,45 %	45,90 %
45-64	5 639	5 243	4 497	746	1 142	16,59 %	25,39 %
65-74	6 289	5 949	4 848	1 101	1 441	22,71 %	29,72 %
75-84	7 217	7 452	6 080	1 372	1 137	22,57 %	18,70 %
85+	8 854	10 120	8 536	1 584	318	18,56 %	3,73 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Kansas	**60 693**	**50 329**	**49 999**	**10 364**	**10 694**	**20,59 %**	**21,39 %**
0-24	867	644	813	223	54	34,63 %	6,64 %
25-44	3 063	2 203	2 072	860	991	39,04 %	47,83 %
45-64	10 882	8 826	9 066	2 056	1 816	23,29 %	20,03 %
65-74	12 238	9 565	8 879	2 673	3 359	27,95 %	37,83 %
75-84	14 669	11 964	11 924	2 705	2 745	22,61 %	23,02 %
85+	18 974	17 127	17 245	1 847	1 729	10,78 %	10,03 %



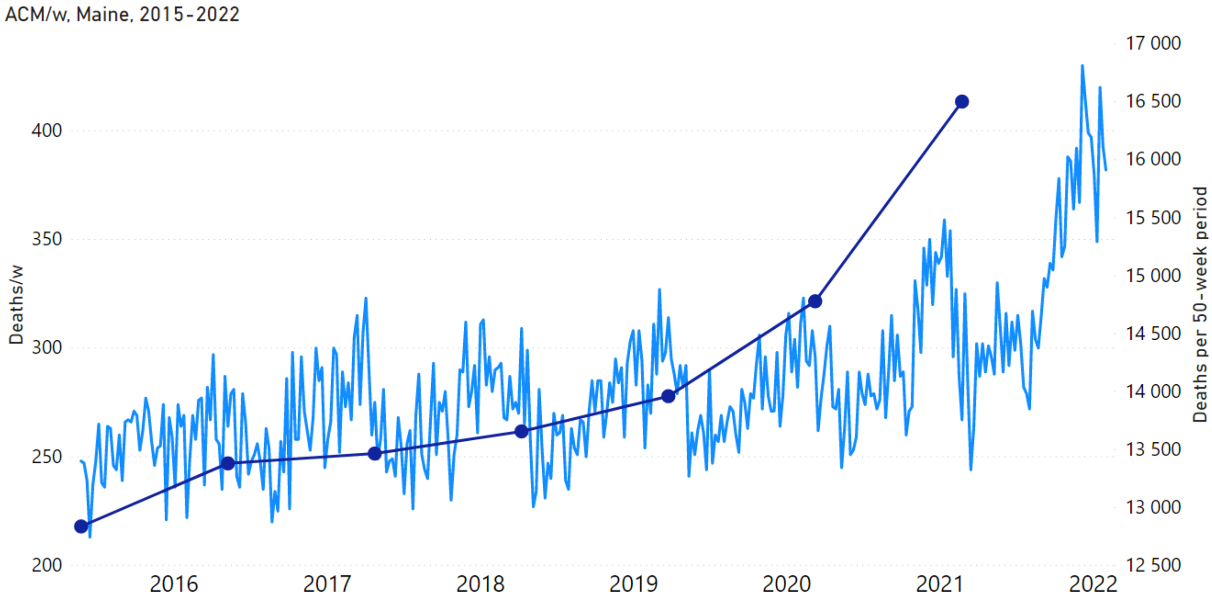
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Kentucky**	**58 357**	**55 261**	**46 760**	**8 501**	**11 597**	**18,18 %**	**24,80 %**
0-24	1 068	1 034	771	263	297	34,11 %	38,52 %
25-44	3 891	3 546	2 548	998	1 343	39,17 %	52,71 %
45-64	13 668	11 974	10 343	1 631	3 325	15,77 %	32,15 %
65-74	13 413	11 993	10 034	1 959	3 379	19,52 %	33,68 %
75-84	14 165	13 426	11 649	1 777	2 516	15,25 %	21,60 %
85+	12 152	13 288	11 415	1 873	737	16,41 %	6,46 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Kentucky**	**113 618**	**92 731**	**92 284**	**20 887**	**21 334**	**22,52 %**	**23,12 %**
0-24	2 102	1 549	1 801	553	301	35,70 %	16,71 %
25-44	7 437	5 136	5 419	2 301	2 018	44,80 %	37,24 %
45-64	25 642	20 508	20 939	5 134	4 703	25,03 %	22,46 %
65-74	25 406	19 978	19 322	5 428	6 084	27,17 %	31,49 %
75-84	27 591	22 933	22 005	4 658	5 586	20,31 %	25,39 %
85+	25 440	22 627	22 798	2 813	2 642	12,43 %	11,59 %



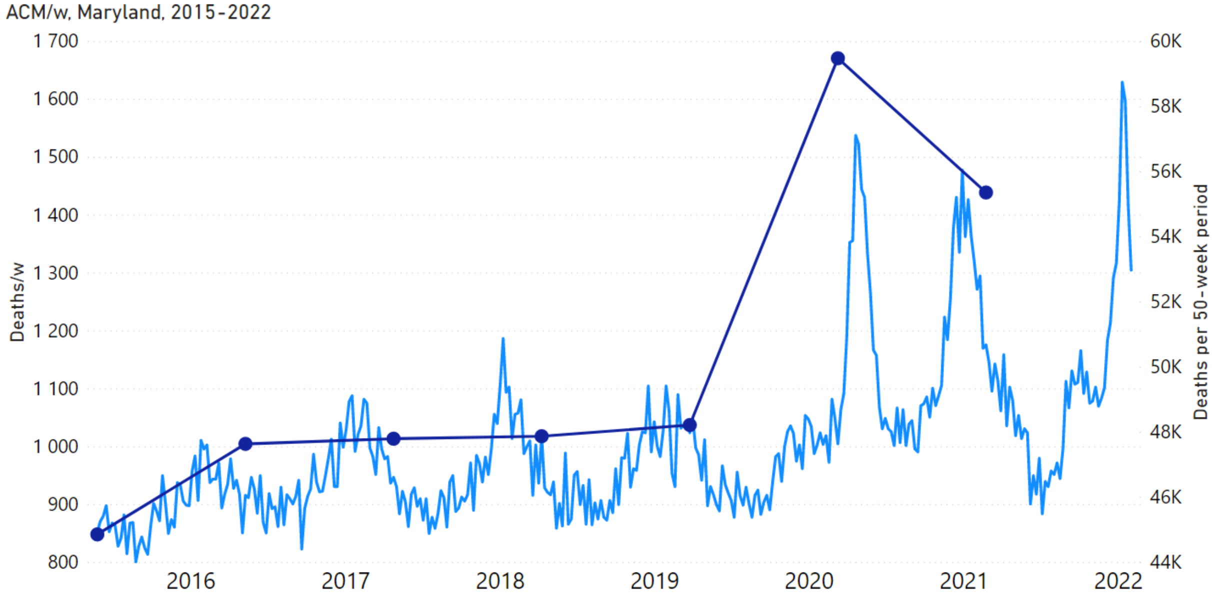
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Louisiana	**54 566**	**56 915**	**44 401**	**12 514**	**10 165**	**28,18 %**	**22,89 %**
0-24	1 427	1 363	1 228	135	199	10,99 %	16,21 %
25-44	4 318	3 856	2 853	1 003	1 465	35,16 %	51,35 %
45-64	12 638	12 261	9 786	2 475	2 852	25,29 %	29,14 %
65-74	12 109	12 467	9 390	3 077	2 719	32,77 %	28,96 %
75-84	12 456	13 540	10 437	3 103	2 019	29,73 %	19,34 %
85+	11 618	13 428	10 707	2 721	911	25,41 %	8,51 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Louisiana	**111 481**	**88 207**	**87 706**	**23 274**	**23 775**	**26,39 %**	**27,11 %**
0-24	2 790	2 419	2 553	371	237	15,34 %	9,28 %
25-44	8 174	5 493	5 505	2 681	2 669	48,81 %	48,48 %
45-64	24 899	19 582	20 137	5 317	4 762	27,15 %	23,65 %
65-74	24 576	18 668	17 936	5 908	6 640	31,65 %	37,02 %
75-84	25 996	20 673	20 090	5 323	5 906	25,75 %	29,40 %
85+	25 046	21 372	21 485	3 674	3 561	17,19 %	16,57 %



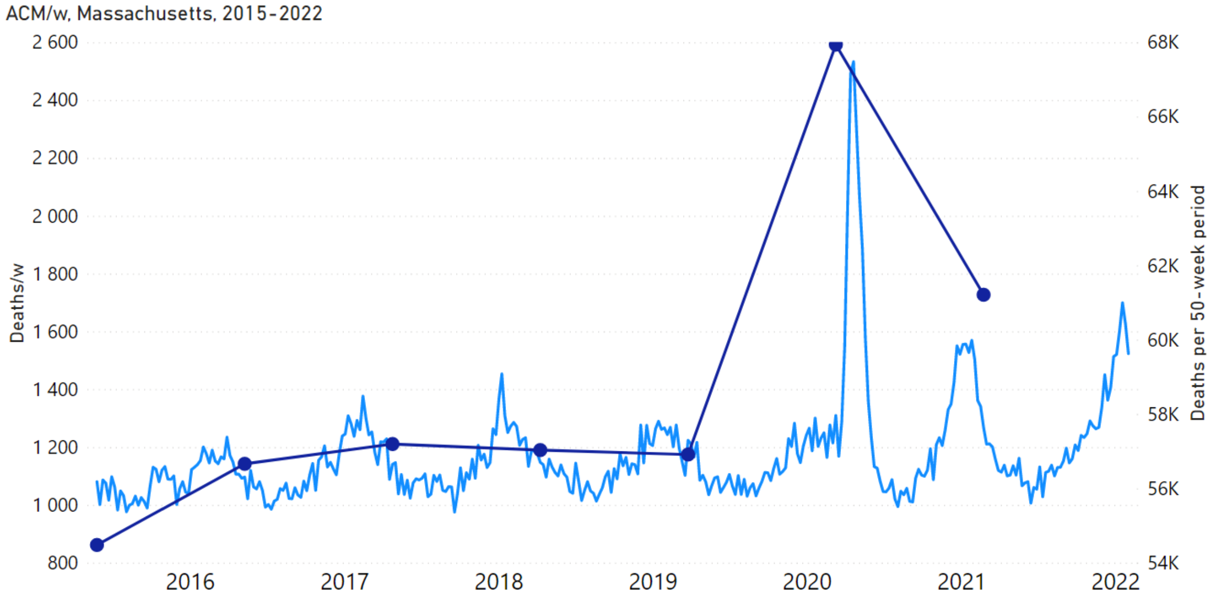
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Maine	**16 503**	**14 779**	**13 960**	**819**	**2 543**	**5,87 %**	**18,22 %**
25-44	769	501	439	62	330	14,12 %	75,17 %
45-64	2 987	2 558	2 360	198	627	8,39 %	26,57 %
65-74	3 383	2 939	2 754	185	629	6,72 %	22,84 %
75-84	4 268	3 887	3 680	207	588	5,63 %	15,98 %
85+	5 096	4 894	4 727	167	369	3,53 %	7,81 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Maine	**31 282**	**27 616**	**26 845**	**3 666**	**4 437**	**13,27 %**	**16,53 %**
0-24			11		-11		-100,00 %
25-44	1 270	771	629	499	641	64,72 %	101,91 %
45-64	5 545	4 717	4 715	828	830	17,55 %	17,60 %
65-74	6 322	5 417	5 219	905	1 103	16,71 %	21,13 %
75-84	8 155	7 275	6 763	880	1 392	12,10 %	20,58 %
85+	9 990	9 436	9 508	554	482	5,87 %	5,07 %



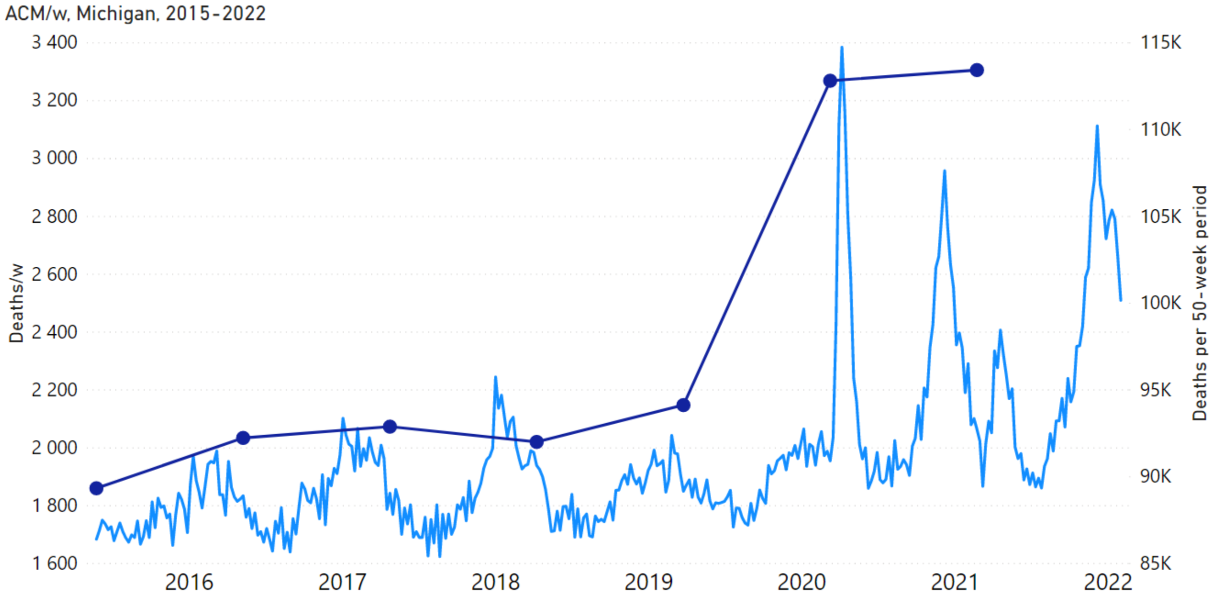
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Maryland	**55 398**	**59 489**	**48 222**	**11 267**	**7 176**	**23,36 %**	**14,88 %**
0-24	1 061	1 095	1 026	69	35	6,73 %	3,41 %
25-44	3 538	3 553	2 902	651	636	22,43 %	21,92 %
45-64	11 118	11 338	9 188	2 150	1 930	23,40 %	21,01 %
65-74	11 105	11 580	9 121	2 459	1 984	26,96 %	21,75 %
75-84	13 114	13 901	11 241	2 660	1 873	23,66 %	16,66 %
85+	15 462	18 022	14 744	3 278	718	22,23 %	4,87 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Maryland	**114 887**	**96 100**	**95 443**	**18 787**	**19 444**	**19,55 %**	**20,37 %**
0-24	2 156	1 996	2 228	160	-72	8,02 %	-3,23 %
25-44	7 091	5 667	5 586	1 424	1 505	25,13 %	26,94 %
45-64	22 456	18 738	19 149	3 718	3 307	19,84 %	17,27 %
65-74	22 685	17 940	17 401	4 745	5 284	26,45 %	30,37 %
75-84	27 015	22 179	21 371	4 836	5 644	21,80 %	26,41 %
85+	33 484	29 580	29 708	3 904	3 776	13,20 %	12,71 %



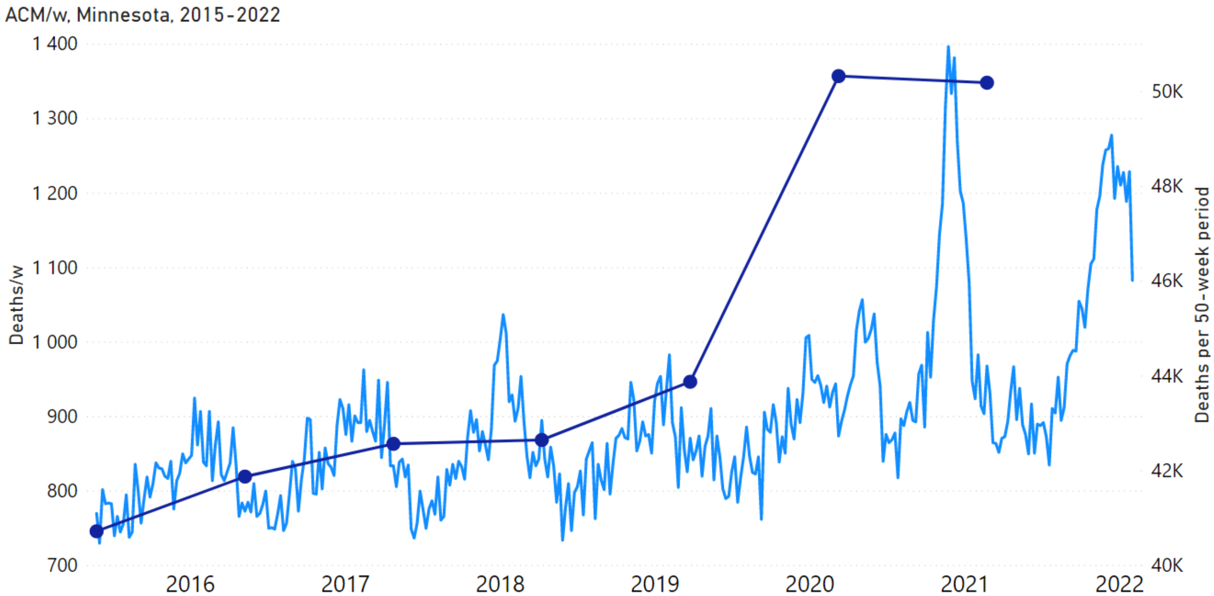
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Massachusetts	**61 239**	**67 951**	**56 925**	**11 026**	**4 314**	**19,37 %**	**7,58 %**
0-24	727	687	729	-42	-2	-5,76 %	-0,27 %
25-44	3 001	2 947	2 606	341	395	13,09 %	15,16 %
45-64	10 340	10 417	9 103	1 314	1 237	14,43 %	13,59 %
65-74	11 565	12 074	9 874	2 200	1 691	22,28 %	17,13 %
75-84	14 907	16 338	13 233	3 105	1 674	23,46 %	12,65 %
85+	20 699	25 488	21 380	4 108	-681	19,21 %	-3,19 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Massachusetts	**129 190**	**113 969**	**113 881**	**15 221**	**15 309**	**13,36 %**	**13,44 %**
0-24	1 414	1 517	1 732	-103	-318	-6,79 %	-18,36 %
25-44	5 948	5 178	5 369	770	579	14,87 %	10,78 %
45-64	20 757	18 424	18 431	2 333	2 326	12,66 %	12,62 %
65-74	23 639	19 498	18 994	4 141	4 645	21,24 %	24,46 %
75-84	31 245	26 646	25 754	4 599	5 491	17,26 %	21,32 %
85+	46 187	42 706	43 601	3 481	2 586	8,15 %	5,93 %



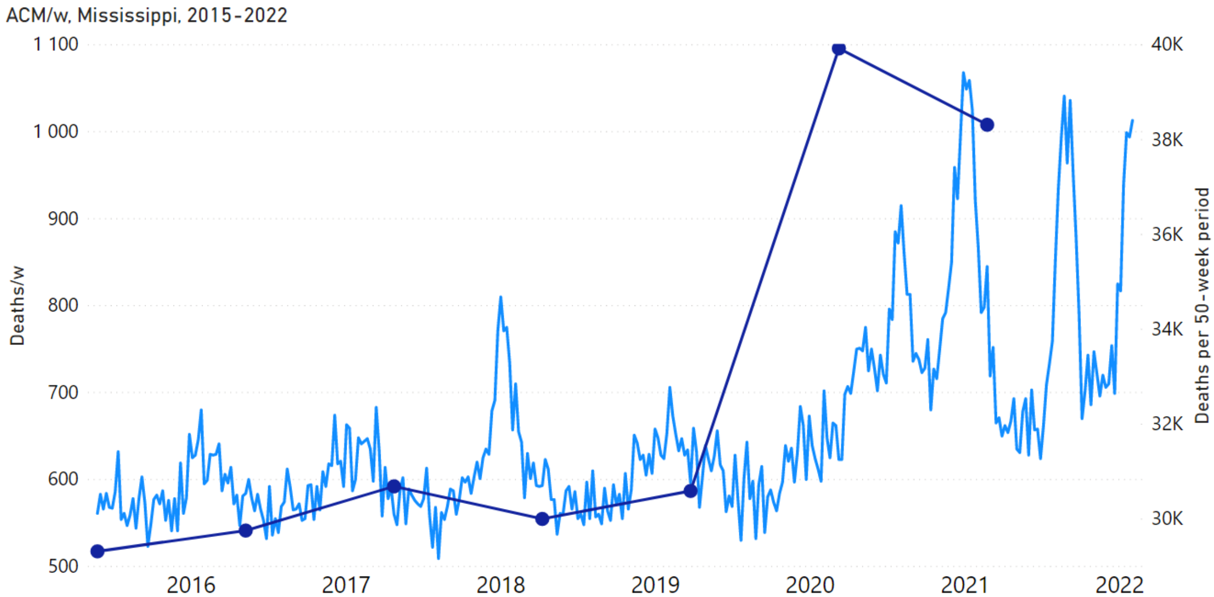
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Michigan**	**113 485**	**112 822**	**94 128**	**18 694**	**19 357**	**19,86 %**	**20,56 %**
0-24	1 934	1 893	1 761	132	173	7,50 %	9,82 %
25-44	6 025	5 275	4 220	1 055	1 805	25,00 %	42,77 %
45-64	22 338	20 541	17 338	3 203	5 000	18,47 %	28,84 %
65-74	24 433	23 162	18 759	4 403	5 674	23,47 %	30,25 %
75-84	27 303	27 635	22 510	5 125	4 793	22,77 %	21,29 %
85+	31 452	34 316	29 540	4 776	1 912	16,17 %	6,47 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Michigan**	**226 307**	**186 135**	**185 124**	**40 172**	**41 183**	**21,58 %**	**22,25 %**
0-24	3 827	3 545	3 925	282	-98	7,95 %	-2,50 %
25-44	11 300	8 506	8 678	2 794	2 622	32,85 %	30,21 %
45-64	42 879	34 529	35 867	8 350	7 012	24,18 %	19,55 %
65-74	47 595	36 566	34 791	11 029	12 804	30,16 %	36,80 %
75-84	54 938	44 486	42 235	10 452	12 703	23,50 %	30,08 %
85+	65 768	58 503	59 628	7 265	6 140	12,42 %	10,30 %



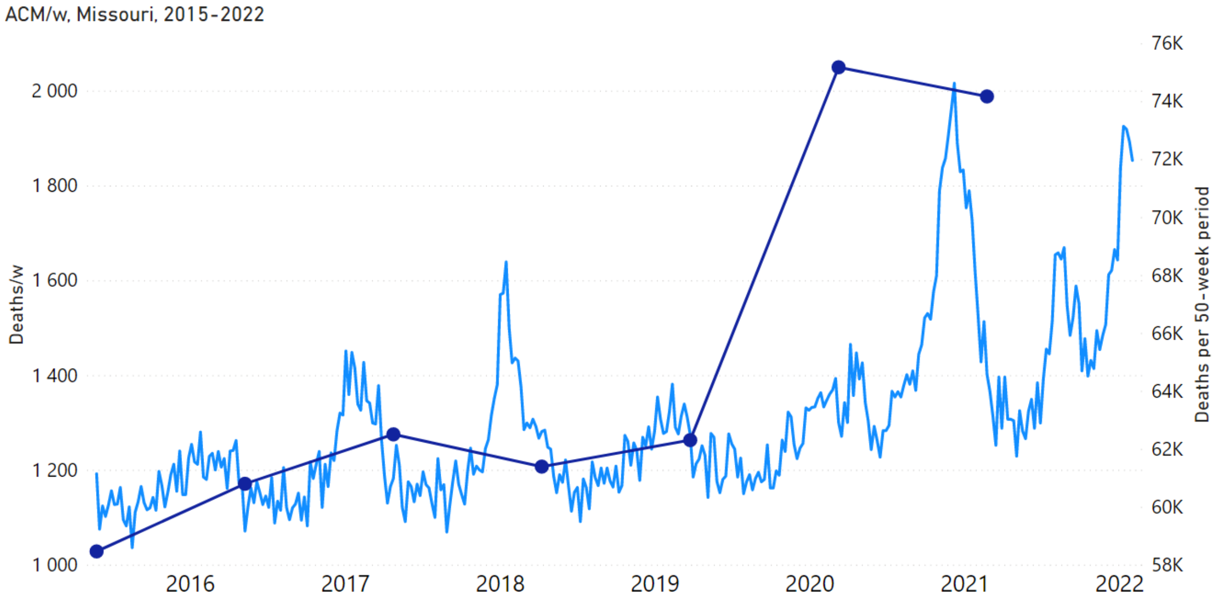
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Minnesota	**50 304**	**50 330**	**43 879**	**6 451**	**6 425**	**14,70 %**	**14,64 %**
0-24	956	863	873	-10	83	-1,15 %	9,51 %
25-44	2 605	2 192	1 797	395	808	21,98 %	44,96 %
45-64	8 590	7 715	6 792	923	1 798	13,59 %	26,47 %
65-74	9 716	8 881	7 725	1 156	1 991	14,96 %	25,77 %
75-84	12 172	12 487	10 566	1 921	1 606	18,18 %	15,20 %
85+	16 265	18 192	16 126	2 066	139	12,81 %	0,86 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Minnesota	**100 634**	**86 529**	**84 447**	**14 105**	**16 187**	**16,30 %**	**19,17 %**
0-24	1 819	1 680	1 644	139	175	8,27 %	10,64 %
25-44	4 797	3 401	3 117	1 396	1 680	41,05 %	53,90 %
45-64	16 305	13 655	13 814	2 650	2 491	19,41 %	18,03 %
65-74	18 597	15 115	14 132	3 482	4 465	23,04 %	31,59 %
75-84	24 659	20 714	19 494	3 945	5 165	19,05 %	26,50 %
85+	34 457	31 964	32 246	2 493	2 211	7,80 %	6,86 %



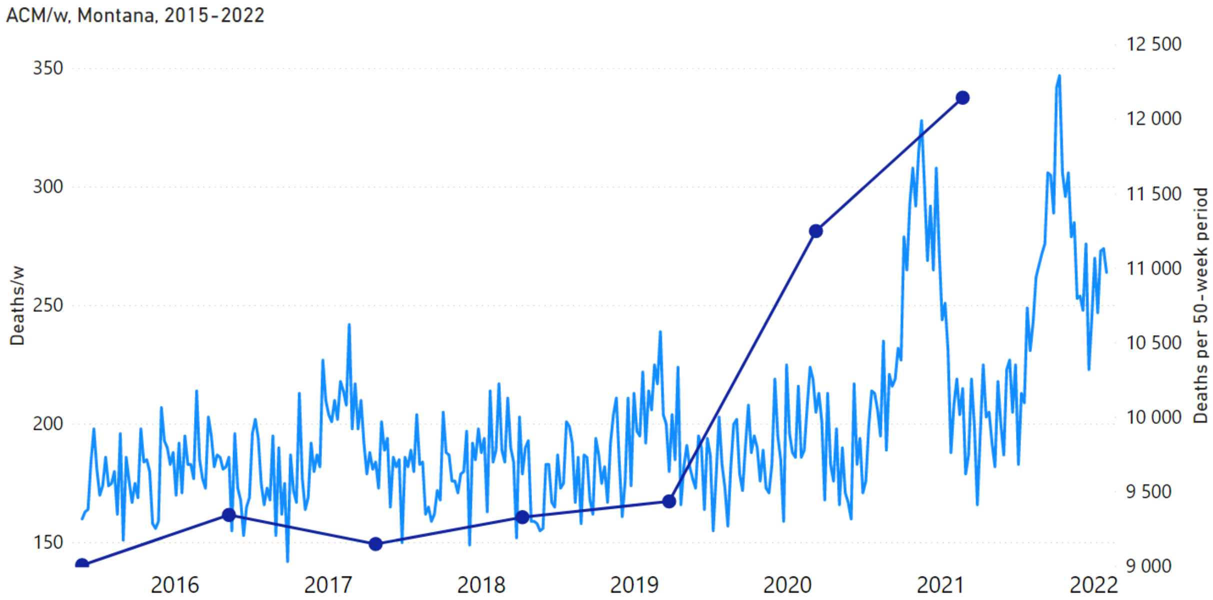
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Mississippi**	**38 329**	**39 923**	**30 592**	**9 331**	**7 737**	**30,50 %**	**25,29 %**
0-24	1 013	851	746	105	267	14,08 %	35,79 %
25-44	2 674	2 399	1 776	623	898	35,08 %	50,56 %
45-64	9 130	8 814	6 798	2 016	2 332	29,66 %	34,30 %
65-74	8 851	9 048	6 668	2 380	2 183	35,69 %	32,74 %
75-84	8 943	9 738	7 464	2 274	1 479	30,47 %	19,82 %
85+	7 718	9 073	7 140	1 933	578	27,07 %	8,10 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Mississippi**	**78 252**	**60 594**	**60 446**	**17 658**	**17 806**	**29,14 %**	**29,46 %**
0-24	1 864	1 490	1 434	374	430	25,10 %	29,99 %
25-44	5 073	3 427	3 318	1 646	1 755	48,03 %	52,89 %
45-64	17 944	13 636	14 150	4 308	3 794	31,59 %	26,81 %
65-74	17 899	13 154	12 615	4 745	5 284	36,07 %	41,89 %
75-84	18 681	14 636	14 282	4 045	4 399	27,64 %	30,80 %
85+	16 791	14 251	14 647	2 540	2 144	17,82 %	14,64 %



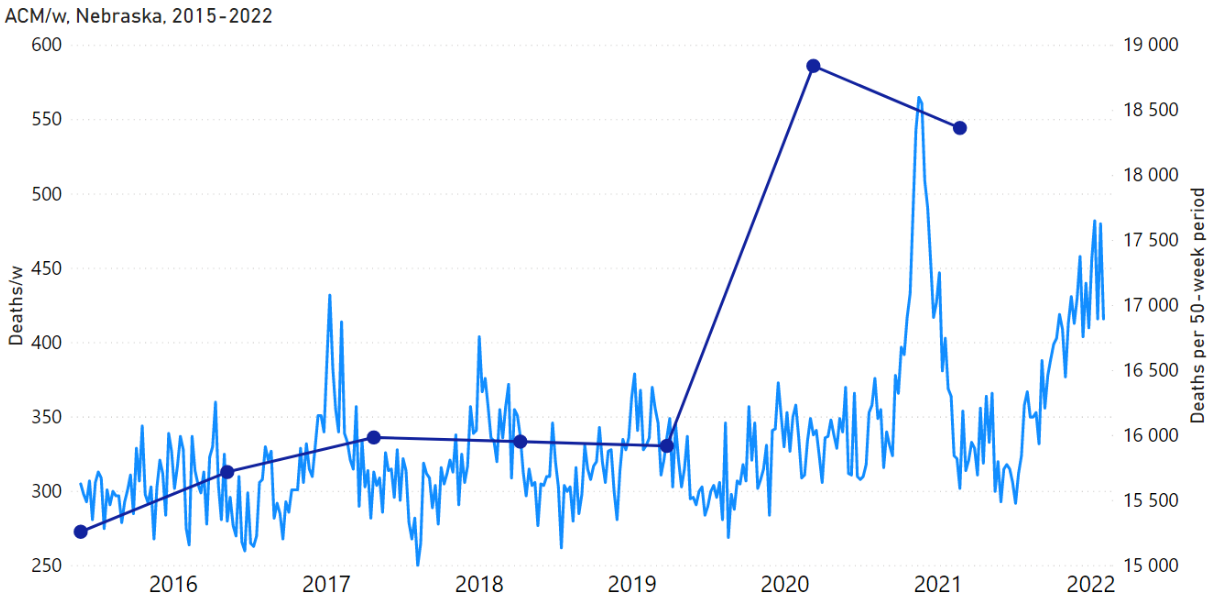
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Missouri**	**74 286**	**75 191**	**62 319**	**12 872**	**11 967**	**20,66 %**	**19,20 %**
0-24	1 608	1 631	1 524	107	84	7,02 %	5,51 %
25-44	4 529	4 051	3 355	696	1 174	20,75 %	34,99 %
45-64	15 652	13 917	12 090	1 827	3 562	15,11 %	29,46 %
65-74	16 015	15 360	12 592	2 768	3 423	21,98 %	27,18 %
75-84	17 690	18 724	15 041	3 683	2 649	24,49 %	17,61 %
85+	18 792	21 508	17 717	3 791	1 075	21,40 %	6,07 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Missouri**	**149 477**	**123 724**	**123 330**	**25 753**	**26 147**	**20,81 %**	**21,20 %**
0-24	3 239	3 070	3 194	169	45	5,50 %	1,41 %
25-44	8 580	6 638	6 249	1 942	2 331	29,26 %	37,30 %
45-64	29 569	24 354	24 210	5 215	5 359	21,41 %	22,14 %
65-74	31 375	24 781	23 848	6 594	7 527	26,61 %	31,56 %
75-84	36 414	29 894	29 590	6 520	6 824	21,81 %	23,06 %
85+	40 300	34 987	36 239	5 313	4 061	15,19 %	11,21 %



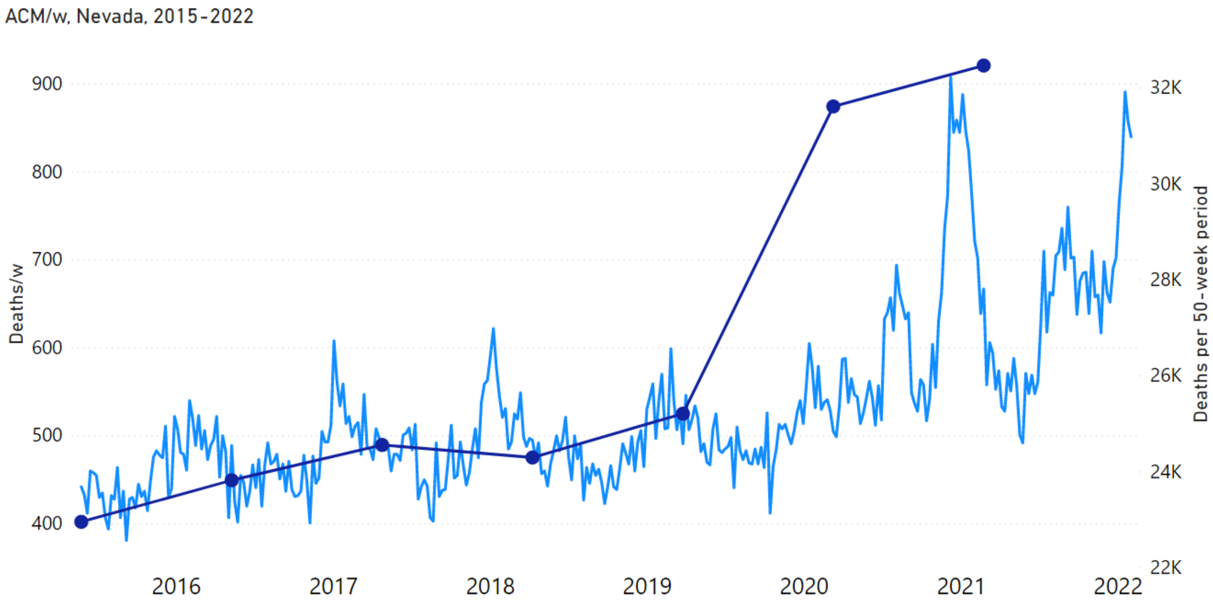
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Montana	**12 146**	**11 250**	**9 436**	**1 814**	**2 710**	**19,22 %**	**28,72 %**
0-24		11		11		Infinity	
25-44	581	400	193	207	388	107,25 %	201,04 %
45-64	2 306	1 990	1 667	323	639	19,38 %	38,33 %
65-74	2 663	2 366	1 979	387	684	19,56 %	34,56 %
75-84	3 220	2 948	2 520	428	700	16,98 %	27,78 %
85+	3 376	3 535	3 077	458	299	14,88 %	9,72 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Montana	**23 396**	**18 766**	**18 495**	**4 630**	**4 901**	**24,67 %**	**26,50 %**
0-24	11			11	11	Infinity	Infinity
25-44	981	406	360	575	621	141,63 %	172,50 %
45-64	4 296	3 366	3 414	930	882	27,63 %	25,83 %
65-74	5 029	3 924	3 672	1 105	1 357	28,16 %	36,96 %
75-84	6 168	4 942	4 767	1 226	1 401	24,81 %	29,39 %
85+	6 911	6 128	6 282	783	629	12,78 %	10,01 %



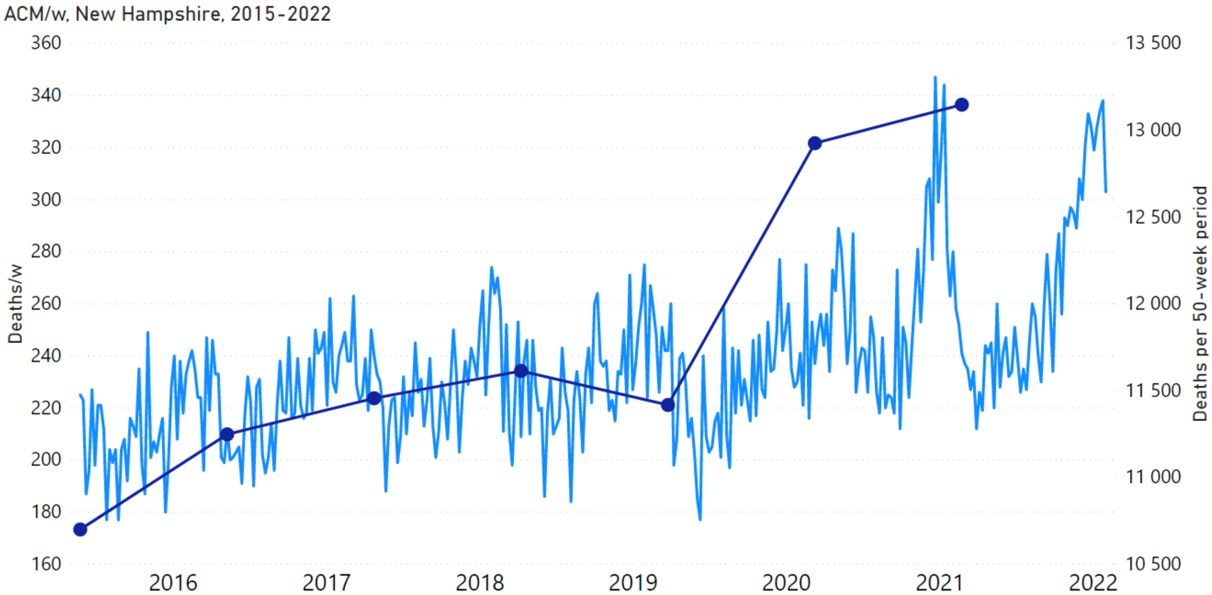
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Nebraska**	**18 374**	**18 842**	**15 921**	**2 921**	**2 453**	**18,35 %**	**15,41 %**
0-24	172	126	61	65	111	106,56 %	181,97 %
25-44	761	710	458	252	303	55,02 %	66,16 %
45-64	3 315	3 067	2 698	369	617	13,68 %	22,87 %
65-74	3 792	3 671	3 003	668	789	22,24 %	26,27 %
75-84	4 430	4 713	3 948	765	482	19,38 %	12,21 %
85+	5 904	6 555	5 753	802	151	13,94 %	2,62 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Nebraska**	**37 216**	**31 875**	**31 706**	**5 341**	**5 510**	**16,76 %**	**17,38 %**
0-24	298	160	214	138	84	86,25 %	39,25 %
25-44	1 471	1 011	913	460	558	45,50 %	61,12 %
45-64	6 382	5 438	5 388	944	994	17,36 %	18,45 %
65-74	7 463	5 958	5 647	1 505	1 816	25,26 %	32,16 %
75-84	9 143	7 792	7 651	1 351	1 492	17,34 %	19,50 %
85+	12 459	11 516	11 893	943	566	8,19 %	4,76 %



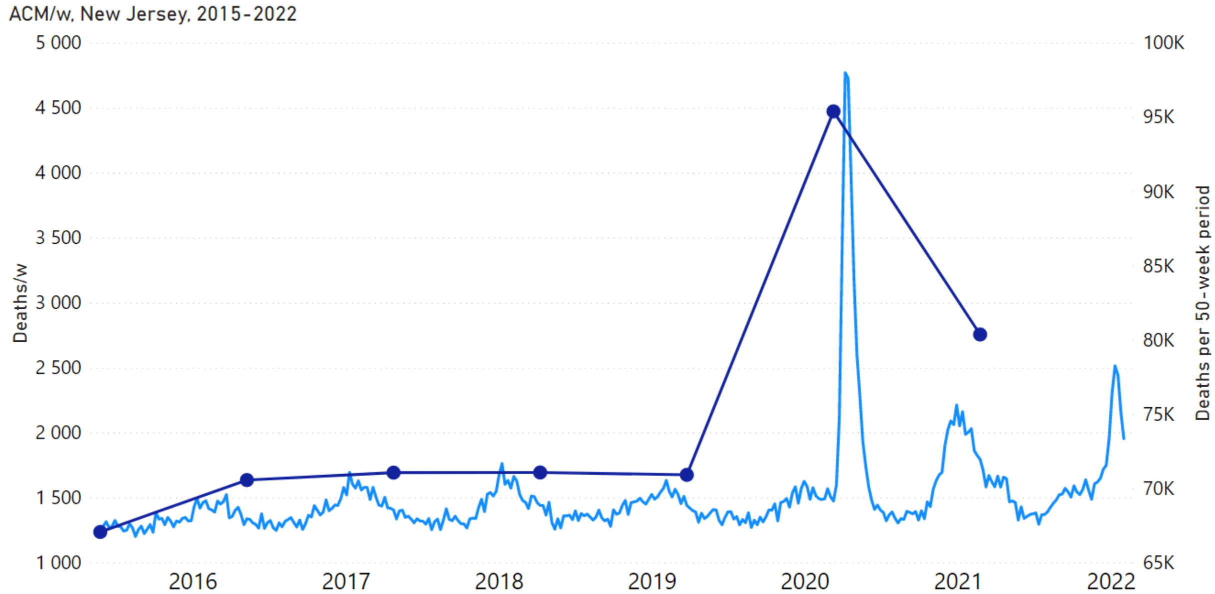
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Nevada**	**32 484**	**31 616**	**25 212**	**6 404**	**7 272**	**25,40 %**	**28,84 %**
0-24	558	484	378	106	180	28,04 %	47,62 %
25-44	2 190	1 843	1 337	506	853	37,85 %	63,80 %
45-64	7 202	6 642	5 316	1 326	1 886	24,94 %	35,48 %
65-74	7 720	7 342	5 791	1 551	1 929	26,78 %	33,31 %
75-84	8 375	8 343	6 564	1 779	1 811	27,10 %	27,59 %
85+	6 439	6 962	5 826	1 136	613	19,50 %	10,52 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Nevada**	**64 100**	**49 510**	**48 384**	**14 590**	**15 716**	**29,47 %**	**32,48 %**
0-24	1 042	667	817	375	225	56,22 %	27,54 %
25-44	4 033	2 734	2 749	1 299	1 284	47,51 %	46,71 %
45-64	13 844	10 562	10 650	3 282	3 194	31,07 %	29,99 %
65-74	15 062	11 470	11 050	3 592	4 012	31,32 %	36,31 %
75-84	16 718	12 803	12 084	3 915	4 634	30,58 %	38,35 %
85+	13 401	11 274	11 034	2 127	2 367	18,87 %	21,45 %



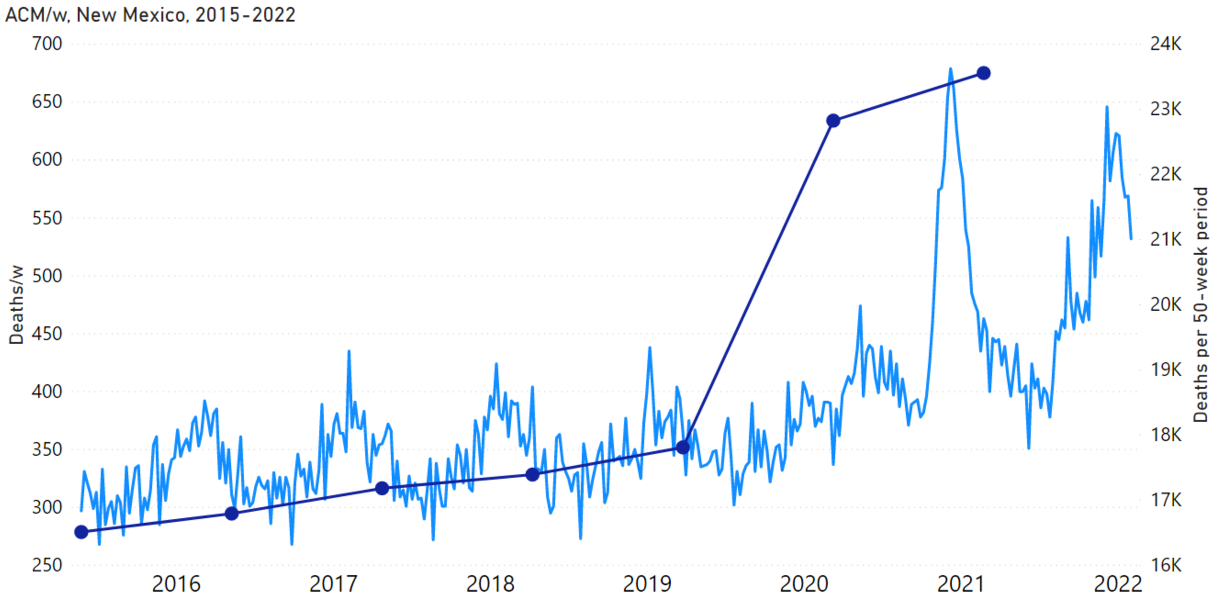
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **New Hampshire**	**13 154**	**12 925**	**11 417**	**1 508**	**1 737**	**13,21 %**	**15,21 %**
25-44	586	345	267	78	319	29,21 %	119,48 %
45-64	2 333	2 048	2 043	5	290	0,24 %	14,19 %
65-74	2 728	2 530	2 190	340	538	15,53 %	24,57 %
75-84	3 393	3 299	2 887	412	506	14,27 %	17,53 %
85+	4 114	4 703	4 030	673	84	16,70 %	2,08 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **New Hampshire**	**26 079**	**23 030**	**22 704**	**3 049**	**3 375**	**13,24 %**	**14,87 %**
25-44	931	584	755	347	176	59,42 %	23,31 %
45-64	4 381	4 126	4 137	255	244	6,18 %	5,90 %
65-74	5 258	4 385	4 108	873	1 150	19,91 %	27,99 %
75-84	6 692	5 739	5 548	953	1 144	16,61 %	20,62 %
85+	8 817	8 196	8 156	621	661	7,58 %	8,10 %



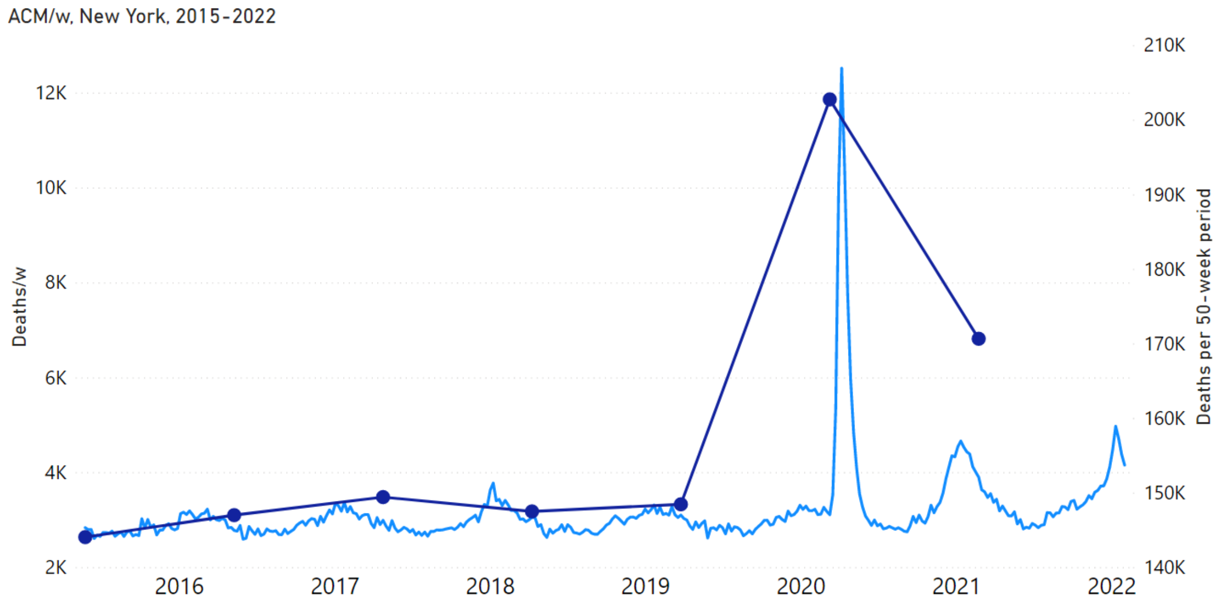
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
New Jersey	**80 676**	**95 415**	**70 933**	**24 482**	**9 743**	**34,51 %**	**13,74 %**
0-24	959	973	957	16	2	1,67 %	0,21 %
25-44	3 959	4 161	3 272	889	687	27,17 %	21,00 %
45-64	14 526	16 878	11 741	5 137	2 785	43,75 %	23,72 %
65-74	15 154	17 563	12 243	5 320	2 911	43,45 %	23,78 %
75-84	19 414	23 160	16 787	6 373	2 627	37,96 %	15,65 %
85+	26 664	32 680	25 933	6 747	731	26,02 %	2,82 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
New Jersey	**176 091**	**142 025**	**141 664**	**34 066**	**34 427**	**23,99 %**	**24,30 %**
0-24	1 932	1 984	2 186	-52	-254	-2,62 %	-11,62 %
25-44	8 120	6 602	6 392	1 518	1 728	22,99 %	27,03 %
45-64	31 404	23 852	24 287	7 552	7 117	31,66 %	29,30 %
65-74	32 717	24 423	23 526	8 294	9 191	33,96 %	39,07 %
75-84	42 574	33 345	32 755	9 229	9 819	27,68 %	29,98 %
85+	59 344	51 819	52 518	7 525	6 826	14,52 %	13,00 %



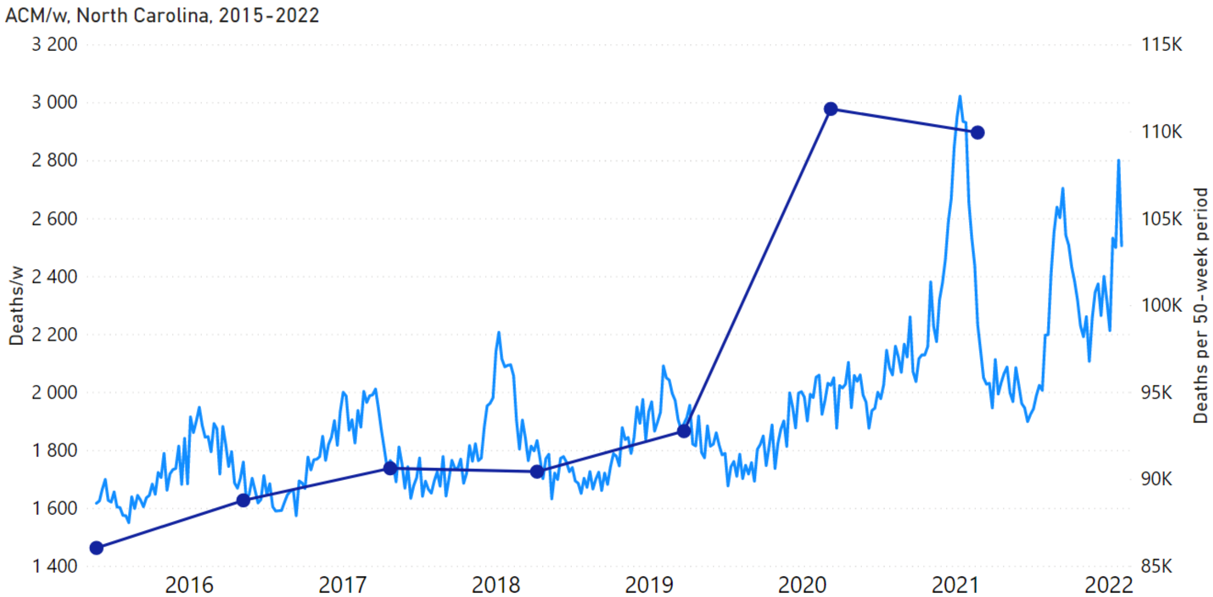
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
New Mexico	**23 619**	**22 829**	**17 810**	**5 019**	**5 809**	**28,18 %**	**32,62 %**
0-24	357	200	206	-6	151	-2,91 %	73,30 %
25-44	2 459	2 025	1 478	547	981	37,01 %	66,37 %
45-64	5 237	4 771	3 656	1 115	1 581	30,50 %	43,24 %
65-74	4 826	4 644	3 489	1 155	1 337	33,10 %	38,32 %
75-84	5 176	5 397	4 142	1 255	1 034	30,30 %	24,96 %
85+	5 564	5 792	4 839	953	725	19,69 %	14,98 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
New Mexico	**46 448**	**35 203**	**33 976**	**11 245**	**12 472**	**31,94 %**	**36,71 %**
0-24	557	352	407	205	150	58,24 %	36,86 %
25-44	4 484	2 772	2 476	1 712	2 008	61,76 %	81,10 %
45-64	10 008	7 181	7 105	2 827	2 903	39,37 %	40,86 %
65-74	9 470	7 021	6 628	2 449	2 842	34,88 %	42,88 %
75-84	10 573	8 184	7 836	2 389	2 737	29,19 %	34,93 %
85+	11 356	9 693	9 524	1 663	1 832	17,16 %	19,24 %



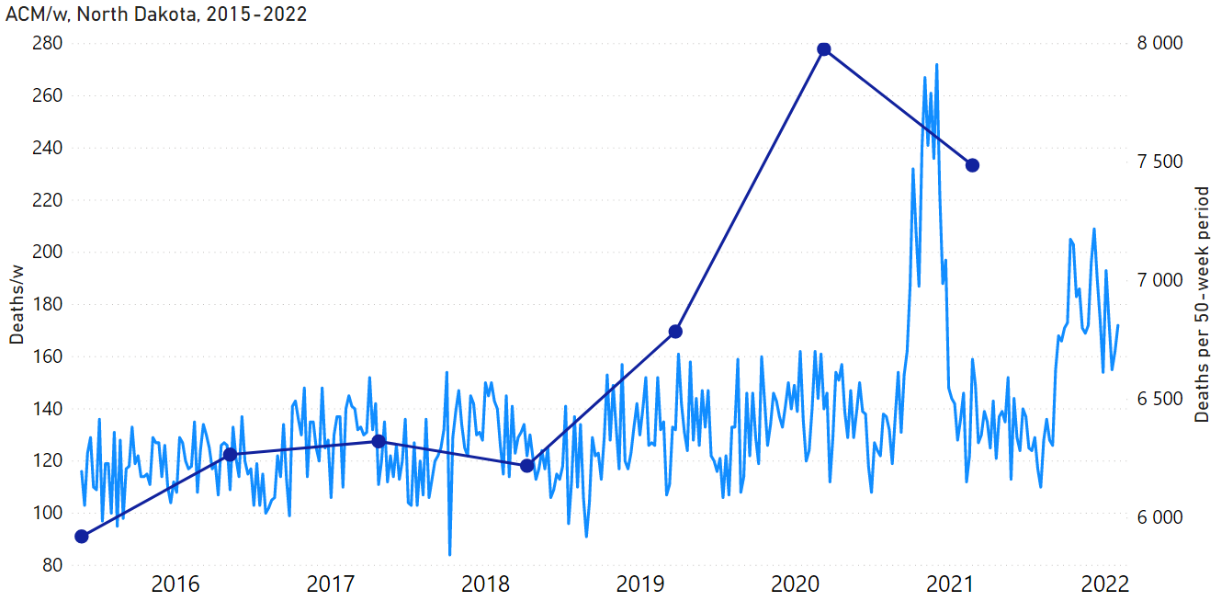
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
New York	**170 873**	**202 806**	**148 501**	**54 305**	**22 372**	**36,57 %**	**15,07 %**
0-24	2 482	2 498	2 441	57	41	2,34 %	1,68 %
25-44	8 644	8 910	6 342	2 568	2 302	40,49 %	36,30 %
45-64	31 464	35 813	25 388	10 425	6 076	41,06 %	23,93 %
65-74	33 371	38 953	27 197	11 756	6 174	43,23 %	22,70 %
75-84	40 363	48 635	34 947	13 688	5 416	39,17 %	15,50 %
85+	54 549	67 997	52 186	15 811	2 363	30,30 %	4,53 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
New York	**373 679**	**296 046**	**296 515**	**77 633**	**77 164**	**26,22 %**	**26,02 %**
0-24	4 980	4 877	5 261	103	-281	2,11 %	-5,34 %
25-44	17 554	12 381	12 444	5 173	5 110	41,78 %	41,06 %
45-64	67 277	51 057	52 583	16 220	14 694	31,77 %	27,94 %
65-74	72 324	53 676	52 079	18 648	20 245	34,74 %	38,87 %
75-84	88 998	69 598	67 835	19 400	21 163	27,87 %	31,20 %
85+	122 546	104 457	106 313	18 089	16 233	17,32 %	15,27 %



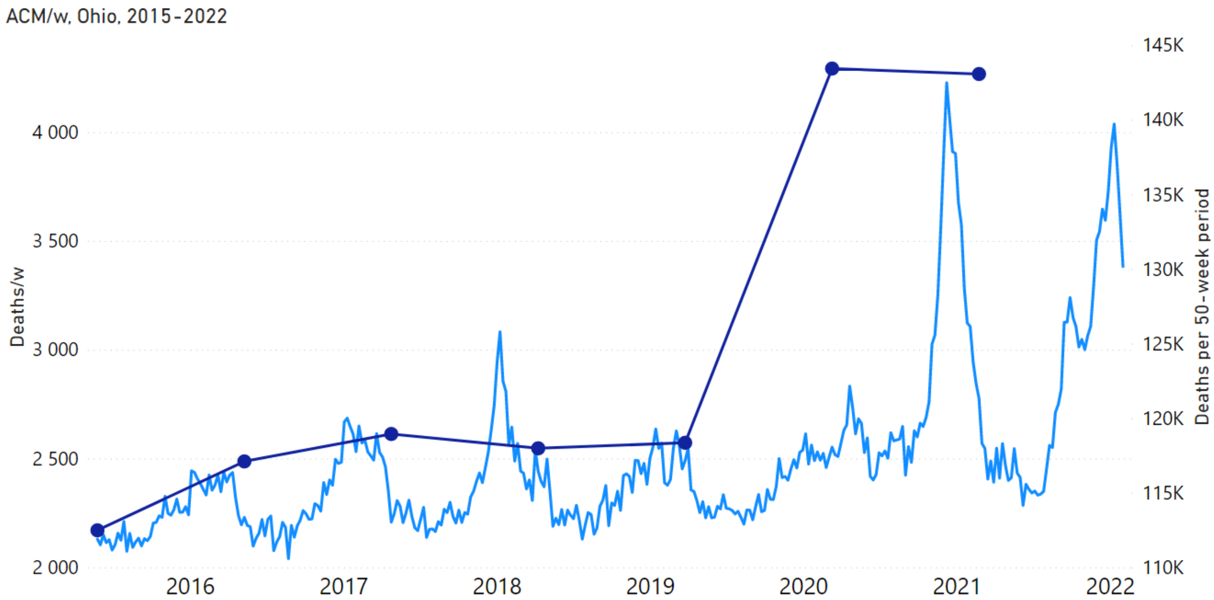
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **North Carolina**	**111 328**	**111 321**	**92 780**	**18 541**	**18 548**	**19,98 %**	**19,99 %**
0-24	2 450	2 432	2 129	303	321	14,23 %	15,08 %
25-44	7 240	6 267	4 851	1 416	2 389	29,19 %	49,25 %
45-64	23 868	21 405	18 146	3 259	5 722	17,96 %	31,53 %
65-74	24 093	23 316	19 145	4 171	4 948	21,79 %	25,84 %
75-84	26 905	28 108	23 053	5 055	3 852	21,93 %	16,71 %
85+	26 772	29 793	25 456	4 337	1 316	17,04 %	5,17 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **North Carolina**	**222 649**	**183 230**	**179 440**	**39 419**	**43 209**	**21,51 %**	**24,08 %**
0-24	4 882	4 213	4 383	669	499	15,88 %	11,38 %
25-44	13 507	9 552	9 201	3 955	4 306	41,40 %	46,80 %
45-64	45 273	36 207	36 731	9 066	8 542	25,04 %	23,26 %
65-74	47 409	37 821	36 709	9 588	10 700	25,35 %	29,15 %
75-84	55 013	45 397	42 877	9 616	12 136	21,18 %	28,30 %
85+	56 565	50 040	49 539	6 525	7 026	13,04 %	14,18 %



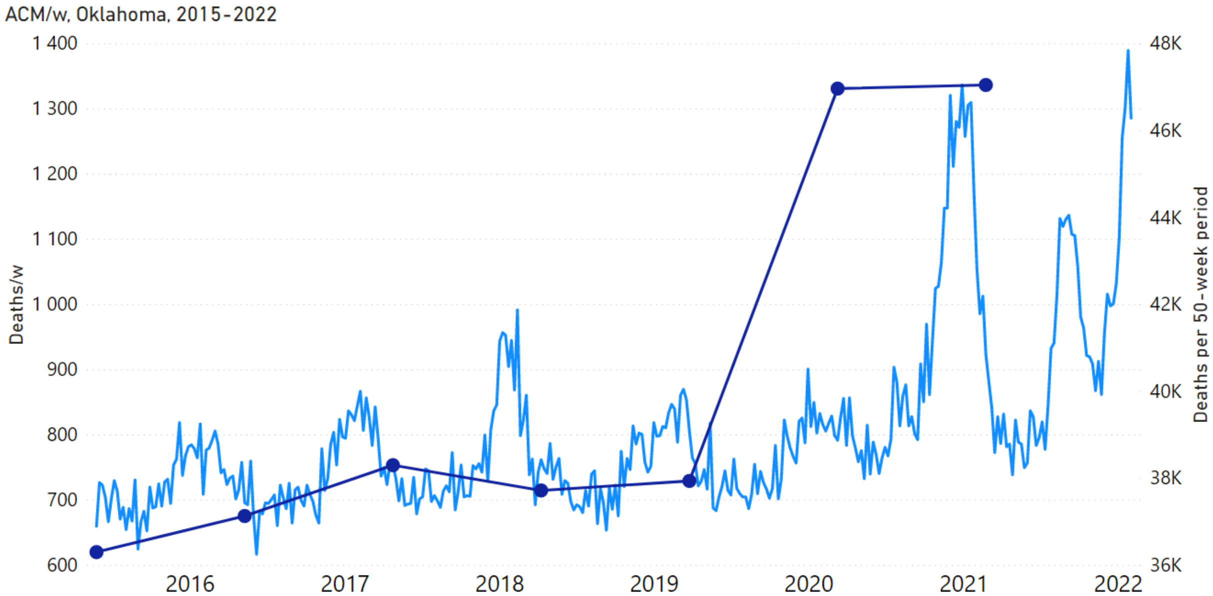
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **North Dakota**	**7 601**	**7 977**	**6 786**	**1 191**	**815**	**17,55 %**	**12,01 %**
25-44	328	183	112	71	216	63,39 %	192,86 %
45-64	1 535	1 332	1 231	101	304	8,20 %	24,70 %
65-74	1 612	1 496	1 260	236	352	18,73 %	27,94 %
75-84	1 817	1 987	1 656	331	161	19,99 %	9,72 %
85+	2 309	2 979	2 527	452	-218	17,89 %	-8,63 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **North Dakota**	**15 578**	**13 006**	**12 590**	**2 572**	**2 988**	**19,78 %**	**23,73 %**
0-24			13		-13		-100,00 %
25-44	511	159	106	352	405	221,38 %	382,08 %
45-64	2 867	2 388	2 232	479	635	20,06 %	28,45 %
65-74	3 108	2 420	2 206	688	902	28,43 %	40,89 %
75-84	3 804	3 169	3 101	635	703	20,04 %	22,67 %
85+	5 288	4 870	4 932	418	356	8,58 %	7,22 %



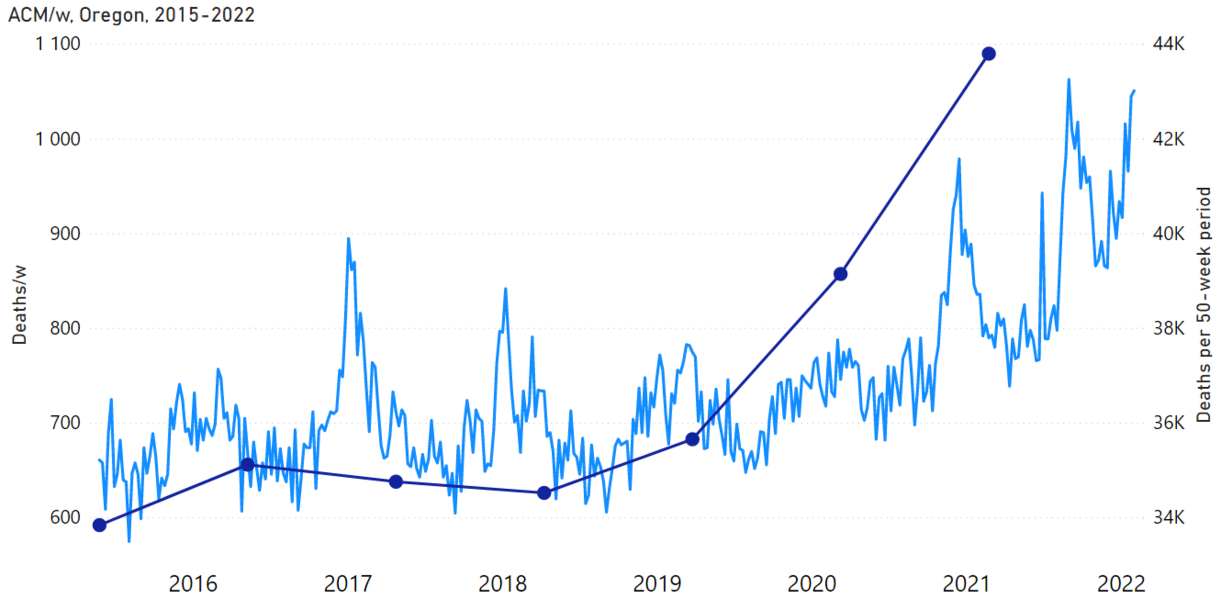
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Ohio	**143 192**	**143 472**	**118 385**	**25 087**	**24 807**	**21,19 %**	**20,95 %**
0-24	2 657	2 511	2 379	132	278	5,55 %	11,69 %
25-44	8 147	7 364	6 125	1 239	2 022	20,23 %	33,01 %
45-64	28 907	25 907	22 227	3 680	6 680	16,56 %	30,05 %
65-74	31 158	28 861	23 323	5 538	7 835	23,74 %	33,59 %
75-84	34 083	35 299	28 731	6 568	5 352	22,86 %	18,63 %
85+	38 240	43 530	35 600	7 930	2 640	22,28 %	7,42 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Ohio	**286 664**	**236 399**	**236 108**	**50 265**	**50 556**	**21,26 %**	**21,41 %**
0-24	5 168	4 778	5 452	390	-284	8,16 %	-5,21 %
25-44	15 511	12 105	12 705	3 406	2 806	28,14 %	22,09 %
45-64	54 814	44 740	45 701	10 074	9 113	22,52 %	19,94 %
65-74	60 019	46 070	43 912	13 949	16 107	30,28 %	36,68 %
75-84	69 382	56 900	55 164	12 482	14 218	21,94 %	25,77 %
85+	81 770	71 806	73 174	9 964	8 596	13,88 %	11,75 %



State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Oklahoma	**47 131**	**46 971**	**37 943**	**9 028**	**9 188**	**23,79 %**	**24,22 %**
0-24	1 002	905	837	68	165	8,12 %	19,71 %
25-44	2 909	2 409	1 935	474	974	24,50 %	50,34 %
45-64	10 477	9 434	7 957	1 477	2 520	18,56 %	31,67 %
65-74	10 624	10 359	8 124	2 235	2 500	27,51 %	30,77 %
75-84	11 575	11 815	9 473	2 342	2 102	24,72 %	22,19 %
85+	10 544	12 049	9 617	2 432	927	25,29 %	9,64 %

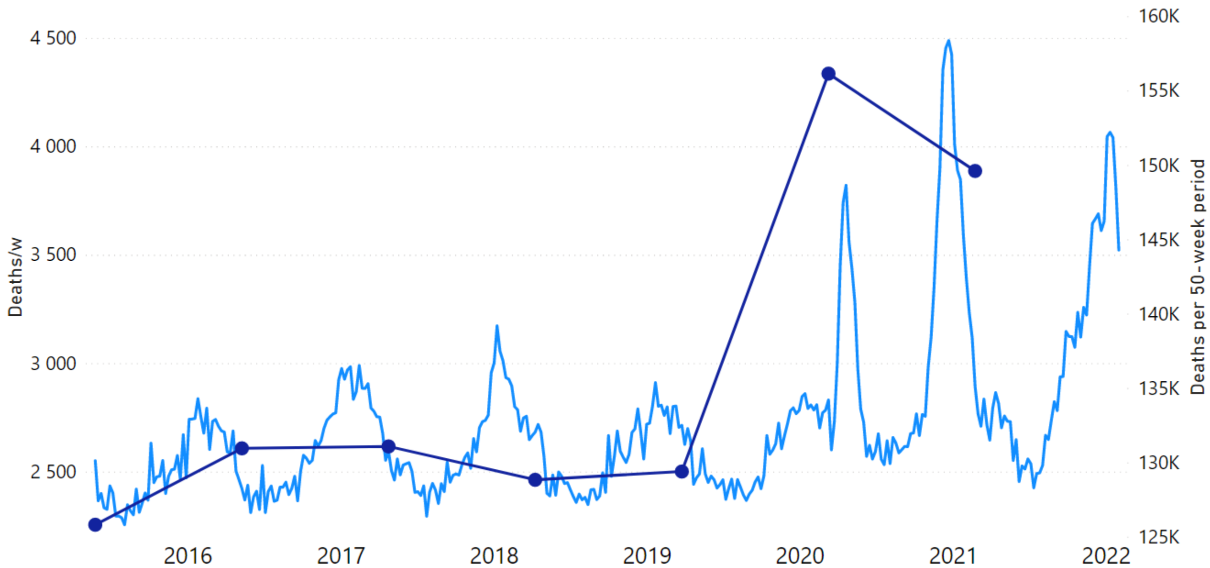
State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Oklahoma	**94 102**	**75 667**	**75 441**	**18 435**	**18 661**	**24,36 %**	**24,74 %**
0-24	1 907	1 702	1 901	205	6	12,04 %	0,32 %
25-44	5 318	3 878	4 011	1 440	1 307	37,13 %	32,59 %
45-64	19 911	16 046	16 446	3 865	3 465	24,09 %	21,07 %
65-74	20 983	16 069	15 273	4 914	5 710	30,58 %	37,39 %
75-84	23 390	18 690	18 270	4 700	5 120	25,15 %	28,02 %
85+	22 593	19 282	19 540	3 311	3 053	17,17 %	15,62 %



State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Oregon	**43 835**	**39 150**	**35 660**	**3 490**	**8 175**	**9,79 %**	**22,92 %**
0-24	533	563	409	154	124	37,65 %	30,32 %
25-44	2 304	1 775	1 504	271	800	18,02 %	53,19 %
45-64	7 821	6 725	6 044	681	1 777	11,27 %	29,40 %
65-74	9 353	8 141	7 350	791	2 003	10,76 %	27,25 %
75-84	10 998	9 804	8 855	949	2 143	10,72 %	24,20 %
85+	12 826	12 142	11 498	644	1 328	5,60 %	11,55 %

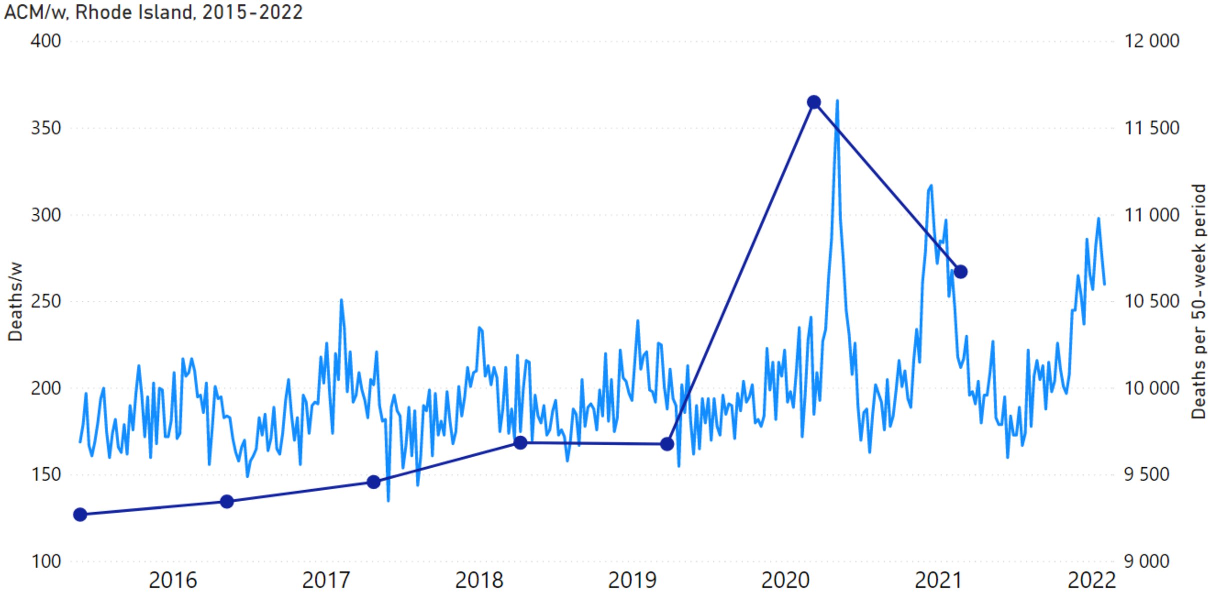
State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Oregon	**82 985**	**70 186**	**69 886**	**12 799**	**13 099**	**18,24 %**	**18,74 %**
0-24	1 096	810	1 221	286	-125	35,31 %	-10,24 %
25-44	4 079	2 908	2 674	1 171	1 405	40,27 %	52,54 %
45-64	14 546	12 130	12 418	2 416	2 128	19,92 %	17,14 %
65-74	17 494	14 370	13 648	3 124	3 846	21,74 %	28,18 %
75-84	20 802	17 248	16 525	3 554	4 277	20,61 %	25,88 %
85+	24 968	22 720	23 400	2 248	1 568	9,89 %	6,70 %

ACM/w, Pennsylvania, 2015-2022



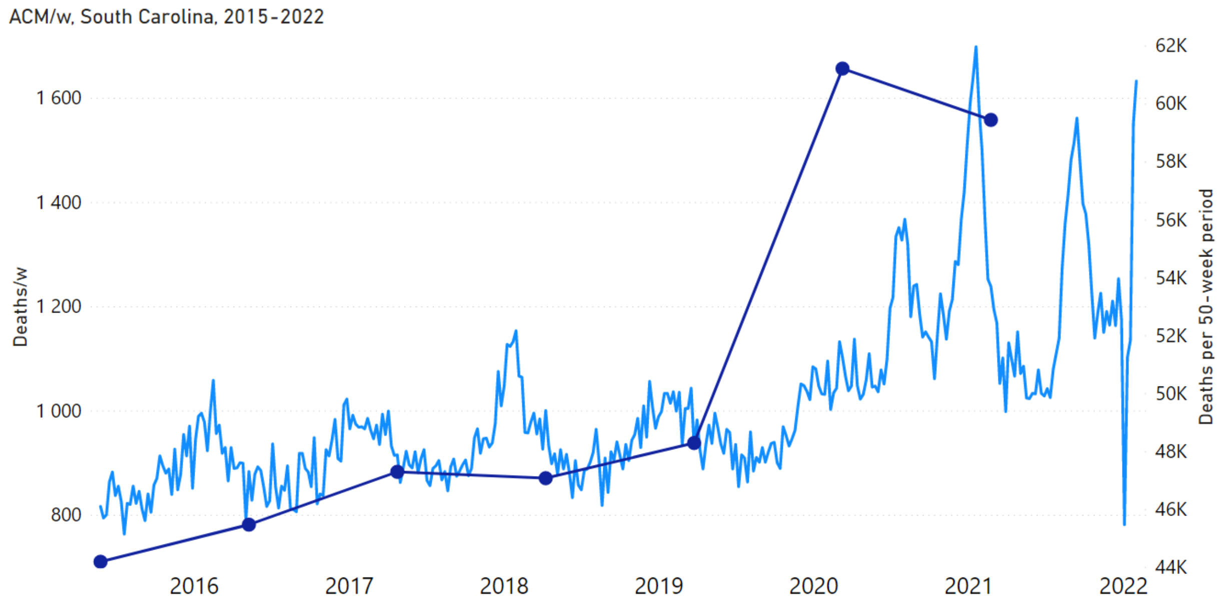
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Pennsylvania**	**149 833**	**156 171**	**129 421**	**26 750**	**20 412**	**20,67 %**	**15,77 %**
0-24	2 449	2 306	2 200	106	249	4,82 %	11,32 %
25-44	7 526	6 841	5 952	889	1 574	14,94 %	26,44 %
45-64	27 122	25 193	21 797	3 396	5 325	15,58 %	24,43 %
65-74	30 662	29 558	23 564	5 994	7 098	25,44 %	30,12 %
75-84	36 201	37 980	31 103	6 877	5 098	22,11 %	16,39 %
85+	45 873	54 293	44 805	9 488	1 068	21,18 %	2,38 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Pennsylvania**	**306 004**	**258 285**	**262 088**	**47 719**	**43 916**	**18,48 %**	**16,76 %**
0-24	4 755	4 505	5 117	250	-362	5,55 %	-7,07 %
25-44	14 367	11 912	12 488	2 455	1 879	20,61 %	15,05 %
45-64	52 315	43 813	44 916	8 502	7 399	19,41 %	16,47 %
65-74	60 220	46 806	45 686	13 414	14 534	28,66 %	31,81 %
75-84	74 181	61 353	60 729	12 828	13 452	20,91 %	22,15 %
85+	100 166	89 896	93 152	10 270	7 014	11,42 %	7,53 %



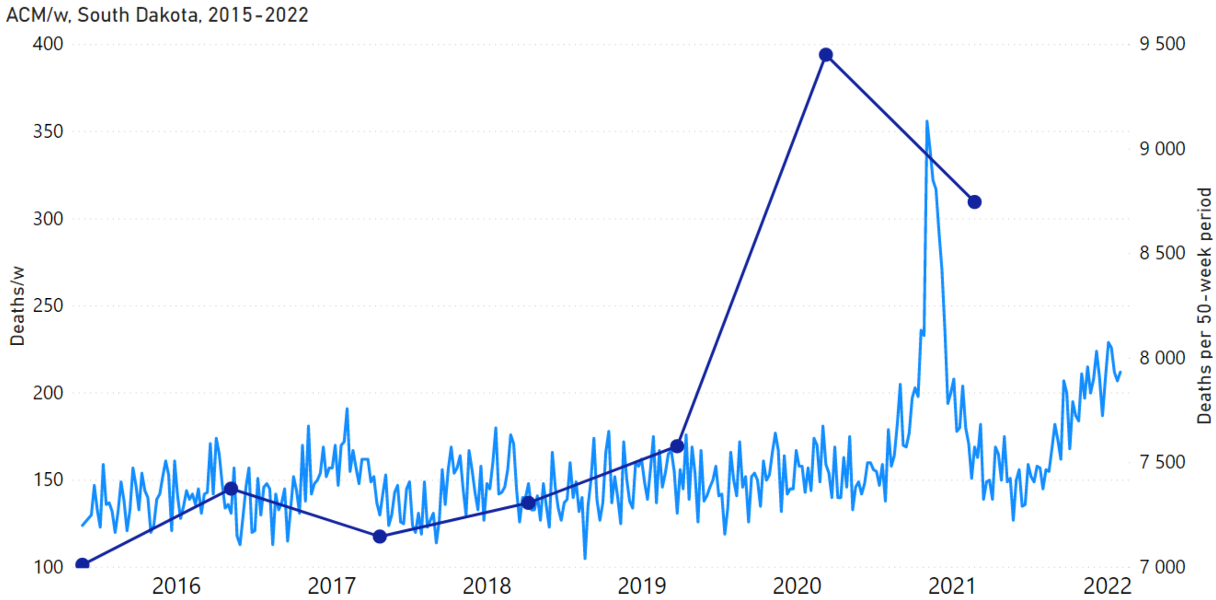
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Rhode Island	**10 674**	**11 651**	**9 678**	**1 973**	**996**	**20,39 %**	**10,29 %**
25-44	263	195	129	66	134	51,16 %	103,88 %
45-64	1 879	1 875	1 569	306	310	19,50 %	19,76 %
65-74	2 131	2 092	1 677	415	454	24,75 %	27,07 %
75-84	2 607	2 773	2 381	392	226	16,46 %	9,49 %
85+	3 794	4 716	3 922	794	-128	20,24 %	-3,26 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Rhode Island	**22 325**	**19 364**	**18 805**	**2 961**	**3 520**	**15,29 %**	**18,72 %**
25-44	458	221	223	237	235	107,24 %	105,38 %
45-64	3 754	3 156	3 185	598	569	18,95 %	17,86 %
65-74	4 223	3 496	3 283	727	940	20,80 %	28,63 %
75-84	5 380	4 656	4 269	724	1 111	15,55 %	26,02 %
85+	8 510	7 835	7 845	675	665	8,62 %	8,48 %



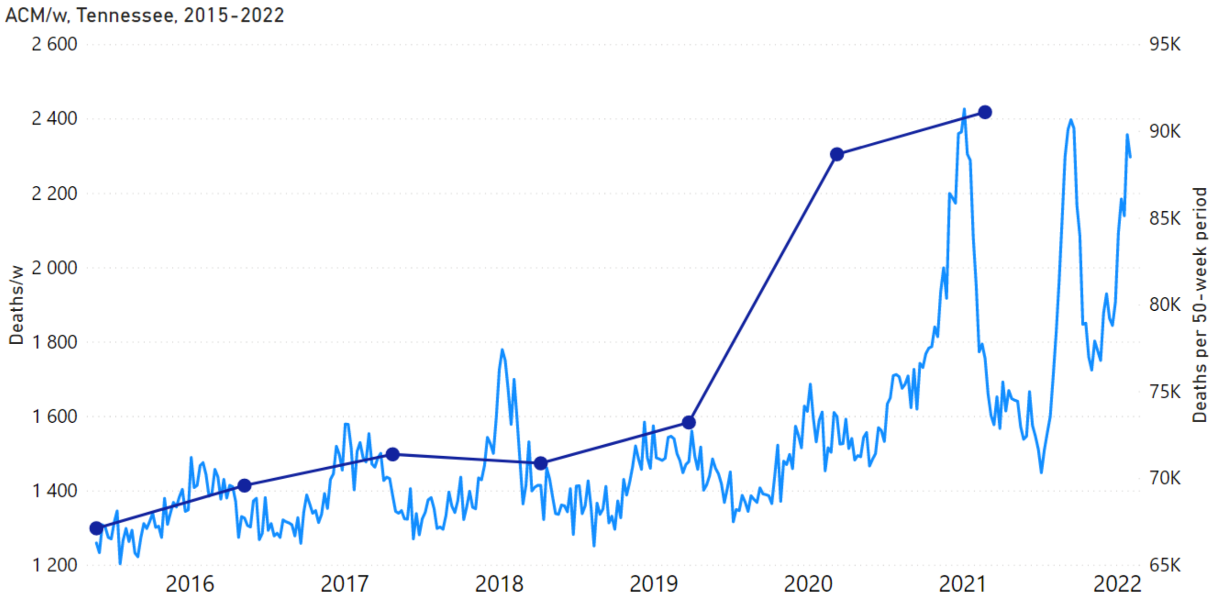
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
South Carolina	**59 495**	**61 227**	**48 298**	**12 929**	**11 197**	**26,77 %**	**23,18 %**
0-24	1 375	1 251	1 165	86	210	7,38 %	18,03 %
25-44	4 057	3 464	2 689	775	1 368	28,82 %	50,87 %
45-64	13 074	12 394	10 034	2 360	3 040	23,52 %	30,30 %
65-74	13 479	13 421	10 339	3 082	3 140	29,81 %	30,37 %
75-84	14 355	15 568	12 042	3 526	2 313	29,28 %	19,21 %
85+	13 155	15 129	12 029	3 100	1 126	25,77 %	9,36 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
South Carolina	**120 722**	**95 381**	**92 782**	**25 341**	**27 940**	**26,57 %**	**30,11 %**
0-24	2 626	2 249	2 215	377	411	16,76 %	18,56 %
25-44	7 521	5 306	4 878	2 215	2 643	41,75 %	54,18 %
45-64	25 468	19 904	20 227	5 564	5 241	27,95 %	25,91 %
65-74	26 900	20 460	19 697	6 440	7 203	31,48 %	36,57 %
75-84	29 923	23 582	22 209	6 341	7 714	26,89 %	34,73 %
85+	28 284	23 880	23 556	4 404	4 728	18,44 %	20,07 %



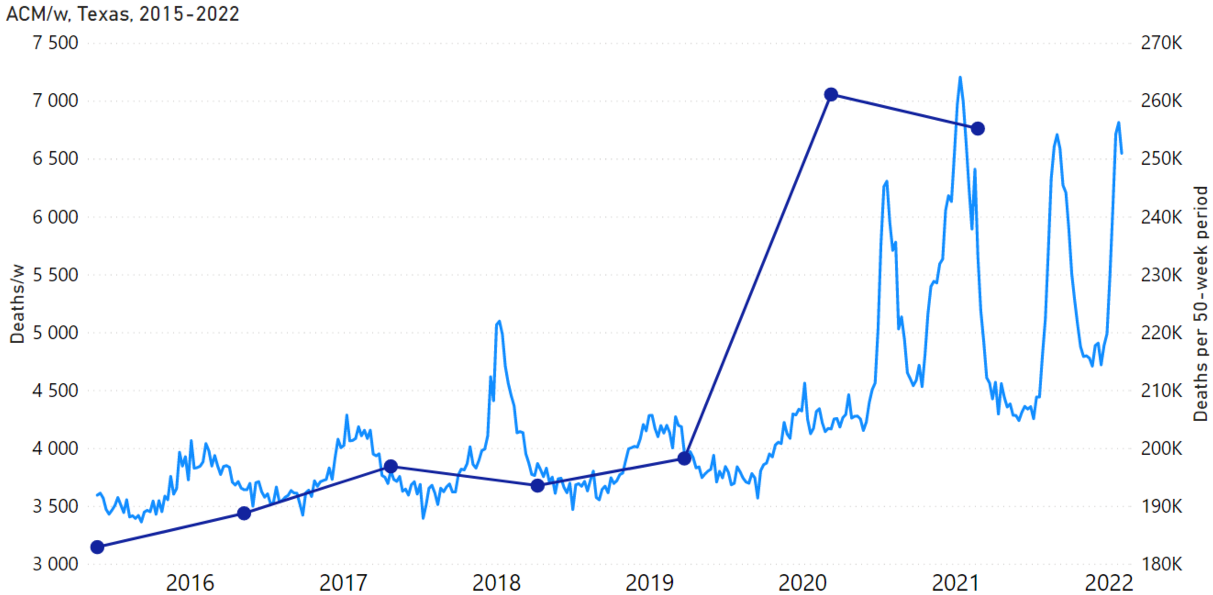
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
South Dakota	**8 757**	**9 451**	**7 579**	**1 872**	**1 178**	**24,70 %**	**15,54 %**
0-24	11	22		22	11	Infinity	Infinity
25-44	404	226	128	98	276	76,56 %	215,63 %
45-64	1 686	1 624	1 353	271	333	20,03 %	24,61 %
65-74	1 857	1 901	1 410	491	447	34,82 %	31,70 %
75-84	2 035	2 290	1 852	438	183	23,65 %	9,88 %
85+	2 764	3 388	2 836	552	-72	19,46 %	-2,54 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
South Dakota	**18 208**	**14 887**	**14 523**	**3 321**	**3 685**	**22,31 %**	**25,37 %**
0-24	33		12	33	21	Infinity	175,00 %
25-44	630	173	145	457	485	264,16 %	334,48 %
45-64	3 310	2 709	2 626	601	684	22,19 %	26,05 %
65-74	3 758	2 817	2 630	941	1 128	33,40 %	42,89 %
75-84	4 325	3 605	3 495	720	830	19,97 %	23,75 %
85+	6 152	5 583	5 615	569	537	10,19 %	9,56 %



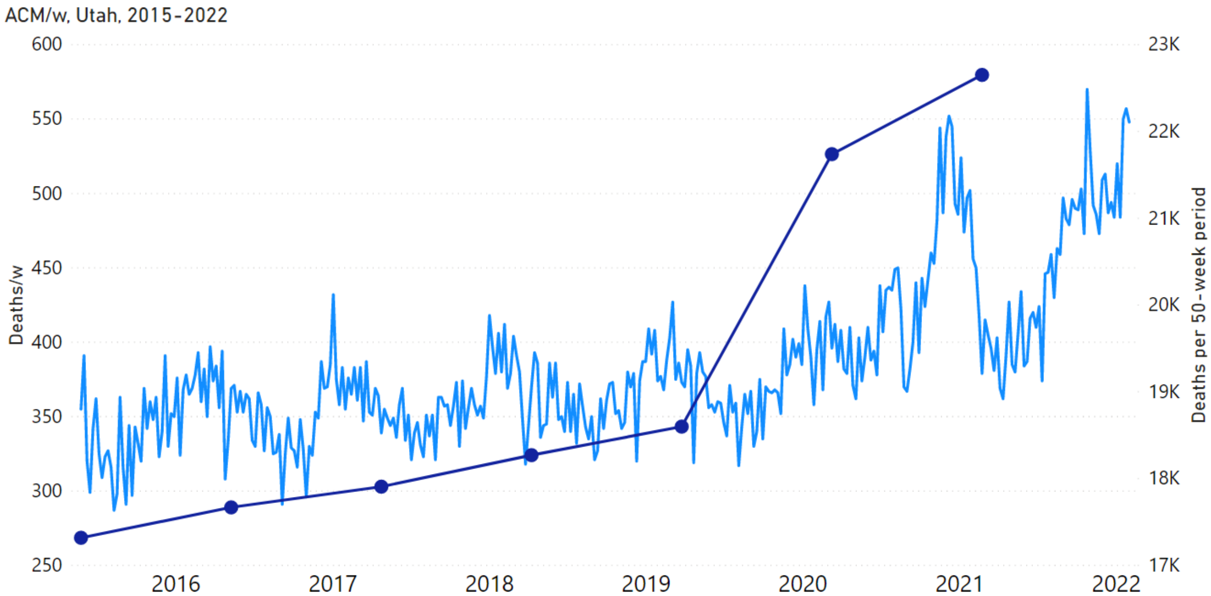
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Tennessee**	**91 144**	**88 685**	**73 230**	**15 455**	**17 914**	**21,10 %**	**24,46 %**
0-24	1 950	1 886	1 808	78	142	4,31 %	7,85 %
25-44	6 538	5 563	4 242	1 321	2 296	31,14 %	54,13 %
45-64	21 321	18 986	16 149	2 837	5 172	17,57 %	32,03 %
65-74	20 633	19 287	15 666	3 621	4 967	23,11 %	31,71 %
75-84	21 700	21 871	17 823	4 048	3 877	22,71 %	21,75 %
85+	19 002	21 092	17 542	3 550	1 460	20,24 %	8,32 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Tennessee**	**179 829**	**144 108**	**140 987**	**35 721**	**38 842**	**24,79 %**	**27,55 %**
0-24	3 836	3 482	3 562	354	274	10,17 %	7,69 %
25-44	12 101	8 228	7 690	3 873	4 411	47,07 %	57,36 %
45-64	40 307	32 050	31 199	8 257	9 108	25,76 %	29,19 %
65-74	39 920	30 640	30 168	9 280	9 752	30,29 %	32,33 %
75-84	43 571	35 212	33 522	8 359	10 049	23,74 %	29,98 %
85+	40 094	34 496	34 846	5 598	5 248	16,23 %	15,06 %



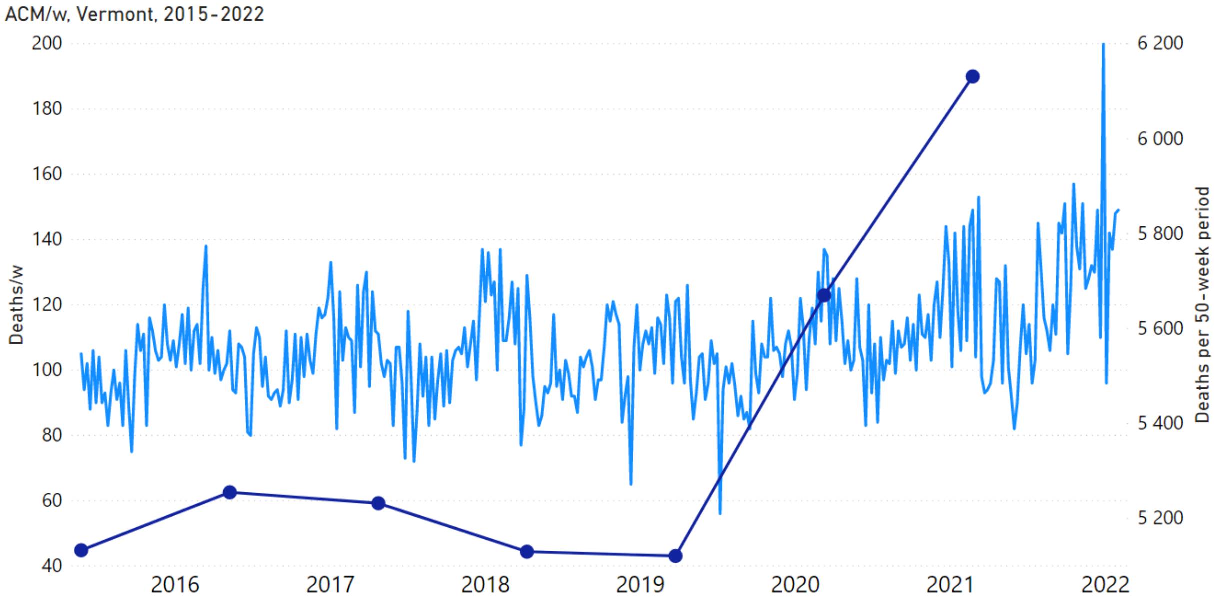
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Texas	**255 483**	**261 182**	**198 282**	**62 900**	**57 201**	**31,72 %**	**28,85 %**
0-24	6 854	6 208	5 914	294	940	4,97 %	15,89 %
25-44	18 140	15 019	11 375	3 644	6 765	32,04 %	59,47 %
45-64	58 218	55 719	41 722	13 997	16 496	33,55 %	39,54 %
65-74	55 639	56 323	40 744	15 579	14 895	38,24 %	36,56 %
75-84	58 693	62 941	47 368	15 573	11 325	32,88 %	23,91 %
85+	57 939	64 972	51 159	13 813	6 780	27,00 %	13,25 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Texas	**516 665**	**391 871**	**385 718**	**124 794**	**130 947**	**31,85 %**	**33,95 %**
0-24	13 062	11 536	11 887	1 526	1 175	13,23 %	9,88 %
25-44	33 159	22 116	21 662	11 043	11 497	49,93 %	53,07 %
45-64	113 937	83 234	83 961	30 703	29 976	36,89 %	35,70 %
65-74	111 962	80 588	76 293	31 374	35 669	38,93 %	46,75 %
75-84	121 634	92 634	89 439	29 000	32 195	31,31 %	36,00 %
85+	122 911	101 763	102 476	21 148	20 435	20,78 %	19,94 %



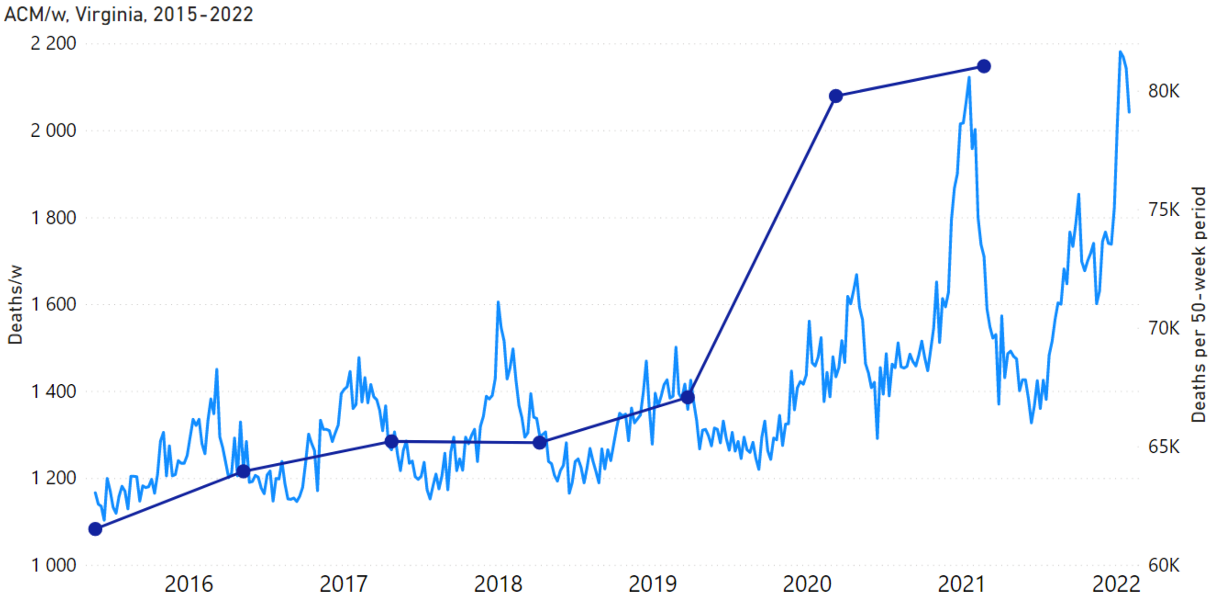
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Utah**	**22 658**	**21 739**	**18 599**	**3 140**	**4 059**	**16,88 %**	**21,82 %**
0-24	630	561	657	-96	-27	-14,61 %	-4,11 %
25-44	1 633	1 508	1 209	299	424	24,73 %	35,07 %
45-64	4 290	3 719	3 101	618	1 189	19,93 %	38,34 %
65-74	4 324	4 038	3 293	745	1 031	22,62 %	31,31 %
75-84	5 533	5 427	4 637	790	896	17,04 %	19,32 %
85+	6 248	6 486	5 702	784	546	13,75 %	9,58 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Utah**	**44 397**	**36 869**	**35 575**	**7 528**	**8 822**	**20,42 %**	**24,80 %**
0-24	1 191	1 261	1 352	-70	-161	-5,55 %	-11,91 %
25-44	3 141	2 514	2 479	627	662	24,94 %	26,70 %
45-64	8 009	6 324	6 377	1 685	1 632	26,64 %	25,59 %
65-74	8 362	6 504	6 049	1 858	2 313	28,57 %	38,24 %
75-84	10 960	9 112	8 468	1 848	2 492	20,28 %	29,43 %
85+	12 734	11 154	10 850	1 580	1 884	14,17 %	17,36 %



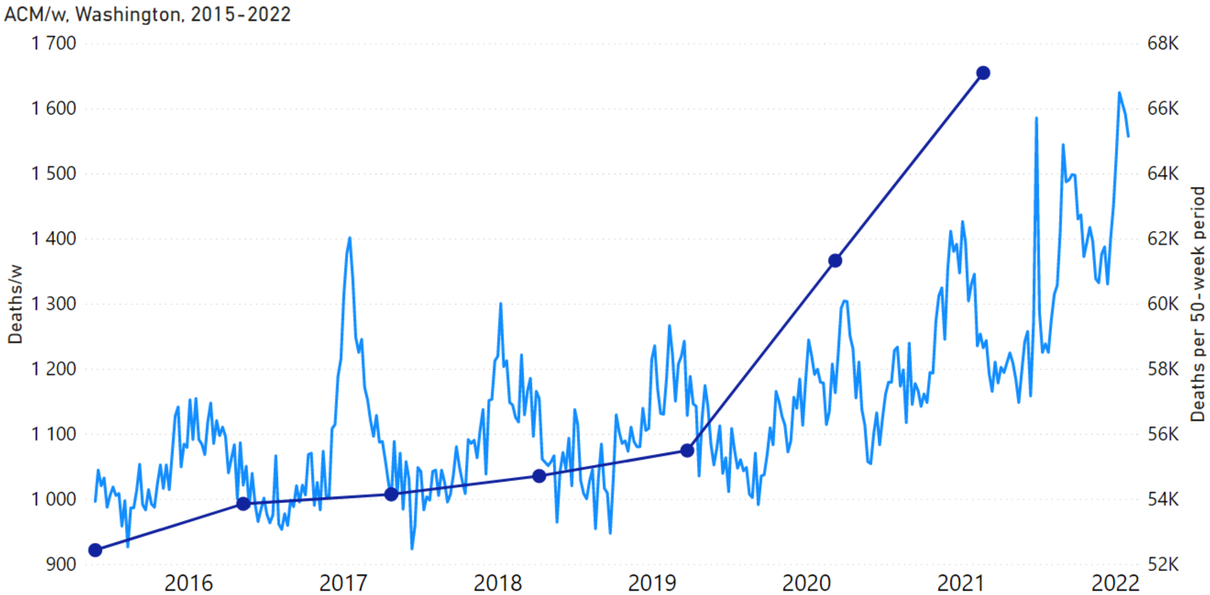
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Vermont**	**6 116**	**5 670**	**5 121**	**549**	**995**	**10,72 %**	**19,43 %**
25-44	65	11		11	65	Infinity	Infinity
45-64	1 066	971	859	112	207	13,04 %	24,10 %
65-74	1 239	1 149	1 041	108	198	10,37 %	19,02 %
75-84	1 584	1 477	1 293	184	291	14,23 %	22,51 %
85+	2 162	2 062	1 928	134	234	6,95 %	12,14 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Vermont**	**11 786**	**10 251**	**10 487**	**1 535**	**1 299**	**14,97 %**	**12,39 %**
25-44	76	22	24	54	52	245,45 %	216,67 %
45-64	2 037	1 717	1 762	320	275	18,64 %	15,61 %
65-74	2 388	2 033	2 013	355	375	17,46 %	18,63 %
75-84	3 061	2 622	2 622	439	439	16,74 %	16,74 %
85+	4 224	3 857	4 066	367	158	9,52 %	3,89 %



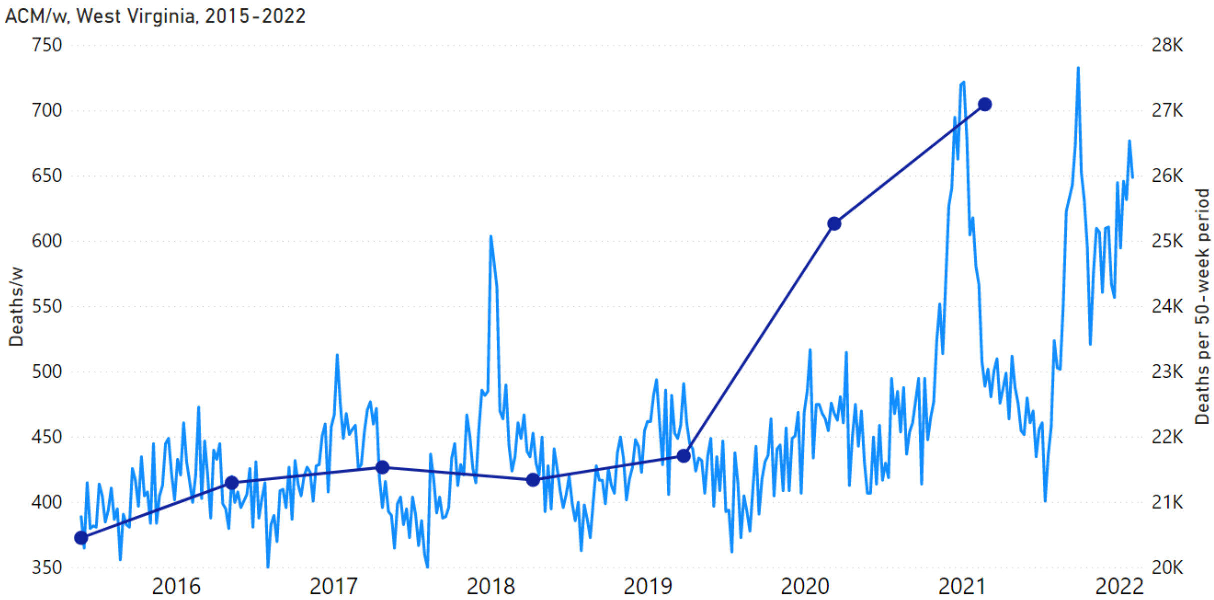
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Virginia	**81 528**	**79 781**	**67 090**	**12 691**	**14 438**	**18,92 %**	**21,52 %**
0-24	1 629	1 542	1 380	162	249	11,74 %	18,04 %
25-44	4 598	4 014	3 183	831	1 415	26,11 %	44,45 %
45-64	16 023	14 750	12 577	2 173	3 446	17,28 %	27,40 %
65-74	17 048	15 951	13 203	2 748	3 845	20,81 %	29,12 %
75-84	20 275	20 044	16 648	3 396	3 627	20,40 %	21,79 %
85+	21 955	23 480	20 099	3 381	1 856	16,82 %	9,23 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Virginia	**161 309**	**132 268**	**129 198**	**29 041**	**32 111**	**21,96 %**	**24,85 %**
0-24	3 171	2 763	2 805	408	366	14,77 %	13,05 %
25-44	8 612	6 140	6 011	2 472	2 601	40,26 %	43,27 %
45-64	30 773	25 117	25 368	5 656	5 405	22,52 %	21,31 %
65-74	32 999	25 973	25 049	7 026	7 950	27,05 %	31,74 %
75-84	40 319	32 878	30 842	7 441	9 477	22,63 %	30,73 %
85+	45 435	39 397	39 123	6 038	6 312	15,33 %	16,13 %



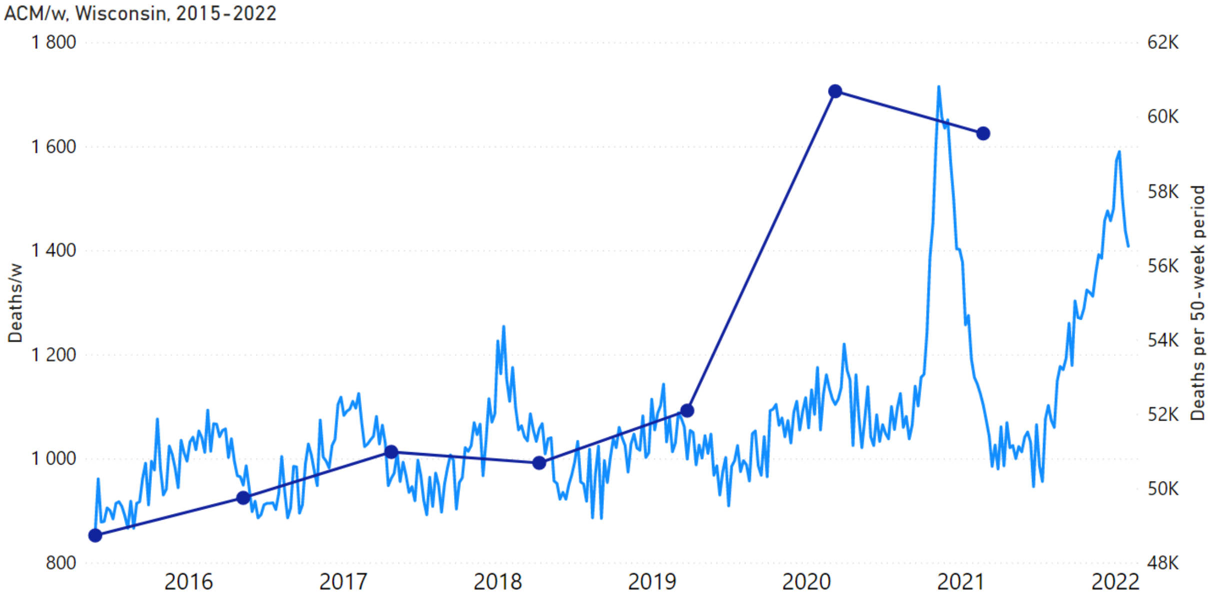
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Washington	**67 133**	**61 338**	**55 503**	**5 835**	**11 630**	**10,51 %**	**20,95 %**
0-24	1 254	1 151	1 050	101	204	9,62 %	19,43 %
25-44	3 807	3 046	2 547	499	1 260	19,59 %	49,47 %
45-64	12 590	10 944	9 842	1 102	2 748	11,20 %	27,92 %
65-74	14 137	12 474	11 251	1 223	2 886	10,87 %	25,65 %
75-84	16 219	14 840	13 375	1 465	2 844	10,95 %	21,26 %
85+	19 126	18 883	17 438	1 445	1 688	8,29 %	9,68 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Washington	**128 471**	**110 222**	**108 022**	**18 249**	**20 449**	**16,56 %**	**18,93 %**
0-24	2 405	2 166	2 164	239	241	11,03 %	11,14 %
25-44	6 853	5 007	4 757	1 846	2 096	36,87 %	44,06 %
45-64	23 534	19 810	19 911	3 724	3 623	18,80 %	18,20 %
65-74	26 611	22 149	20 792	4 462	5 819	20,15 %	27,99 %
75-84	31 059	26 296	24 644	4 763	6 415	18,11 %	26,03 %
85+	38 009	34 794	35 754	3 215	2 255	9,24 %	6,31 %



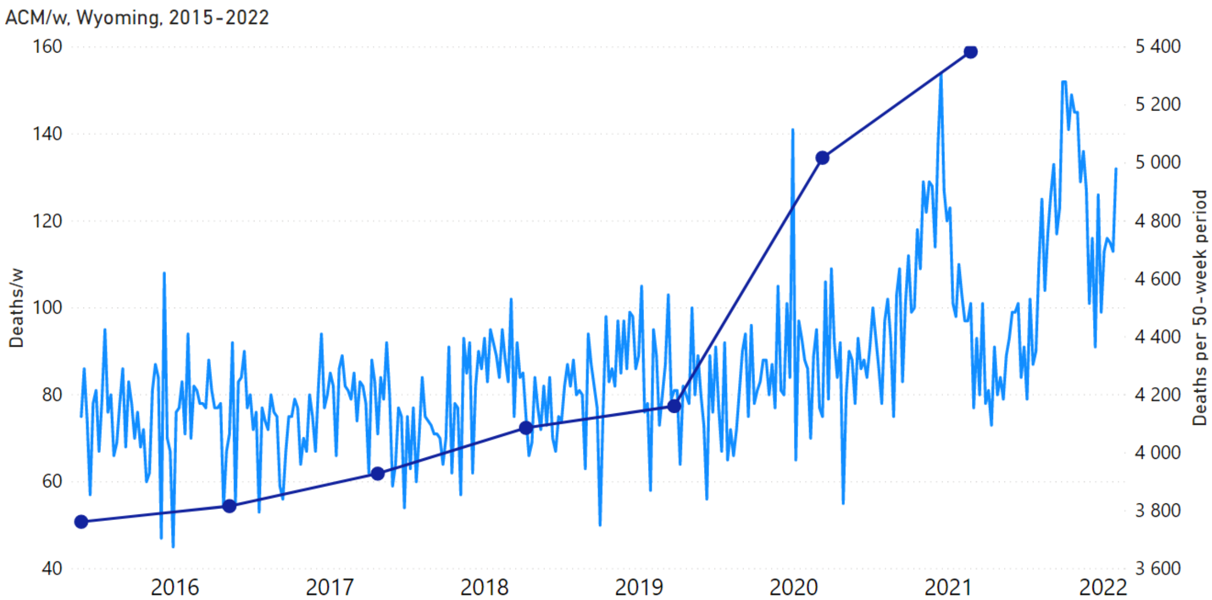
State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **West Virginia**	**27 179**	**25 273**	**21 712**	**3 561**	**5 467**	**16,40 %**	**25,18 %**
0-24	74	45	24	21	50	87,50 %	208,33 %
25-44	1 728	1 584	1 284	300	444	23,36 %	34,58 %
45-64	6 056	5 201	4 500	701	1 556	15,58 %	34,58 %
65-74	6 476	5 630	4 782	848	1 694	17,73 %	35,42 %
75-84	6 654	6 503	5 548	955	1 106	17,21 %	19,94 %
85+	6 191	6 310	5 574	736	617	13,20 %	11,07 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **West Virginia**	**52 452**	**43 057**	**42 839**	**9 395**	**9 613**	**21,82 %**	**22,44 %**
0-24	119	98	152	21	-33	21,43 %	-21,71 %
25-44	3 312	2 490	2 565	822	747	33,01 %	29,12 %
45-64	11 257	8 956	9 126	2 301	2 131	25,69 %	23,35 %
65-74	12 106	9 325	8 986	2 781	3 120	29,82 %	34,72 %
75-84	13 157	11 029	10 594	2 128	2 563	19,29 %	24,19 %
85+	12 501	11 159	11 416	1 342	1 085	12,03 %	9,50 %



State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
Wisconsin	**59 574**	**60 697**	**52 104**	**8 593**	**7 470**	**16,49 %**	**14,34 %**
0-24	994	989	941	48	53	5,10 %	5,63 %
25-44	3 025	2 629	2 095	534	930	25,49 %	44,39 %
45-64	10 348	9 721	8 558	1 163	1 790	13,59 %	20,92 %
65-74	11 824	11 566	9 558	2 008	2 266	21,01 %	23,71 %
75-84	14 589	14 815	12 685	2 130	1 904	16,79 %	15,01 %
85+	18 794	20 977	18 267	2 710	527	14,84 %	2,88 %

State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
Wisconsin	**120 271**	**102 801**	**100 748**	**17 470**	**19 523**	**16,99 %**	**19,38 %**
0-24	1 983	1 849	2 072	134	-89	7,25 %	-4,30 %
25-44	5 654	4 094	4 093	1 560	1 561	38,10 %	38,14 %
45-64	20 069	17 000	16 852	3 069	3 217	18,05 %	19,09 %
65-74	23 390	18 644	17 492	4 746	5 898	25,46 %	33,72 %
75-84	29 404	24 819	23 580	4 585	5 824	18,47 %	24,70 %
85+	39 771	36 395	36 659	3 376	3 112	9,28 %	8,49 %

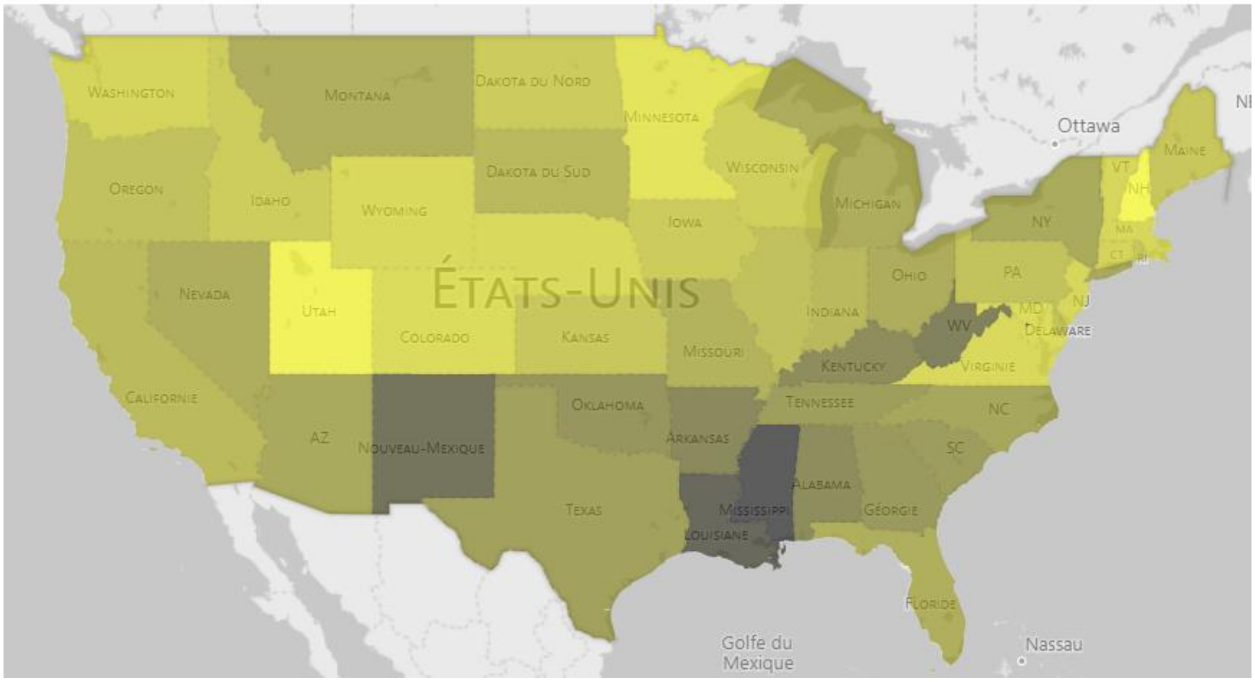


State	w50c	w50c-1	w50c-2	pVax-pCVD	Vax-pCVD	pVax-pCVD/pCVD	Vax-pCVD/pCVD
⊟ **Wyoming**	**5 385**	**5 018**	**4 161**	**857**	**1 224**	**20,60 %**	**29,42 %**
25-44	77	24		24	77	Infinity	Infinity
45-64	1 167	992	868	124	299	14,29 %	34,45 %
65-74	1 308	1 128	883	245	425	27,75 %	48,13 %
75-84	1 352	1 354	1 037	317	315	30,57 %	30,38 %
85+	1 481	1 520	1 373	147	108	10,71 %	7,87 %

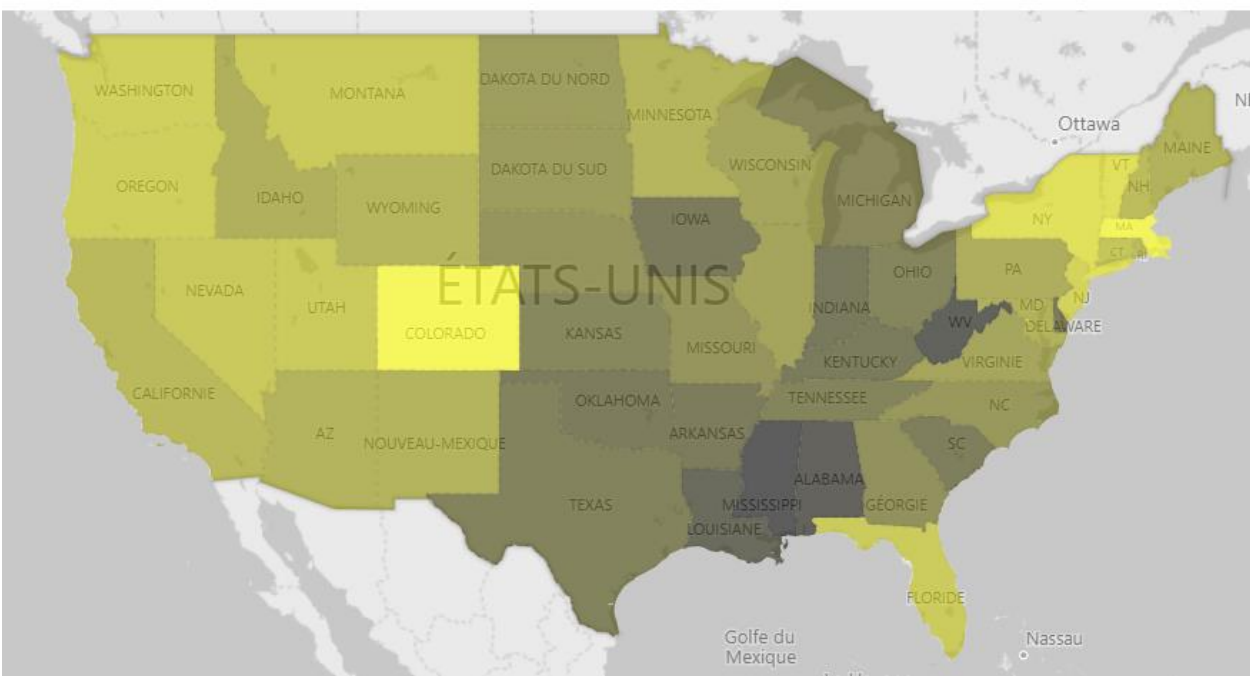
State	w100c	w100c-1	w100c-2	xDc(100)1	xDc(100)2	xDc(100)1%	xDc(100)2%
⊟ **Wyoming**	**10 403**	**8 247**	**7 744**	**2 156**	**2 659**	**26,14 %**	**34,34 %**
25-44	101	23		78	101	339,13 %	Infinity
45-64	2 159	1 662	1 677	497	482	29,90 %	28,74 %
65-74	2 436	1 736	1 606	700	830	40,32 %	51,68 %
75-84	2 706	2 115	1 954	591	752	27,94 %	38,49 %
85+	3 001	2 711	2 507	290	494	10,70 %	19,70 %

Appendix B – Poverty and obesity maps of the USA

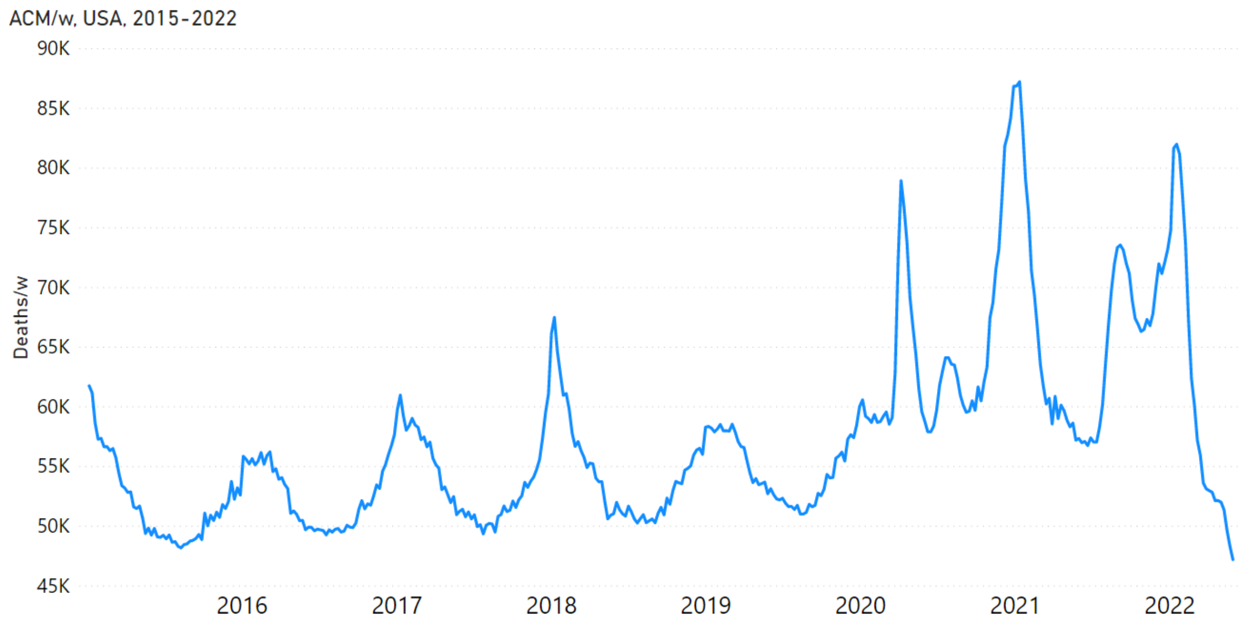
POVERTY IN THE USA



OBESITY IN THE USA



Appendix C – ACM/w in the USA from 2015 to most recent data



Data for this graph were retrieved from the CDC:

https://gis.cdc.gov/grasp/fluview/mortality.html