Hey Dr. Epperly, thanks so much for your feedback!

You have a wonderful way of sharpening my thinking in our discussions. Before I get into the detail of my response, I wanted to publicly thank you regarding how helpful you have been in my own personal journey of health. As my very own primary care doc, you have taught me much in terms of “systems health” which I, as an aging biophysicist should known more about from the very get-go. I also don’t think it inappropriate for me to thank you, too, by poxy, for the likely hundreds of lives you have saved or improved in your almost 40 year practice of primary care. I count it our privilege to call you “my doc.” Last, in terms of your points, they are all super important! I would expect nothing less from you, doc. Because they touch directly on my meandering dual careers in biophysics/molecular biology and data science, I know you will permit me to draw upon those two disciplines freely. Specifically, I will be leaning upon two bodies of literature from those careers:

1. The recent peer-reviewed scientific safety literature on Covid (largely population-based epidemiology)
2. Classical Fisherian tests of statistical inference/significance. (No Bayesian or Information theoretic inference here. Epidemiologists are — unfortunately — pretty much old school.)

I know, as well, given the importance of the issues you raise, that you will permit me four quick points to frame the issues appropriately.

*First*, I will continue my practice of providing no datum or fact without providing a reference from the peer-reviewed scientific literature — as I have done since I began FB posting on Covid a year ago. This is a habit I learned as a wet-behind-the-ears biophysicist over 40 years ago. I know you will forgive me the sheer pedantry of it all — but this is the only way we can move forward as two guys who deeply value science. (You will notice that even in my Mini-Fact post that prompted your response, I provided footnotes and link to a PDF with its own more extensive footnotes and bibliography.[[1]](#footnote-1) I have especially taken pairs to ensure that these facts represent the consensus of the literature by pulling down over 1300 peer-reviewed articles since Covid began — and actually reading most of them! So I what I substantiate here is NOT “cherry-picked” from the literature. To demonstrate this I will often include more than one reference to back up a point. Hence the bibliography of over 40 peer-reviewed articles.

Second, you will notice that I have always used Chicago-style footnoting. This style includes the page numbers so you can jump to the actual page (or page range) where the evidence can be found. I will continue that practice here — not just for consistency — but so that no unsubstantiated stats (the *de facto* base state of almost all FB posts) ends up mucking up the works.

Third, and most importantly, I trust you will see that I am taking all your points seriously. I do so not merely because you are one of my closest friends, but because the issues you and I are discussing ARE extremely important. They ARE, literally, a matter of life and death.

Fourth, thanks for turning me on to your source, too, Dr. Peter A. McCullough, M.D. There is no doubt he is a SUPER credentialed cardiologist. In fact, he is one of the most published cariologists in history with (by my count) 798 publications. I read the entire transcript of the Joe Rogan interview.[[2]](#footnote-2) And I agree with his balanced need for intervention/immunization and treatment. I will speak to treatments, in fact, at a later date. Prevention plus treatment — that’s just basic medicine. But if one reads the entire transcript, however, ***a clear pattern emerges***. McCullough is a trained compassionate clinician on the front lines. So he wants to accelerate the process of approval of treatments that are anecdotally powerful, but concerning which the meta-analytic literature demonstrates poor efficacy or even worse safety — such as hydroxychloroquine.[[3]](#footnote-3) In a nutshell he is ignoring the consensus of the scientific literature two ways. First, he is ignoring the consensus of thirty studies in over a dozen countries (including the gold-standard randomized controlled trials or RCT’s ) that demonstrate the safety of the vaccines. Instead he is relying on VAERS. I’ll speak to the non-causal nature of VAERS below. Second, he is ignoring the low efficacy/immature consensus of the scientific literature on treatments. I will speak to treatments at a later date. For today, I will limit my comments to the former — his claims made on 13 December 2021 that 1) the Covid Vaccines produced 18,000 deaths and 30,000 disabilities and 2) that these were CAUSALLY related to vaccination Here is his entire quote (Italics mine):

“*So all these really happened, 18,000 deaths. There are 30,000 individuals who are permanently disabled* after the vaccine, 250,000 emergency room visits, office visits, other healthcare encounters related to the vaccine. We have two separate analyses showing one from McLaughlin from Queens University in London, one from Jessica Rose from Canada, showing that *50% of these deaths occur within 48 hours of the shot, that 80% of the deaths occur within a week*.”[[4]](#footnote-4)

Wow!

If these VAERS reports are accurate and causally true it would DRAMATICALLY change the research safety profile of Covid-19 landscape. It would change the mortality incidence of US vaccination from the randomized controlled trials values of 0.0000345% (1 death out of 1.836 million doses)[[5]](#footnote-5) to 0.0032667 (1 death out of 30,611 doses).[[6]](#footnote-6) This would increase the RR (Relative Risk) of Covid by over 60-fold.[[7]](#footnote-7) In other words McCullough is claiming that the vaccines are 60 times as risky as the entire body of other research studies, including YY randomized controlled trials in during Phases II and III of the Emergency Use Authorization (EUA) vaccine approval process[[8]](#footnote-8) and in ZZ subsequent retrospective safety studies[[9]](#footnote-9) conducted in countries all over the world per Table 1.

Concerning Dr. McCullough’s numbers, let’s cut to the chase.

Not only does Dr. McCullough over-report the raw deaths by over 45%, incredibly, he assumes that the reported VAERS deaths “really happened.” This is quite stunning given that VAERS itself is not a causal system —as VAERS itself makes abundantly clear.[[10]](#footnote-10) VAERS is an “early warning” safety system that can arrive at causality only after these reports are retrospectively. Studies that do so discover that VAERS typically over-reports mortality by an average of 500%[[11]](#footnote-11) with a significant percentage of these studies reducing causation to zero.[[12]](#footnote-12) Accordingly, by assuming that these deaths “really happened” he omits almost two dozen standard steps in assigning causality to VAERS data. Two types of causal assessments are traditional and were executed here, **qualitative** causal assessment (which performs statistically valid pulls of the of the VAERS Covid-19 mortality records) and standard epidemiologcal **quantitative** causal assessment. In thorough-going studies, such as we execute here, both assessments should occur after the records in question have undergone standard data cleaning methods from data science.

From this point on, for brevity and for clarity, I will adopt the standard metaphor of scientific reporting, via the time honored sections of an abstract, materials and methods, results, discussion, and conclusion.

**Title**: VAERS Covid-19 Mortality Data Over-Reports Deaths by 2000%: Results of Parallel Qualitative and Quantitative Causal Assessments of Covid-19 Mortality Reporting in 2020-2021.

**Abstract**: Not merely social media platforms but large, multinational news outlets have been abuzz with a newfound affinity for reporting VAERS (Vaccine Adverse Effects Reporting System) data in their ongoing coverage of the pandemic caused by the SARS-Cov-2 virus. Despite the fact that VAERS is explicitly not a casual system the Covid-19 pandemic has nonetheless proven to be a fertile birthing ground for the assumptive causal use of raw VAERS data. The negative public health ramifications of this misuse of VAERS data is patent. This study performs two standard, but thoroughgoing, casual assessments of the Covid-19 mortality data, a qualitative and quantitative assessment respectively. Both draw upon current, standard practices in causal inference from data science/data cleaning and epidemiology. The qualitative assessment sets an upper bound of 5% of the VAERS reports implicating the vaccine causally. The more rigorous quantitative assessment indicates that 2% of the VAERS reports are linked to the vaccine causally. This quantitative mortality incidence (1 death in 1 million immunizations) would still be slightly, but nonetheless significantly above the historic raw VAERS reporting incidence of other respiratory vaccines (1 death in 10 million immunizations) and well as higher than chance alone once the standard causal approaches are supplied. While outside the scope of this study, this higher incidence may be able to be explained wholly or in part by other findings supported by univariate and multivariate inference which we do include here such as 1) the high probability of reporting fraud using a Conner’s assessment due to 2) significant association of mortality reporting with VAERS field incompleteness 3) less verifiable administration routes 4) shorter and less technical data in the SYMTOM\_TEXT field, and 5) absence of data in the LAB\_DATA field. We also make recommendations for improvements to VAERS to as a real-time system in terms of its quality control during pandemics. Finally, in terms of the VAERS system itself, taking into account our recommendations for VAERS improvements, we conclude that the VAERS system is nonetheless functioning as designed, as a necessarily publicly-accessible early safety warning system for vaccines.

**Introduction:** In the last several months political pundits and even respected, highly published medical and professionals have been guilty of reporting the raw VAERS adverse events data uncritically, without causal assessment.[[13]](#footnote-13) Most noteworthy among many such examples[[14]](#footnote-14) is the 13 December 2021 appearance of Dr. Peter McCullough, one of the most published cardiologists worldwide, on the politically right-wing platform of Joe Rogan, a noted anti-vaccine advocate on his eponymously titled *Radio Experience* program.[[15]](#footnote-15) Most relevant for our purposes, while Dr. McCullough’s otherwise deep competencies in the molecular biology and clinical course of the SAR-Cov2 vaccine were on full display, his interview was marred by one of the most elementary misuses of VAERS data. For the purposes of this study I will limit my comments to his claims that triad of Covid-19 EUA vaccines produced 18,000 deaths and 30,000 disabilities and 2) that these were CAUSALLY related to vaccination.

Here is his entire quote (Italics ours):

“So all these really happened, 18,000 deaths. There are 30,000 individuals who are permanently disabled after the vaccine, 250,000 emergency room visits, office visits, other healthcare encounters related to the vaccine. We have two separate analyses showing one from McLaughlin from Queens University in London, one from Jessica Rose from Canada, showing that 50% of these deaths occur within 48 hours of the shot, that 80% of the deaths occur within a week.”[[16]](#footnote-16)

The objective of this study is to causally assess whether these 18,000 deaths “really happened.”

**Materials and Methods**: To verify the 18,000 deaths we executed several dozen VAERS reports using the CDC Wonder reporting system on the VAERS website,[[17]](#footnote-17) limiting our queries to the reporting completed in the 2020-2021.[[18]](#footnote-18) For the purposes of causal assessment we downloaded and extracted the entire VAERS databases from publicly available

Triangulating on causal assessment two ways by repeated trials of randomized qualitative assessment and a standard suite of quantitative data cleaning measures drawn from both epidemiology and data science praxis.

**Qualitative Causal Assessment Methodology**

1. **Reproduce published/reported VAERS mortality numbers**: the “initial set”
2. **Subtract invalid records using data science / data cleaning** (see below)
3. **Perform pulls of** **VAERS Covid-19 mortality records (N=100) with completed in statistically valid number of sets (S = 5)**. This estimate the population when the initial set is too large to qualitatively causally assess.
4. **Qualitatively disambiguate mortality caused by vaccination from all other causes via the records with**  (N samples in S sets)
5. **Report causality proportion as a percentage of the initial set**. (This typically yields the highest bound since it does not implement formal epidemiological causal assessment)

**Quantitative Causal Assessment Methodology**

This approach combines standard suites of measures from both data science (principally data cleaning) and epidemiology in that order:

Data Science / Data Cleaning

1. **Reproduce published/reported VAERS mortality numbers**
2. **Perform validity testing of mortality field logic if it is not provided in meta-data**
3. **Perform mortality field QA vs. other VAERS adverse effects fields (null hypothesis testing)**
   1. **Record completeness**
   2. **Proportion from high probability administration routes**
   3. **Proportion with longer record length**
   4. **Proportion with more detailed records**
   5. **Proportion with lab reports**
4. **Perform initial field/feature null hypothesis testing (Characterizes field/feature inhomogeneity)**
5. **Subtract any reports due to VAERS Design and Reporting Artifacts**
   1. **Unique Key (VAERS\_ID) Assessment:** Duplicate unique ID’s inflates totals
   2. **Duplicate Key Assessment:** determines which duplicate VAERS\_ID’s to eliminate
   3. **Reporting Reproducibility:** results in non-reproducible totals
6. **Subtract any reports with high levels of missing data: (optional)**

Epidemiological Causal Assessment

1. **Subtract any reports that are logically impossible** (e.g. deaths of age groups before those age groups received the vaccine)
2. **Subtract any reports unreasonably far from the time of vaccination**: greater than one month
3. **Subtract any reports where other disease states were explicitly identified as the cause of death**
   1. **Covid** (one of six Covid disease identifiers were listed.)
   2. **Already existing terminal disease processes**
4. **Subtract any reports where vaccine administration effects are implicated (**expired product administered, contaminated vaccine, etc.)
5. **Subtract a conservative proportion of reports where reporter identified other causes of death as primary**
6. **Subtracting background mortality rates for this cohort: adjusted to time period**
7. **Subtracting any sociological, legal, or psychological factors that increase reporting rates**
8. **Reperform field/feature null hypothesis testing (Characterizes field/feature inhomogeneity)**

Once these steps are executed, standard epidemiological practice would then:

1. **Compare this adjusted rate to other VAERS-tracked vaccines** and test for significance
2. **Compare this adjusted rate to other Covid-19 death rates in other studies** (especially RCT’s)

If the VAERS data is still higher than highest vaccinated cohort:

* + - 1. Run mortality by age and comorbility to see if this was the first time a highly comorbid pop was vaccinated at 80% coverage rather than 20% coverage.
      2. Run month vaccinated to see morbidity spike (death per doses)
      3. Run 1st, 2nd dose morbidity for Pfizer, Moderna
      4. Is there new required reporting effects…is there adequate de-duping
      5. Profile perm disabilities

Once these steps are taken (as I will demonstrate) the causally corrected VAERS number falls in line all other previously published studies. The conclusion? Once corrected for these omissions the data actually demonstrates the opposite of what Dr. McCullough claims. Uncontaminated, properly stored, dosed and injected, all three Covid-19 vaccines are safe, confer no statistically significant incidence of death above the normal background incidence rates.

**Establishing a raw reporting baseline**

To check Dr. McCullough’s value of 18,000 deaths and 30,000 permanent disabilities. I executed a VAERS run on the VAERS CDC Wonder online computer interface[[19]](#footnote-19) on 27 Jan 2022 using the following parameters:

Vaccine Products: COVID19 (COVID19 VACCINE)

Vaccine Manufacturers: JANSSEN, MODERNA, PFIZER/BIONTECH

Locations: Worldwide

Deaths Occurred: 2020; 2021

Report Completed Dates: 2020 and 2021 (2022 was dropped to match the date of the interview [12/13/2021])

Organize Table Layout: Event Category then Vaccine Manufacturer

Two initial tables were executed. Tables 1 and 2 queried the VAERS databases for worldwide deaths and permanent disabilities respectively covering the entire time period of the pandemic (2020-2021). The goal was to verify Dr. McCullogh’s claims of 18,000 deaths and 38,000 permanent disabilities and establish a baseline for other VAERS data pulls. The VAERS reports for Tables 1 and 2 are below:

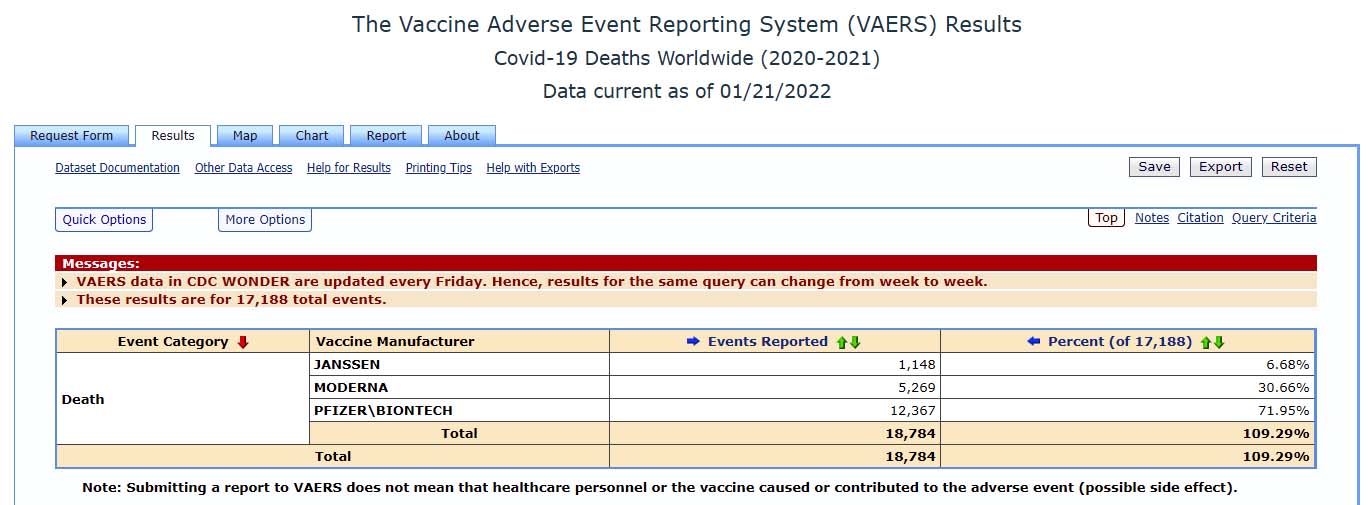


Table 1: VAERS Covid-19 Deaths Reported Worldwide (2021-2022)

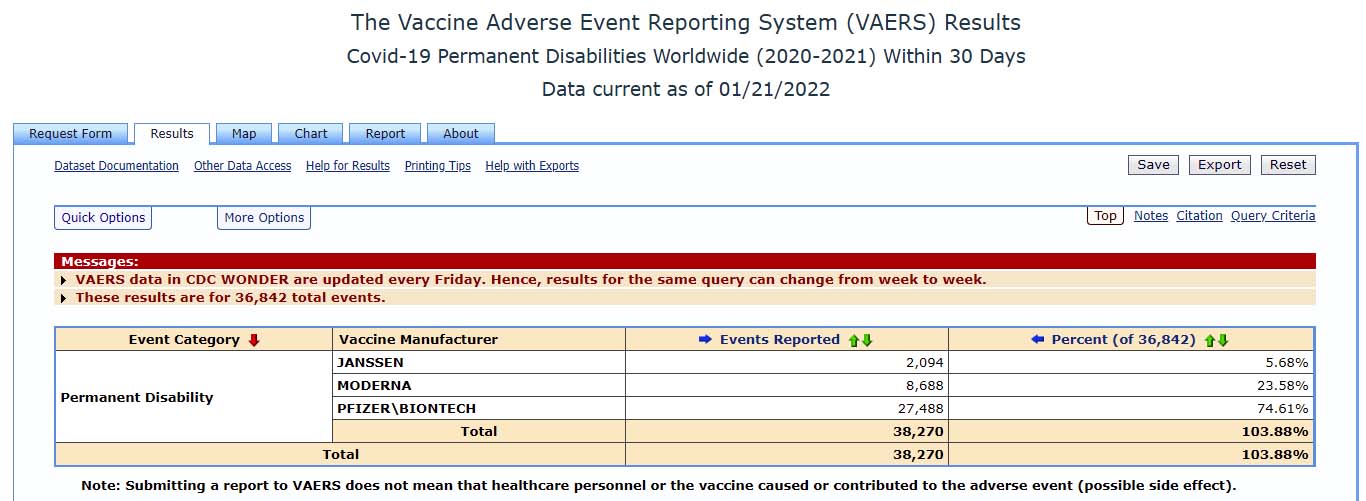


Table 2: VAERS Covid-19 Permanent Disabilities Reported Worldwide (2021-2022)

Tables 1 and 2 do indeed closely match the values Dr. McCullough’s reported on 13 Dec 2021. The exception is that permanent disabilities come in at 38,270 above the 30,000 disabilities. We surmise that between 13 December and 31 December many cases of permanent disabilities were reported as part of the application process for social security benefits.

Let’s simplify our effort and focus on reported deaths. Since VAERS is not a causal system, but a safety reporting system we will implement standard approaches in epidemiology that will systematically eliminate VAERS reports reports that are certainly or very likely not caused by vaccination. These are deaths that should be subtracted from the raw total because they are:

It is critical to note that the death total however, must be adjusted by the criteria Dr. McCullough himself mentioned (80% of the deaths occurring within 15 days.) We chose to expand that period to 1) capture above 80% of the deaths potentially due to the vaccine and 2) because the research of Faes et. al., demonstrates that the variance term (via box and whisker plots) representing the average time from initial hospitalization and death for some age groups and genders can extend to 30 days.[[20]](#footnote-20) We therefore executed a VAERS pull identical to Table 1 but limited only to those deaths that occurred in the first 30 days. The result is represented in Table 3.

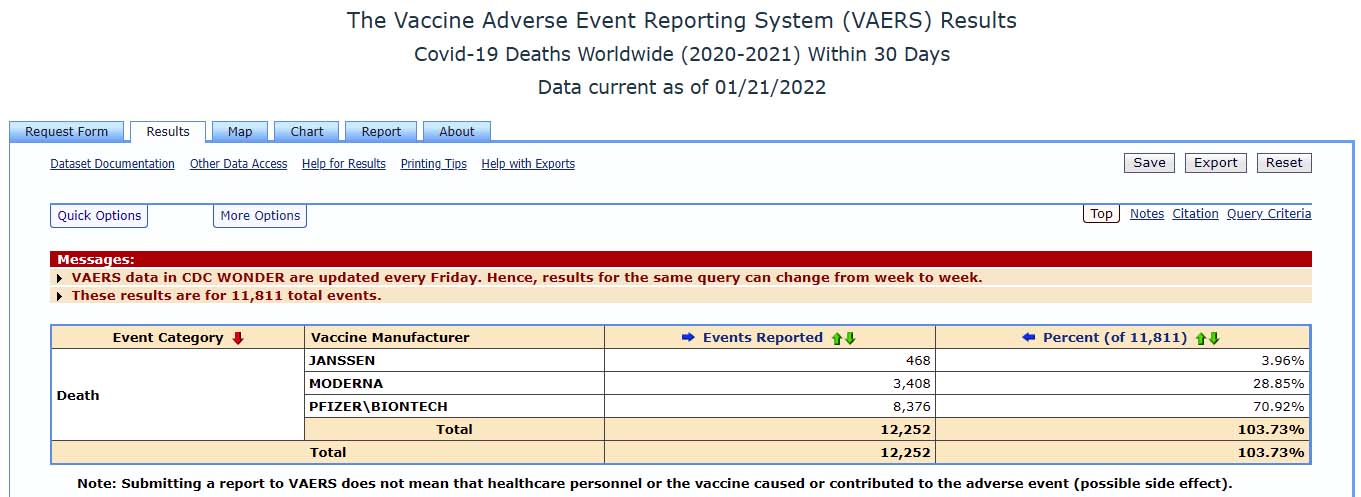


Table 3: VAERS Covid-19 Deaths Reported Worldwide with Death Onset within 30 Days (2021-2022)

Table 3 demonstrates that the total VAERS deaths of those vaccinated worldwide from all three EUA Covid-19 vaccines in which death resulted in 30 days sums to 12,252 not 18,000. Thus, Dr. McCullough’s 18,000 number appears indeed to be based on the total deaths over the entire pandemic period not the period he himself suggests of 15 days. If this oversight was the only problem with McCullough’s data and reasoning, we could overlook that he over-estimated the “15-day” deaths by over 45% (46.915%.)

1. They do not account for fraud in the VAERS system. Initial conservative estimates demonstrate that at least XX percent of the Covid-19 VAERS data is falsely reported.

2. Data Cleansing Strategies: Two methods

3. Rule based data cleaning:

a. Flag (possibly eliminate) ID’s with impossible fields

i. Ages

ii. Covid Reports before 2020

iii. Janssen with 2 doses

iv. Any Vaccine with No Doses?

b. Flag (possibly eliminate) ID’s with unlikely fields

i. Profile subgroup combinations with high percentage of deaths

c. Don’t eliminate fields on the basis of just one flag

1.

d. Machine learning-based elimination

e. Find fields that display the same quality as Pre-Covid Fields

f. Eliminate ID’s with impossible logical combinations

g. Eliminate ID’s with unlikely distribution (deaths with no other events)

h. Eliminate ID’s with large numbers of missing fields if they have

i. Do not eliminate those with lab data

j. Evaluate if hard-to-emulate or risky to emulate have different distributions by administration military vs. private

k. Eliminate by completeness of fields

l. Eliminate if display naïve results (private heart attack)

a. Explore dates these VAERS reports were filed (by week) to see if they are proportional to the vaccination rate for that time period (Calculate increasing deaths per million vaccinated: one would expect constant rate or decreasing as younger populations display better survival)

b. Do not eliminate

To achieve these four outcomes we will switch to a USA baseline rather than a world baseline because the data on mortality, vaccination, and cause of death is tracked far better in the US (or any high per capita GDP country) than it is in the over 200 other countries (largely with lower GDP) that have been vaccinated with the Janssen, Moderna and Pfizer vaccines. Accordingly, the USA baseline for deaths within the 30-day onset is in Table 4:

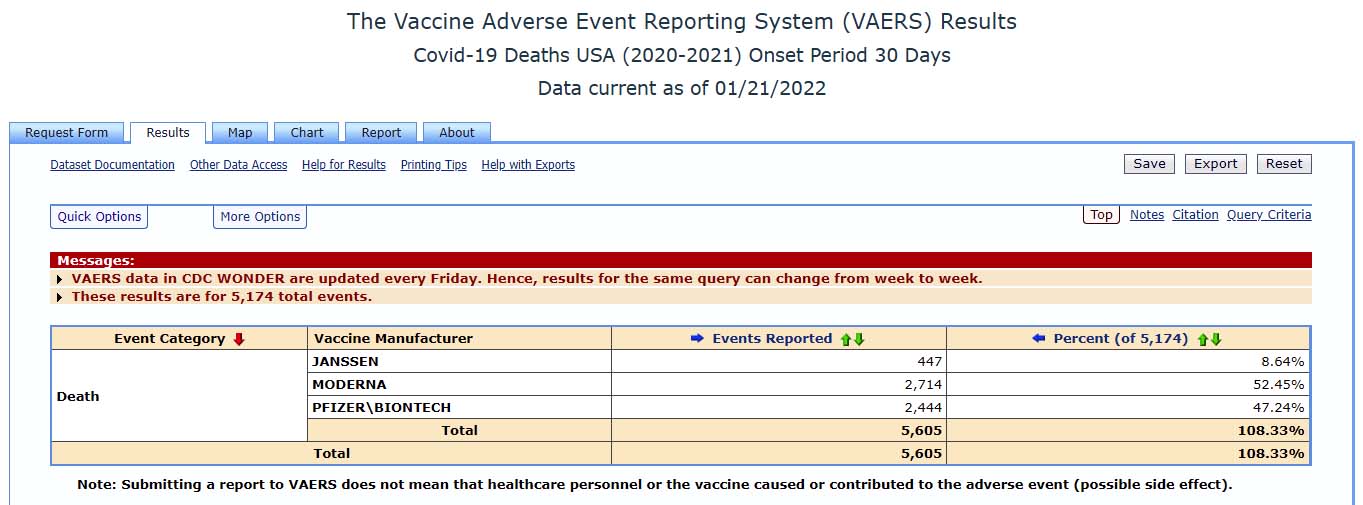


Table 4: US Deaths Reported within 30 Days of Covid Infection

Note that this data yields US 5,174 deaths within 30 days of vaccination. As of December 31st, 2021 this translates to a death rate per vaccine and per dose displayed in Table 5:

|  |  |  |  |
| --- | --- | --- | --- |
| covid-19 Vaccines: Deaths within 30 days of administration | Deaths: 2020-2021 | MILLION Doses 2020-2021 | Deaths Per Million Doses |
| Janssen | 447 | 17.61 | 27.09 |
| Moderna | 2714 | 193.65 | 14.01 |
| Pfizer/Biontech | 2477 | 295.86 | 8.37 |
| Totals | 5,174 | 507.12 | 10.11 |

Table 5: Coivid-19 Vaccines in 2020-2021: Causally Uncorrected VAERS Deaths Per Million Doses

This may be compared to the death rate from Influenza vaccines in Table 6:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| VACCINES | VAERS VACCINE ideNtifierS | YEAR/ seasons | 30-day onset VAERS DEATHS | MILLION DOSES[[21]](#footnote-21) | Deaths Per Million Doses |
| FLU-OGEN, ZONE (i.e. fluogen, fluzone),NB[[22]](#footnote-22) | 34,7,44 | 1990-1991 | 6 | 28.3 | 0.212014 |
| FLU-IMMUNE,OGEN,ZONE,nb | 201,34,7,44 | 1991-1992 | 22 | 28.5 | 0.77193 |
| FLU-IMMUNE,OGEN,ZONE,nb | 201,34,7,44 | 1992-1993 | 27 | 38.3 | 0.704961 |
| FLU-IMMUNE,OGEN,ZONE,nb | 201,34,7,44 | 1993-1994 | 25 | 47.1 | 0.530786 |
| FLU-OGEN,SHIELD,VIREN,ZONE,nb | 34,261,262,7,44 | 1994-1995 | 21 | 52.1 | 0.403071 |
| flu-SHIELD,VIREN,ZONE | 261,262,7 | 1995-1996 | 11 | 54.9 | 0.200364 |
| FLU-OGEN,SHIELD,ZONE,nb | 34,261,7,44 | 1996-1997 | 16 | 58.2 | 0.274914 |
| FLU-OGEN,SHIELD,VIREN,ZONe | 34,261,262,7 | 1997-1998 | 18 | 75.3 | 0.239044 |
| FLU-OGEN,SHIELD,virin,ZONE,nb | 34,261,262,7,44 | 1998-1999 | 17 | 62.6 | 0.271565 |
| FLU-SHIELD,ZONE | 261,7 | 1999-2000 | 11 | 76.8 | 0.143229 |
| FLU-SHIELD,viren,ZONE,nb | 261,262,7,44 | 2000-2001 | 20 | 70.4 | 0.2841 |
| FLU-immune, SHIELD,viren,ZONE | 201,261,262,7,44 | 2001-2002 | 24 | 77.7 | 0.30888 |
| SHIELD,VIREN,ZONE,nb | 261,262,7,44 | 2002-2003 | 11 | 83 | 0.13253 |
| SHIELD,VIREN,ZONE,nb | 261,262,7,44 | 2003-2004 | 18 | 83.1 | 0.216606 |
| FLU-IMMUNE, ZONE,nb | 201,7,44 | 2004-2005 | 25 | 57 | 0.438596 |
| flu-VIREN,ZONE,nb | 262,7,44 | 2005-2006 | 27 | 81.2 | 0.332512 |
| FLU-arix, laval,VIREN,ZONE,nb | 1089,1101,262,7,44 | 2006-2007 | 20 | 103.4 | 0.193424 |
| FLU-arix,imune,LAVAL,mist,VIREN,ZONE,nb | 1089,201,1101, 1085,262,7,44 | 2007-2008 | 27 | 112.4 | 0.240214 |
| FLU-ARIX,LAVAL,MIST,ZONE,nb | 1089,1101,1085,7,44 | 2008-2009 | 20 | 110.9 | 0.180343 |
| afluria,arix,laval,virin,zone,H1NI,M,N,s, nb | 1121,1089,1101,262,7, 1131,1133,1132,44 | 2009-2010 | 59 | 114 | 0.517544 |
| afluria,laval,virin, zone-hd,zone, H1NI-c,m,n,s,unk,NB | 1121,1101,262,1145,7, 1134,1131,1133,1132,  1135,44 | 2010-2011 | 63 | 155.1 | 0.40619 |
| fluarix,laval,mist,virin, zone-hd,zone,H1NI-n,s,NB | 1089,1101,1085,262, 1145,7,1133,1132,44 | 2011-2012 | 35 | 132 | 0.265152 |
| alfuria,fluenz,LAVAL,MIST,VIRIN, ZONE-HD,ZONE-ID,zone,NB | 1121,1190,1101,1085 262,1145,1152,7,44 | 2012-2013 | 25 | 134.9 | 0.185322 |
| agriflu,fluarix,arixq,laval,mist,virin, zonehd,zoneq,zone,h1n1-mu, nb | 1151,1089,1161,1101, 1085,262,1145,1162,7,  1135,44 | 2013-2014 | 29 | 1345.5 | 0.021553 |
| AFLURIA,FLULAVAL, LAVALQ, CELVAX, MISTQ, VIRIN, ZONEHD,zoneq,ZONE,nb | 1121,1101,1166,1159, 1160,262,1145,1162,7,44 | 2014-2015 | 30 | 147.8 | 0.202977 |
| FLUARIX, ARIXQ, CELVAX, MIST,VIRIN, ZONEHD,ZONEQ,ZONE,NB | 1089,1161,1159,1085,262,1145,1162,7,44 | 2015-2016 | 23 | 146.4 | 0.157104 |
| AFLURIA,FLUARIXQ, LAVAL, ZONEHD, ZONEQ, ZONE,NB | 1121,1161,1101,1145, 1162,7,44 | 2016-2017 | 28 | 145.9 | 0.191912 |
| AFLURIA,AFLURIAQ,FLUAD,ZONEHD, ZONEQ, VIRIN,NB | 1121,1177,1173,1145, 1162,262,44 | 2017-2018 | 13 | 155.3 | 0.083709 |
| AFLURIA,AFLURIAQ,FLUAD,ARIXQ,CELVAXQ, LAVALQ, ZONEHD,ZONEQ,ZONE,NB | 1121,1177,1173,1161,11751166,1145, 1162,7,44 | 2018-2019 | 23 | 169.1 | 0.136014 |
| AFLURIA,FLUAD,FLUADQ,ARIXQ,BLOKQ,CELVAXQ, LAVALHD, ZONEHD,ZONEHDQ,ZONEQ,NB | 1121,1173,1198,1161,1176,1175,1166,1145,1162,7,44 | 2019-2021 | 17 | 174.5 | 0.136014 |
| AFLURIA,FLUAD,FLUADQ,ARIXQ,BLOKQ,CELVAXQ, LAVALHD, ZONEHD,ZONEHDQ,ZONEQ,NB | 1121,1173,1198,1161,1176,1175,1166,1145,1162,7,44 | 2020-2021 | 28 | 193.5 | 0.136014 |
| AFLURIA,FLUAD,FLUADQ,ARIXQ,BLOKQ,CELVAXQ, LAVALHD, ZONEHD,ZONEHDQ,ZONEQ,NB | 1121,1173,1198,1161,1176,1175,1166,1145,1162,7,44 | 2021-2022 | 42 | NA | NA |
| FLU-IMUNE, FLUOGEN,FLUSHIELD,virin, zonehd,zone,H1N1-ms,nb[[23]](#footnote-23) | 201,34,261,262,1145,7,1132,44 | UNKNOWN | 37 | NA | NA |
| totALS: all flu vaccines | ALL VACCINE IDS | 1990-2022 | 776 | 4315.2 | 0.1798 |

Table 5: Influenza Vaccines

Table 5 demonstrates that 4.314 billion doses of flu vaccines were adminstered in the US and its territories from 1990-2021, yielding an average 30-day onset death rate of 0.1798 per million doses. Consistent with a mortality rate this low, Gidengil et al,’s meta-analysis of the flu mortality literature by determined that the approved US flu vaccines pose no evidence of a significant increased risk of death.[[24]](#footnote-24) In contrast 507.12 million doses of the three SARS-Cov2 vaccines were administered in 2020 an-2021 yielded an average 30-day onset death rate of 11.21 deaths per million. This remarkable difference (a more than 62-fold higher reported death rate for the Covid-19 vaccines) is completely out-of-family not only with influenza vaccines but also with all other vaccines tracked in the VAERS system since its inception in 1990. See Figure 1.

What might explain such an out-of-family result? This is especially critical given that, as of this writing, over 30 SARS-Cov2 safety studies have been executed in 16 countries yielding an average mortality rate of XX, YY, and ZZ per million from the Jansen/Johnson&Johnson , Moderna, and the Pfizer/Biotech vaccines, respectively.

A number of modalities, may explain the relatively high reported incidence of death in SARS-Cov2 to other vaccines. They fall under three logical heads.

1. The VAERS data regarding SARS-Cov2 is accurate.
   1. The safety studies systematically underestimated the mortality of the virus because of some systemic flaw or limitation in the DoE (Design of the Experiment). Such flaws or limitations include the following:
      1. Flaws in Execution:
         1. Flawed follow-up on vaccinated cohorts resulting in undercounting (false negative)
         2. Inadequate or poorly executed *post hoc* causal assessment of deaths (causal misattribution)
      2. Flaws in Designing Adequate Experimental Group Sizes
         1. Reduction of sample size by confounding factors
            1. Vaccinated person catching SARS-Cov2 requiring
            2. Higher than expected attrition
         2. The safety studies or were of insufficient size detect the VAERS death rate (1 death in 89,158 doses).
   2. VAERS reports in lower visibility diseases have been relatively un-reported.
2. The VAERS data regarding SARS-Cov2 data is inaccurate (too high)
   1. Due to higher sensitivity of reporting due to the higher visibility of the disease.
   2. Due to higher sensitivity and awareness of reporting due to active use of healthcare apps such as the US Center for Disease Control and Prevention’s smartphone app V-safe
   3. Due to intentionally fraudulent reporting
3. A combination of over-reporting of SARS-Cov2 and underreporting of other vaccine

When all the vaccines in the VAERS database totals are aggregated by vaccine type the following table is produced

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| influenza Vaccines | other idetifier | YEAR | DEATHS | MILLION DOSES | Deaths Per Million Doses |
| H1N1 (MONOVALENT) (CSL) (1134)[[25]](#footnote-25) |  | 2009 | 1 |  |  |
| H1N1 (MONOVALENT) (NOVARTIS) (1133)[[26]](#footnote-26) |  | 2009 | 17 |  |  |
| H1N1 (MONOVALENT) (SANOFI) (1132)[[27]](#footnote-27) |  | 2009 | 35 |  |  |
| H1N1 (MONOVALENT) (MEDIMMUNE) (1131)[[28]](#footnote-28) |  | 2009 | 5 |  |  |
| SEASONAL: AFLURIA QUADRIVALENT) (1177) | BL 125254 | 2018 | 12 |  |  |
| SEASONAL: FLUARIX QUADRIVALENT) (1161)[[29]](#footnote-29) | BL 125127 | 2018-2021 | 14 |  |  |
| SEASONAL: FLULAVAL QUADRIVALENT) (1166)[[30]](#footnote-30) | BL 125163 |  | 18 |  |  |
| SEASONAL: FLUZONE HIGH-DOSE QUAD) (1199)[[31]](#footnote-31) | STN: 103914 | 2021-2022 | 22 |  |  |
| H1N1: MONOVALENT) (UNKNOWN) (1135) |  |  | 3 |  |  |

Table 5: All Other Vaccines Vaccines: Causally Uncorrected VAERS Deaths Per Million Doses

A higher than average VAERS reporting can be due to any number of factors other than a fault with the vaccine. These include handling faults (contamination, inadequate refrigeration), administration faults (improper injection technique, improper injection dosing, incorrect vaccine administered, improper sterile technique) – including, ominously, spontaneous reports following after “unsubstantiated claims of deaths began circulating on the Internet.” As Miller et. al, write:

*During the US multi-state measles outbreak of 2014–2015, unsubstantiated claims of deaths caused by measles, mumps, and rubella (MMR) vaccine began circulating on the Internet, prompting responses by public health officials to address… around spontaneous reports submitted to the US Vaccine Adverse Event Reporting System (VAERS).[[32]](#footnote-32)*

Now determine how many of these VAERS reported numbers are actually caused by the vaccine. There is plenty of data to work with! VAERS data is mentioned in well over 12,000 peer-reviewed articles.[[33]](#footnote-33) Dozens of follow-on studies have retrospectively tracked whether vaccination (whatever it may be) have actually *caused* the reported adverse effect. I chose eight such causal follow-up studies at random.[[34]](#footnote-34) I discovered that, on average, VAERS over-reported Serious Adverse Event (SAE’s) such as death or permanent disability reported in VAERS by 800%.[[35]](#footnote-35) If this follows with SAR-Cov-2 (what we call Covid) that would mean that these 5,496 deaths would reduce to XX and the permanent disabilities would reduce to (not 30,000.) [[36]](#footnote-36) Quite a difference. Regarding deaths of other vaccines these studies have ranged from zero percent of the reported incidents of death being due to the vaccine[[37]](#footnote-37) Louglin et. al. in their article published in *Vaccine* are representative. They conclude that, “Assessment of VAERS reports identified that causality was thought to be probable or definite in less than one quarter of reports.”[[38]](#footnote-38)

Incorrect Inference from VAERS Data. VAERS is NOT a Causal System. VAERS itself states that “VAERS reports alone cannot be used to determine if a vaccine caused or contributed to an adverse event or illness.[[39]](#footnote-39)  Why? VAERS is a “passive reporting system,” meaning that “it relies on individuals to send in reports of their experiences.”[[40]](#footnote-40) As such VAERS is susceptible to double counting, triple counting etc. This is also why VAERS suggests two other systems with better controls, stating, “These systems do not have the same scientific limitations as VAERS.”[[41]](#footnote-41)  This is why researchers take two tacks in identifying causation:

1. The take the VAERS data perform retrospective tracking studies to see which of the reported data were actually caused by the vaccine.
2. They start with randomized controlled trials (RCT) and examine whether a “statistically significant higher rate of an adverse event (e.g., fever) occurs in the vaccinated group compared to the control group, plus other factors such as biologic plausibility and clustering of onset interval (time elapsed between vaccination and onset of the adverse event).[[42]](#footnote-42)

No Tests of Significance Were Employed: When Severe Adverse Effects are adjusted to take into account normal mortality and disability among those vaccinated, the death and disabilities values are seen to be no greater than average. See the details below.

The Fisher’s exact test contained in the StatsDirect (version 2.8.0) statistical software package was utilized for statistical analyses, and a two-sided p value<0.05 was considered to be statistically significant. Odds ratios (ORs), p values, and 95 % confidence intervals (CIs) were calculated. The null hypothesis was that there would be no difference in between the adjusted VAERS data and the known mortality and disability data before Covid appeared.

Let’s be conservative with the VAERS data and double the adjusted reported causality numbers to 200% their adjusted reported values of XX and YY. That would yield 2,748 deaths and 4,798 permanent disabilities. Now let’s normalize those deaths and disability numbers to the population and compare that incidence to what statisticians refer to as “random walk” — whether those probabilities are significantly greater (or less) than one would expect by chance alone. As of January 21st, 2022 there have been 311.85 million Covid shots delivered by Pfizer and 202.4 5 million by Moderna, yielding a total number of 514,300,000 injections.[[43]](#footnote-43) Given that the baseline mortality rate[[44]](#footnote-44) for the year prior to Covid (2019) are published by the CDC yearly[[45]](#footnote-45) we can first calculate whether these SAE’s are larger than would be expected by chance alone, and if so, whether that difference is significant. The age-adjusted death rate for the total population was 715.2 per 100,000. Let’s subtract out from that total the 49.3 deaths from unintentional injuries because these can hardly be confounded with a Covid death. Then let’s convert it to the needed monthly rate and compare that to the VAERS incidence. STOPPED Doing the math, the 2,748 deaths and 4,798 permanent disabilities that occurred within 30 days and were reported by VAERS, compares to 715.2 yielding Every year per the CDC, Conclusion? Even when we double the likely causality incidence, we fall well within statistical “random walk.” If we put on our univariate Fisherian statistical hats we would need to accept the null hypothesis (the hypothesis of no difference) and therefore reject that hypothesis that the mRNA vaccines caused the death statistically. If you want to do the work yourself the appropriate non-parametric Fisherian test would be the XX described here. I have provided a link to the tests description from the

Conclusion: The safety record of the Pfizer and Moderna vaccines, in particular, are remarkable. Not only are they the most deployed medical intervention in history, their safety record competes with the best deployed interventions in the history of medicine. By comparison aspirin, because of Reyes syndrome, is ten times as deadly. What is truly unsafe, scientifically, is to remain unvaccinated. In effect, the vaccine-hesitant are making a medical Faustian wager with all its attendant risks. They are – quite literally — trading off a known 2,000% increase in death from being unvaccinated (and the 10,000% increase for the most at-risk elderly and co-morbid) with their last surviving evaporating objection, the unknown worries of a future that, daily, is become diminishingly remote.

Conclusion. These misuse of VAERS data is nothing new, by the way.

Back in 2009, during the H1N1 flu Black et. al., wrote a peer-reviewed article entitled, “Importance of Background Rates of Disease in Assessment of Vaccine Safety During Mass Immunisation with Pandemic H1N1 Influenza Vaccines.”[[46]](#footnote-46) They write, “Unfortunately, the availability of the internet together with an increased public concern and engagement in interpretation of vaccine adverse event data have increasingly allowed for spurious associations to be promoted as fact.”[[47]](#footnote-47)

Moreover, in that article Black et. al., do what I have done here — and what all responsible epidemiologists without an ax to grind do:

1. Start with the VAERS data.
2. Perform follow-up causal assessments to arrive at causal numbers not raw reported numbers.
3. Test whether the SAE incidence is above chance (background rates)
4. Make a conclusion
5. Here I will most frequently use Spirer and Jaffe’s now classic, “Misuses of Statistics: Lessons for Statisticians, Non-Statisticians, Students and Teachers,”[[48]](#footnote-48) and/or Irving Copi’s heavily referenced chapter on informal fallacies.[[49]](#footnote-49)

Borja-Hart, N. L., et al. “Human Papillomavirus Vaccine Safety in Pediatric Patients: An Evaluation of the Vaccine Adverse Event Reporting System.” *Ann Pharmacother* 43 (2009) 356-9.

CDC. “CDC Wonder.” No Pages. Online: <https://wonder.cdc.gov/vaers.html>.

Chen, Po‐Huang, et al. “Does Hydroxychloroquine Reduce Mortality in Patients with COVID‐19? A meta‐analysis with Trial Sequential Analysis.” *International Journal of Clinical Practice (Esher)* 75 (2021) e14448, doi: 10.1111/ijcp.14448, Online: <https://onlinelibrary.wiley.com/doi/pdfdirect/10.1111/ijcp.14448?download=true>.

Chivese, Tawanda, et al. “Efficacy of Chloroquine and Hydroxychloroquine in Treating COVID-19 Infection: A Meta-Review of Systematic Reviews and an Updated Meta-Analysis.” *Travel Medicine and Infectious Disease* 43 (2021) 102135-102135.

Copi, Irving M. “Informal Fallacies.” In *Introduction to Logic*, 97-137. New York, NY.; London, UK.: MacMillian; Collier Macmillian, 1982.

Copi, Irving M., et al. “Fallacies.” In *Introduction to Logic*, 191-273. New York, NY.; London, UK.: Routledge, Taylor and Francis, 2016.

Cortegiani, Andrea, et al. “Update I. A Systematic Review on the Efficacy and Safety of Chloroquine/Hydroxychloroquine for COVID-19.” *Journal of Critical Care* 59 (2020) 176-190.

Davlin, S. L., et al. “Detailed Examination of Reports of Death to VAERS Following HPV4 Vaccination.” *Annals of Epidemiology* 23 (2013) 597-597.

Elsawah, Hozaifa Khalil, et al. “Hydroxychloroquine for Treatment of Non‐Severe COVID‐19 Patients; Systematic Review and Meta‐Analysis of Controlled Clinical Trials.” *Journal of Medical Virology* 93 (2020) 1265–1275, doi: 10.1002/jmv.26442, Online: <https://onlinelibrary.wiley.com/doi/pdfdirect/10.1002/jmv.26442?download=true>.

Faes, Christel, et al. “Time between Symptom Onset, Hospitalisation and Recovery or Death: Statistical Analysis of Belgian COVID-19 Patients.” *International Journal of Environmental Research and Public Health* 17 (2020) 7560.

Gidengil, Courtney, et al. “Safety of Vaccines Used for Routine Immunization in the United States: An Updated Systematic Review And Meta-Analysis.” *Vaccine* 39 (2021) 3696-3716.

Hernandez, Adrian V., et al. “Efficacy and Safety of Hydroxychloroquine for Hospitalized COVID-19 Patients: A Systematic Review and Meta-Analysis.” *Journal of Clinical Medicine* 10 (2021) 2503.

Loughlin, Anita M., et al. “Causality Assessment of Adverse Events Reported to the Vaccine Adverse Event Reporting System (VAERS).” *Vaccine* 30 (2012) 7253-9.

Sarma, Phulen, et al. “Virological and Clinical Cure in COVID‐19 Patients Treated with Hydroxychloroquine: A Systematic Review and Meta‐Analysis.” *Journal of Medical Virology* 92 (2020) 776-785.

Spirer, Herbert F., and A. J. Jaffe. “Misuses of Statistics: Lessons for Statisticians, Non-statisticians, Students and Teachers.” *The American Journal of Economics And Sociology* 43 (1984) 205-216.

Takla, Michael, and Kamalan Jeevaratnam. “Chloroquine, Hydroxychloroquine, and Covid-19: Systematic Review and Narrative Synthesis of Efficacy and Safety.” *Saudi Pharmaceutical Journal* 28 (2020) 1760-1776.

1. <https://drive.google.com/file/d/1QRq9mt7syRd6Q83lsjGwauT8PANr9cF7/view?usp=sharing> [↑](#footnote-ref-1)
2. <https://covidvaccinesideeffects.com/joe-rogan-interview-with-dr-peter-mccullough-video-full-episode/> [↑](#footnote-ref-2)
3. For the abysmal efficacy of hydroxychloroquine, and its narrow dosing range which make it comparatively unsafe, see the seven meta-analyses by Cortegiani et al., “Update I. A Systematic Review of Chloroquine/Hydroxychloroquine,” 176-190; Elsawah et al., “Hydroxychloroquine for Treatment of Non‐Severe COVID‐19 Patients,” 1265–1275; Sarma et al., “Virological and Clinical Cure in COVID‐19 Patients Treated with Hydroxychloroquine,” 776-785; Takla and Jeevaratnam, “Chloroquine, Hydroxychloroquine, and Covid-19,” 1760-1776; Chen et al., “Does Hydroxychloroquine Reduce Mortality in Patients with COVID‐19?,” e14448; Chivese et al., “Efficacy of Chloroquine and Hydroxychloroquine,” 102135-102135; Hernandez et al., “Efficacy and Safety of Hydroxychloroquine for Hospitalized COVID-19 Patients,” 2503. In contrast, McCullough noted, “currently we’re up to 300 completed studies with Hydroxychloroquine and 32 early treatment studies, and it does have an effect size or an efficacy early in treatment of about 64% globally across the studies… then when we found out the Hydroxychloroquine, like Ivermectin, works best early and has less of an effect late… there’s five randomized trials of inpatients with hydroxychloroquine as they’re about to go on the ventilator. And those five trials are neutral.” Per the Joe Rogan Experience, 13 December 2021. <https://podcastnotes.org/joe-rogan-experience/1747-dr-peter-a-mccullough-joe-rogan-experience/>. See also a response video by video here: <https://www.youtube.com/watch?v=8pcIbVvHI2c>. [↑](#footnote-ref-3)
4. The Rogan Experience, ibid. The 48 hour death stat is also overstated — and by almost 100%. In terms of the most verifiable/auditable numbers from the US, the VAERS data reports 2,264 total deaths within 48 hours out of 8,285 (27.3% not 50%) See the files, Deaths from Covid-19 US within 48 hours All Manufacturers.txt and Deaths from Covid-19 US All Times All Manufacturers.txt. [↑](#footnote-ref-4)
5. [↑](#footnote-ref-5)
6. [↑](#footnote-ref-6)
7. [↑](#footnote-ref-7)
8. [↑](#footnote-ref-8)
9. [↑](#footnote-ref-9)
10. [↑](#footnote-ref-10)
11. [↑](#footnote-ref-11)
12. [↑](#footnote-ref-12)
13. [↑](#footnote-ref-13)
14. [↑](#footnote-ref-14)
15. <https://covidvaccinesideeffects.com/joe-rogan-interview-with-dr-peter-mccullough-video-full-episode/> [↑](#footnote-ref-15)
16. The Rogan Experience, ibid. The 48 hour death stat is also overstated — and by almost 100%. In actuality the VAERS data reports 2,264 total deaths within 48 hours out of 8,285 (27.3% not 50%) See the files, Deaths from Covid-19 US within 48 hours All Manufacturers.txt and Deaths from Covid-19 US All Times All Manufacturers.txt. [↑](#footnote-ref-16)
17. CDC, “CDC Wonder,” no pages. <https://wonder.cdc.gov/vaers.html> [↑](#footnote-ref-17)
18. [↑](#footnote-ref-18)
19. Centers for Disease Control (CDC)/Food and Drug Administration (FDA), United States Department of Health and Human Services (DHHS), Public Health Service (PHS), Vaccine Adverse Event Reporting System (VAERS) 1990 - last month, CDC WONDER On-line Database. https://wonder.cdc.gov/vaers.html. [↑](#footnote-ref-19)
20. See Faes et al., “Time between Symptom Onset, Hospitalisation and Recovery or Death,” 5. [↑](#footnote-ref-20)
21. Per https://www.cdc.gov/flu/prevent/vaccine-supply-historical.htm , Prevent Flu tab [↑](#footnote-ref-21)
22. No brand given, only a VAERS brand ID number (44) [↑](#footnote-ref-22)
23. 37 deaths that could not be associated with any year. The vaccines the VAERS vaccine identifier number and the deaths are as follows: H1N1 MONOVALENT: SANOFI (1132): 1; NB (44): 7, FLU-IMUNE (201): 1, FLUOGEN (34): 4, FLUSHIELD (261): 1, FLUVIRIN(262): 9, FLUZONE-HIGH-DOSE(1145): 2, FLUZONE(7): 12. [↑](#footnote-ref-23)
24. Gidengil et al., “Safety of Vaccines Used for Routine Immunization in the United States,” 3700 [↑](#footnote-ref-24)
25. https://www.fda.gov/vaccines-blood-biologics/vaccines/influenza-h1n1-2009-monovalent-vaccine-csl-limited [↑](#footnote-ref-25)
26. https://www.fda.gov/vaccines-blood-biologics/vaccines/influenza-h1n1-2009-monovalent-vaccine-novartis-vaccines-and-diagnostics-limited [↑](#footnote-ref-26)
27. https://www.fda.gov/vaccines-blood-biologics/vaccines/influenza-h1n1-2009-monovalent-vaccine-sanofi-pasteur-inc [↑](#footnote-ref-27)
28. https://www.fda.gov/vaccines-blood-biologics/vaccines/influenza-h1n1-2009-monovalent-vaccine-medimmune-llc [↑](#footnote-ref-28)
29. https://www.fda.gov/vaccines-blood-biologics/vaccines/fluarix-quadrivalent [↑](#footnote-ref-29)
30. https://www.fda.gov/vaccines-blood-biologics/vaccines/flulaval-quadrivalent [↑](#footnote-ref-30)
31. https://www.fda.gov/vaccines-blood-biologics/vaccines/fluzone-quadrivalent-fluzone-high-dose-quadrivalent-fluzone-intradermal-quadrivalent-fluzone [↑](#footnote-ref-31)
32. [↑](#footnote-ref-32)
33. Parameters for the search was simply “VAERS” in the subject line 12,460 articles on January 22, 2022. This was executed with an inclusive search of 750 databases including all the major biomedical databases. [↑](#footnote-ref-33)
34. [↑](#footnote-ref-34)
35. [↑](#footnote-ref-35)
36. The 13 studies used were [↑](#footnote-ref-36)
37. Per Davlin et al., “Detailed Examination of Reports of Death to VAERS Following HPV4 Vaccination,” 597; Borja-Hart et al., “Human Papillomavirus Vaccine Safety in Pediatric Patients: An Evaluation of the Vaccine Adverse Event Reporting System,” 356-359 [↑](#footnote-ref-37)
38. Loughlin et al., “Causality Assessment of Adverse Events Reported to the Vaccine Adverse Event Reporting System (VAERS),” [↑](#footnote-ref-38)
39. <https://vaers.hhs.gov/data.html> [↑](#footnote-ref-39)
40. Specifically the site declares “VAERS is a passive reporting system, meaning it relies on individuals to send in reports of their experiences to CDC and FDA…..it relies on individuals to send in reports of their experiences. Anyone can submit a report to VAERS, including parents and patients.” <https://vaers.hhs.gov/about.html>. [↑](#footnote-ref-40)
41. The entire paragraph (<https://vaers.hhs.gov/data.html>) reads: “The strengths of VAERS are that it is national in scope and can quickly provide an early warning of a safety problem with a vaccine. As part of CDC and FDA’s multi-system approach to post-licensure vaccine safety monitoring, VAERS is designed to rapidly detect unusual or unexpected patterns of adverse events, also known as “safety signals.” If a safety signal is found in VAERS, further studies can be done in safety systems such as the CDC’s Vaccine Safety Datalink (VSD) or the Clinical Immunization Safety Assessment (CISA) project. These systems do not have the same scientific limitations as VAERS, and can better assess health risks and possible connections between adverse events and a vaccine.” [↑](#footnote-ref-41)
42. [↑](#footnote-ref-42)
43. Per <https://ourworldindata.org/grapher/covid-vaccine-doses-by-manufacturer?country=~USA>. [↑](#footnote-ref-43)
44. For more on this procedure, see Determining the baseline mortality rate in a vaccinated population is necessary to be

    able to identify any unusual increases in deaths following vaccine administration [↑](#footnote-ref-44)
45. Per <https://www.cdc.gov/nchs/products/databriefs/db395.htm>. I have download the PDF and posted it at: <https://drive.google.com/file/d/1O2wQbupyrXwpq7dXJiCjzU2TyLDh4Ccm/view?usp=sharing> [↑](#footnote-ref-45)
46. [↑](#footnote-ref-46)
47. [↑](#footnote-ref-47)
48. Spirer and Jaffe, “Misuses of Statistics,” 205-216. [↑](#footnote-ref-48)
49. I used my old stand-by, the 1982 (6th) edition of Copi, “Informal Fallacies,” 97-137,in this response, which is still serviceable. I see that Copi’s classic text has been updated in 2016 by Cohen and McMahon and is in its 14th (!) edition. The chapter on Informal fallacies has been expanded to include both formal and informal fallacies and hence renamed as “Fallacies” (Copi et al., “Fallacies,” 191-273). [↑](#footnote-ref-49)