

A Comparative Analysis of the Risk and Odds of Death from COVID-19 Vaccination and COVID-19 Infection in Cameroon

Kinga Bertila Mayin^{1,3}, Promise Aseh Munteh^{1,3}, Bereynuy Jude Cholong^{1,3},
Mbacham Fon Wilfred^{1,2,*}

¹Department of Health Economics and Policy Management, Catholic University of Cameroon (CATUC), Bamenda, Cameroon

²The Biotechnology Centre, University of Yaoundé, Yaounde, Cameroon

³Health Economics Association of Cameroon, Bamenda, Cameroon

Email address:

bertsking@yahoo.com (K. B. Mayin), aseh.promise@catuc.org (P. A. Munteh), berenyuyjude@catuc.org (B. J. Cholong),
wfmbacham@yahoo.com (M. F. Wilfred)

*Corresponding author

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Abstract: Like any vaccine, COVID-19 vaccines can cause side effects, most of which are mild or moderate and go away within a few days on their own. Results of clinical trials however show that more serious or long-lasting side effects are possible. This work aims at comparing the risk of dying from COVID-19 vaccination with dying from COVID-19 infection. It made use of secondary data from the Centre for Disease Control and Prevention (CDC) and Worldometer. Percentages, relative risk, and odds ratios were used to analyze the results. The results showed that 0.0017% deaths were attributed to COVID-19 vaccination and 0.0046% death to COVID-19 infection. The relative risk and odds ratio of dying from COVID-19 vaccination and infection was 0.38 and 0.137 respectively. Both figures are far less than 1 indicating that the risk and odd of dying are by far lower among people vaccinated (cases) than amongst none vaccinated people (control). The results equally showed that COVID-19 infections also led to large treatment costs for the country and individuals leading to economic depression and enormous consequences in the country and the world at large. This study, therefore, concludes that the risk of dying from COVID-19 vaccination is about 3 times lower than dying from COVID-19 infection especially amongst elderly people. This work thus recommends massive COVID-19 vaccination especially for the elderly who are most likely to die from COVID-19 infection and less likely to die from the side effect of the COVID-19 vaccines.

Keywords: COVID-19, Vaccination, Death, Risk, Odd, Cameroon

1. Introduction

According to Tom, COVID-19 continues to be a global public health and economic emergency with over two million deaths and an estimated 140 million additional people living in extreme poverty and, in many LMICs, cases are once again on the rise [15]. Reports from Hegens stipulates that as of March 2021, COVID-19 had claimed the lives of more than 2.7 million people worldwide [9]. Over the past few months, the COVID-19 figure has been on a drastic rise in

Cameroon. Figures moved from April (658), May (2265), June (7599), and July (14,916) cases in 2020 [11] to a total of 72,250 cases, 1,107 deaths, and 67,625 recoveries by May 3, 2021 [18]. This shows that the COVID-19 infection is worsening in Cameroon. This has left Cameroonians and all countries in a great Panic thus all efforts are being made to seek a lasting solution to the pandemic. Mass vaccination has become one of the world's largest recommendations to completely curb the negative consequences of COVID-19 and prevent mass deaths. On Monday 13 of April 2021, Cameroon began vaccinating people against the coronavirus.

The campaign kicked off thanks to a donation of 200,000 doses of the Sinopharm vaccine by China. "The government through its Prime Minister Chief Dr. Joseph Dion Ngute encouraged the population, especially priority targets to be vaccinated [1]. This vaccine was made free for the general public with priority to health personnel, adults above sixty years, and with comorbidities like diabetes and hypertension. Contrary to expectations that people will rush to be vaccinated, there has been great vaccine hesitancy amongst Cameroonians. The question is why the hesitancy on a vaccine should be a great relief to the world?

In research, Dinga [5] consulted 2512 adult Cameroonians based at home and abroad on their impressions on the vaccines and found out that vaccine hesitancy to a COVID-19 vaccine was 84.6% among Cameroonians. They also found that the most frequent determinants of Vaccine hesitancy were: Communication and Media Environment, Perception of the pharmaceutical industry, Reliability and/or source of vaccine, and cost. Most Cameroonians agree that even though there were benefits of a clinical trial, they will prefer it should be done out of the continent and involving African scientists for eventual acceptance and uptake. Several videos have however emerged on social media on the harmfulness of the vaccine and presuming China's ill intentions to dominate the world using the sales of the vaccines. Many people have argued that the vaccines have not gone through the complete testing process that makes them suitable to be administered to a large population. Some have specified that the vaccine has negative long-term health consequences. Another scientist, Sherita has however put on a strong fight defending the vaccines saying the side effects of the COVID-19 vaccine are temporary and do not mean you're sick. She insisted that, though the COVID-19 vaccine development was fast, it did not skip steps thus claiming its effectiveness and efficiency against COVID-19 [13]. Carl *et al* also claimed that as of January 2021, three vaccines had completed phase III trials and at least 20 other vaccine candidates were in phase III trials, with over 250 in earlier trials or preclinical studies [2]. Whatever the side effects of COVID-19 vaccines, there is no doubt that the rate of infection and death keeps rising fast with an urgent need to hold on to a permanent solution. The question now is, because the COVID-19 vaccine might present some side effect, does the cost of these vaccines in terms of side effects of death surpasses the benefits in terms of lives saved? It is thus in this light that this piece of paper set out to compare the death rate related to COVID-19 vaccination and that from COVID-19.

2. Literature

Several researchers have investigated the cost-benefit and cost-effectiveness of COVID-19 vaccination in different countries. Amongst them are Pfizer and BioNTech who announced the early results of their COVID-19 vaccine trial stating that more data need to be gathered about the efficacy and safety of the vaccines being trialed. Donald compared and

contrasted the expected duration and number of infections and deaths averted among several designs for clinical trials of COVID-19 vaccine candidates using an epidemiological model [6]. Their results showed that the trial provided maximal net benefits averting an additional 1.1M infections and 8,000 deaths in the U.S. Gollier found out that doubling the speed of COVID-19 vaccination in France could reduce deaths in 2021 by a third, while the presence of senior anti-vaxxers may imply around 5,000 additional deaths among the senior pro-vaccine population (based on 30% of the population refusing the vaccine) [7]. Kohli M, *et al.* investigated vaccination with a hypothetical COVID-19 vaccine in the USA [12]. Results showed that overall, in the U.S adult population, the estimated incremental cost-effectiveness ratio (ICER) for COVID-19 vaccination versus no vaccination was \$8200 per QALY gained. In subgroups at the highest risk of COVID-19-related complications, such as adults aged 65 years or over, vaccination was found to be cost-saving compared to no vaccination. However, in adults aged 49 years or below at low risk of COVID-19-related hospitalization and death, estimated ICERs were \$94 000 per QALY gained or greater. Kohli, *et al.* also estimated that the COVID-19 vaccine would prevent 31% of COVID-19-related deaths in an optimistic supply scenario but only 23% of deaths under supply constraints [12]. They thus concluded that the COVID-19 vaccine would be a cost-effective health care intervention compared to no vaccine.

Charles *et al.* projected the health and economic impact of different vaccination scenarios in Sindh province, Pakistan (population: 48 million) using a compartmental transmission model to COVID-19 cases and deaths in Sindh from 30 April to 15 September 2020 [4]. They found out that a one-year vaccination campaign using an infection-blocking vaccine at \$3/dose with 70% efficacy and 2.5-year duration of protection is projected to avert around 0.93 million cases, 7.3 thousand deaths, and 85.1 thousand DALYs.

Hagens also estimated the cost-effectiveness of strategies for COVID-19 vaccination for Turkey compared to a baseline in the absence of vaccination [9]. His results showed that vaccination is cost-effective from a health care perspective, with an incremental cost-effectiveness ratio (ICER) of 511 USD/QALY and 1045 USD/QALY if vaccine effectiveness on transmission is equal or reduced to only 50% of effectiveness on disease, respectively, at the 90% baseline effectiveness of the vaccine.

Several works have investigated the side effect of COVID-19 vaccination. According to WHO new, like any vaccine, COVID-19 vaccines can cause side effects, most of which are mild or moderate, and go away within a few days on their own. However, precisely, as shown in the results of clinical trials, more serious or long-lasting side effects are possible [16]. Typical side effects include pain at the injection site, fever, fatigue, headache, muscle pain, chills, and diarrhea. Less common side effects reported for some COVID-19 vaccines have included severe allergic reactions such as anaphylaxis; however, this reaction is extremely rare [16]. The MHRA is carrying out a detailed review of reports of an extremely rare blood clotting problem affecting a small

number of people who have had the Oxford/AstraZeneca vaccine. Shmerling on Harvard health block reported that rarely, a potentially life-threatening reaction called anaphylaxis may occur, most often in people known to have had severe vaccine reactions in the past. CDC estimates suggest anaphylaxis occurs in 11 cases per million doses among people receiving the Pfizer/BioNTech vaccine. The signs are trouble breathing, swelling of the face and throat, rash, and low blood pressure [14].

According to Gabrielle and Mackenzie, findings from the FDA Pfizer clinical vaccine trial, young people have more side effects from vaccines than older ones [8]. The most frequently reported symptoms were headache (22.4%), fatigue (16.5%), and dizziness (16.5%) [8].

Ke'ala [10] reviewed early data from CDC [3] and the Food and Drug Administration's (FDA) Vaccine Adverse Event Reporting System (VAERS) indicate that for every 1 million doses of vaccine administered, there were only 45 reports of serious adverse events (.0045%) and 372 reports of non-serious adverse events (.0375%) [11]. CDC showed that over 273 million doses of COVID-19 vaccines were administered in the United States from December 14, 2020, through May 17, 2021. During this time, VAERS received 4,647 reports of death (0.0017%) among people who received a COVID-19 vaccine. However, CDC and FDA physicians review each case report of death as soon as notified, and the CDC requests medical records to further assess reports. Thus, for this study, we will assume that all 0.0017% of death recorded were attributed to COVID-19 vaccination. The above sets of literature have elaborately investigated the cost-benefit of COVID-19 vaccination especially for countries where the vaccination is paid for. However, the case of Cameroon and other African countries are different as the vaccine is free and the main reason hindering them from receiving the vaccines is the fear of the long-term side effects. It is thus necessary to carry out a study of this nature which instead compares the cost of the vaccine in terms of side effects related to death.

3. Methodology

This work makes use of secondary data from the Centre for Disease Control and Prevention (CDC) to get the percentage of death attributed to COVID-19 vaccination in America used to approximate the risk of death in Cameroon. This data was used due to the lack of reliable sources on the risk of vaccination in Cameroon and the low rate of vaccination in Cameroon making it difficult to get primary data. The number of cases, recovery, and death of COVID-19 are gotten from the daily update of the world meter for the 24

of May 2021. Data on the current population (27,129,549) of Cameroon as of the 23 of May 2021 was gotten from world meter [17]. This work uses percentages, relative risk ratio, and odds ratios for the analysis.

Relative Risk of COVID-19 vaccination is calculated as

$$\frac{\text{Attack rate among exposed}}{\text{Attack rate among unexposed}} = \frac{\text{The death rate amongst vaccinated}}{\text{The death rate amongst not vaccinated}} = \frac{0.0017}{0.0046} = 0.38$$

The odd ratio is calculated as

$$\frac{\text{odd of dying from the vaccine (cases)}}{\text{odd of dying from COVID-19 (Control ie.no vaccine)}}$$

Total death was 0.0063 and out of this number, 0.0017 were vaccinated (cases) while 0.0046 were not vaccinated (control) giving an odd ratio of

$$\frac{0.0017}{0.0046} / \frac{0.0046}{0.0017} = \frac{0.37}{2.71} = 0.137$$

4. Results

The result of this work presented in Table 1 show that the percentage of death from COVID-19 vaccination was 0.0017 while that of dying from COVID-19 infection in Cameroon was 0.0046. Figures from CDC further show that 0.375% of vaccinated persons presented mild side effects while 0.0045% of people presented serious side effects [3]. As of 24 May 2021 0.27% of Cameroonians were infected with COVID-19 while 0.25% of them had recovered and 0.0046 died.

This gives an estimated 27% death from vaccination and 73% death from COVID-19 infection in Cameroon. Overall, results in Figure 1 show that Cameroonians are 3 times more likely to die from COVID-19 infections than from Vaccination.

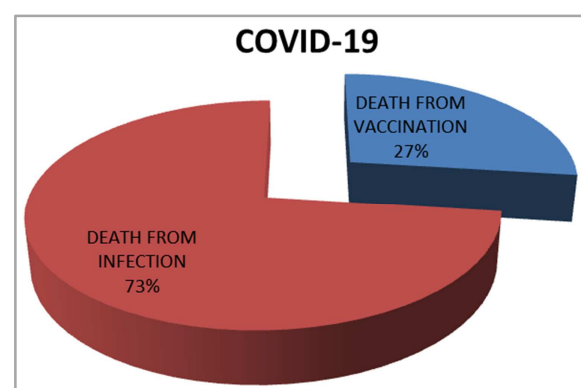


Figure 1. Death from COVID-19 Vaccination and Infection.

Table 1. Percentage risk of COVID-19 vaccination and COVID-19 infection.

COVID-19 Vaccination	Vaccination side effect (Source: CDC, 24 May 2021)	COVID-19 Infection	COVID-19 Cameroon cases (Source: world meter, 24 May 2021)	Percentage
Non serious side effect	.0375%	Corona virus Cases	77,733	0.27%
Serious adverse	.0045%	Recovered	72,226	0.25%
Death from vaccine	0.0017%	Deaths from COVID-19	1,239	0.0046%

The result for the relative risk (RR) which reflects the strength of association between vaccination and death is 0.38. Generally, when the RR results are close to 1, the risk of death is similar among vaccinated and non-vaccinated individuals. RR greater than 1 shows that the risk of dying from the vaccine is higher among people vaccinated (exposed to) than people not vaccinated (not exposed). Our result is however far less than 1 which means that the risk of dying is by far lower among vaccinated people than none vaccinated people. Similar to the RR, odds ratio results closer to 1 show that the odds of dying were similar for vaccinated and non-vaccinated cases. When the odd ratio is greater than 1, it means that the odds of dying from vaccination are greater than dying from not being vaccinated. Our results however give an odd ratio of 0.137 far less than 1 indicating that the odds of dying amongst vaccinated individuals (cases) is lower than among not vaccinated individuals (controls). This result is in line with literature from other findings especially those from CDC [3]. Their results further specified a decrease in the risk of dying from vaccination after 50 years and that females were more at risk of side effects. In Cameroon today, even the old are afraid to be vaccinated not knowing that they have more risk of dying from COVID-19 infection than the vaccines. Figures from the risk of dying from this COVID-19 vaccination could be lower as studies from CDC where data for the risk of dying from vaccination were gotten are yet to establish if all cases of death after vaccination were due to the vaccines or other underlining health condition.

5. Conclusion

This work compares the risk of dying from COVID-19 vaccination and COVID-19 infection. It makes use of secondary data from the CDC on the risk of death from the vaccine and the worldometer to get data on the population of Cameroon and the cases, recovery, and death from COVID-19 in Cameroon as of the 24 of May 2021. Percentages, relative risk, and odds ratios were used to analyze the results. The results show that 0.0017% death is attributed to COVID-19 vaccination and 0.0046% death is attributed to COVID-19 infection. The relative risk and odds ratio of dying from COVID-19 vaccination and dying from COVID-19 infection are 0.38 and 0.137 respectively. Both figures are far less than 1 which means that the risk and odd of dying are by far lower among people vaccinated (cases) than not vaccinated people (control). This study, therefore, concludes that though the COVID-19 vaccine like any other vaccine in the world leaves some recipients with side effects, the risk of dying from the vaccine is about 3 times lower than dying from the infection especially amongst elderly people. COVID-19 infections also lead to large treatment costs for the country and the individual. It also leads to economic depression and enormous consequences in the country and the world at large. This work thus recommends massive vaccination especially for the elderly who are most likely to die from COVID-19 infection and less likely to die from the side effect of the

COVID-19 vaccines.

6. Recommendation for Future Work

This work extrapolated data reported for the side effect for COVID-19 vaccines in the US to estimate possible impact on Cameroon. This was done due to the lack of availability of data as the Vaccination had just started in Cameroon. We thus recommend a follow-up study using data on the current side effect of the COVID-19 vaccine for Cameroon to compare findings with that of this study.

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