**Case-fatality rate of Covid-19: a comparison between pre-vaccination and post-vaccination period**

**Word limit: 300 words**

**Background:** Studies with real world data in the United Kingdom, Israel and Canada had shown that vaccination had helped in limiting transmission and mortality rate.The objective of this study was to compare the global reported cumulative case-fatality rate (CFR) before and after start of vaccination.

**Methods:** The first person in the world receive Covid-19 vaccine was on 8th December 2020, in the UK. We considered 28th day of receiving first vaccine as a cut off to compare the pre-vaccine period (1st Jan 2020- 5th Jan 2021) and post-vaccine period (6th Jan/2021- May 31, 2021). We collected global reported Covid-19 cases, deaths, vaccination, and other relevant data to compare the impact of vaccination on Covid-19 CFR. We performed three time series model to identify trend of global daily reported CFR of Covid-19.

**Results:** The global cumulative CFR of Covid-19 was 2.2 before vaccination and 2.08 after vaccination. The cumulative CFR of Covid-19 in top-20 vaccinated country was **1.68** before vaccination and **1.66** after vaccination period. In beta regression model, vaccination (/100 population) was strong protective factor [IRR: 0.99, 95% CI: 0.98-0.99] for country’s reported CFR of Covid-19 indicating that an increase of 1% vaccination reduce CFR by 1%. In time series model, we detect a strong declining trend after initial peak of CFR at the end of April/2020 and then a rise during January/2021 which started to decline from Feb/2021.

**Conclusion:** Covid-19 vaccine is contributing in reducing the CFR of Covd-19 at global scale despite only **10.83%** of global population is vaccinated and despite arising of different variants of concern of SARS-CoV-2. To achieve reduce Covid-19 deaths at a global scale, vaccine equity and faster roll out especially in Sub-Saharan Africa, Asia and South America is vitally important.

Objective:

1. To compare the global reported cumulative case-fatality rate (CFR) pre-and-post vaccination period
2. To compare the CFR of COVID-19 in top-20 countries of Covid-19 vaccination rate to the rest of the world
3. To predict the number of deaths has been averted globally due to Covid-19 vaccination

Method:

**For objective 1:** The first person in the world receive Covid-19 on 8th December in the UK. We will consider 28th day of receiving first vaccine as a cut off to compare the pre-vaccine period (1st Jan 2020- 5th Jan 2021) and post-vaccine period (6th Jan/2021- May 31 2021),

1. Global cumulative CFR for both period

Dataset: Global dataset with date, total daily reported cases, total daily reported deaths, Cumulative cases and cumulative deaths. And then estimate cumulative global reported CFR for each day (6 variables). No vaccination data is needed.

**For objective 2:** We will compare country specific CFR of top-20 country with Covid-19 vaccine and rest of the world

1. Until 5th Jan/2021
2. Post vaccination period (6th Jan/2021-May 31st, 2021)

Dataset: Country specific dataset (Date, daily reported total cases, daily reported total deaths, vaccination coverage (%)). Please create a variable for to indicate top-20 countries with vaccination rate and rest of the world

**For objective 3:** We will develop a statistical model to predict how many deaths were expected if vaccinations were not in place (6th Jan/2021-31 May/2021) and deduct the reported deaths during the period to calculate number of averted deaths due to Covid-19 vaccination