# Pre-pandemic Alcohol consumption highly predicts Covid-19 mortality

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**Abstract:** Pre-pandemic (data of 2019) epidemiologic and demographic data have shown that some parameters such as cancer, Alzheimer disease, advanced age and alcohol intake levels are positively correlated to Covid-19 mortality, instead, birth and fertility rates are negatively correlated to Covid-19 mortality. A stepwise multiple regression analysis of the above parameters against Covid-19 mortality in 32 countries from Asia, America, Africa and Europe have generated two main predictors of Covid-19 mortality, namely, alcohol consumption and birth/mortality ratio. A first order equation correlated alcohol intake to Covid-19 mortality as follows; Covid-19 mortality= 0.1057 x (liters of alcohol intake) + 0.2214 (Coefficient of determination = 0.750, F value = 38.63 , P value = $7.64x10^{-7}$). A second equation correlated (birth rate/mortality rate) to Covid-19 mortality as follows; Covid-19 mortality= - 0.3129 x (birth rate/mortality) ratio +1.638 (coefficient of determination = 0.799, F value = 51.2, P value = $7.09x10^{-8)}$. Thus, pre-pandemic alcohol consumption is a high predictor of Covid-19 mortality that should be taken into account as a serious risk factor for future safety measures against SARS-CoV-2 infection.

**Keywords:** Covid-19, SARS-CoV-2, epidemiology, demography, alcohol intake, birth rate, mortality rate.

## Introduction:

On the first anniversary of the Covid-19 pandemic, thousands of deaths were registered around the world, nevertheless, the mortality caused by SARS-CoV-2 was very different from a country to another. The Covid-19 mortality was described to be higher in some risk factor cases, such as advanced age, overweight, high blood pressure, cardiovascular and respiratory events, cancer and Alzheimer's disease and chronic renal failure (1). The pathophysiology and

prophylactic treatments of Covid-19 were described in many clinical reports and reviews (2). After one year of pandemic, Covid-19 mortality was found to be much higher in some countries like the United Kingdom, France, Italy and Spain. Instead, other countries like those of neighboring North African countries (Morocco, Algeria, Tunisia) have had lower Covid-19 mortality scores. Our research work has focused on the above differences of Covid-19 mortality between countries. For thus, In the present work we have sought data of the pre-pandemic epidemiologic and demographic parameters (data of 2019) of 32 countries (3,4) from Europe (United Kingdom, Italy, France, Germany, Spain and Portugal), Africa (Morocco, Algeria, Tunisia, Libya, Mauritania, Senegal, Egypt, Mali, Sudan and Congo), Asia (Israel, Saudi Arabia, Jordan, Indonesia, Philippine, India and Iran) and America (USA, Canada, Mexico, Brazil, Colombia, Peru, Chile and Argentina). We considered the period starting from March 1st 2020 until March 22nd 2021 (5). WHO and other agencies have listed the annual most causes of death like non-communicable, communicable diseases and other causes of mortality such as accident injuries (2,3). In the present study, we have obtained data on the 10 most causes of deaths of 32 countries from IHME (2). We have searched for Covid-19 number of deaths in each country and retrieved other epidemiologic and demographic data from specialized and official web pages (2,3). Alcohol consumption data were obtained from a 2016 survey (6). Our study aimed to analyze possible correlations between Covid-19 cumulative deaths and pre-pandemic epidemiologic and demographic data as well as alcohol consumption. The latter parameter is known to be linked to disease incidence of several pathologies.

Our preliminary findings on six European and five North African countries (7) have shown a positive correlation between Covid-19 death and several parameters such as cancer, Alzheimer's disease, advanced age and alcohol consumption. Instead, there was a negative correlation between Covid-19 mortality and both birth rate and fertility rate.

**Material and Methods:**

In the present study, a stepwise multiple linear regression (Microsoft's Excel 2007) was carried out on Covid-19 mortality in 32 countries, to check its possible prediction by the above demographic, epidemiologic and alcohol intake data. Coefficient of determination, F and P values are reported in the outcome result of each analysis, with 95% as a confidence value. Two main equations were developed that express Covid-19 mortality, either through

alcohol intake values and (birth rate/mortality rate) values of each country. Both equations were expressed as "y=ax+b".

**Results and discussion:**

The main result of the present study is the high correlation of alcohol consumption rate with Covid-19 mortality. Significant statistical values were obtained (Figure 1A), as a first order linear equation obtained was as follows: Covid-19 mortality= 0.1057x (liters of alcohol intake) + 0.2214 (Multiple R = 0.750, R square = **0.562,** F value = 38.63, P value = $7.64 \times 10^{-7}$). On the other hand, the ratio (birth rate/mortality rate) was also a good predictor of Covid-19 mortality (Figure 1B) in the 32 countries of our study, and its equation was as follows; Covid-19 mortality= - 0.3129 x (birth rate/mortality rate) + 1.638 (Multiple R = 0.799, R square = **0.638** , F value = 51.2, P value = $7.09 \times 10^{-8)}$. Table 1 shows registered and predicted Covid-19 mortality with both equation 1 and equation 2. Both equation gave predicted Covid-19 mortality means very close to the registered Covid-19 mortality in the 32 countries, and the average difference between predicted and registered values were less than the standard errors in both prediction calculations (Table 1).

We conclude that this study clearly demonstrates that pre-pandemic alcohol intake levels are good predictors of Covid-19 mortality, as well as the (birth rate/mortality rate) ratio. However, in terms of safety measures against Covid-19 mortality and SARS-CoV-2 infection, the study suggests that alcohol consumption should be studied in prospective studies and in laboratory experiments in order to investigate the effects of alcohol as a possible "synergistic" agent in both Covid-19 outcome and cell infection with SARS-CoV-2. We suggest that alcohol consumption could be a risk factor for Covid-19 mortality.

Data Availability Statement:

Replication data of the present work is available at the following link:

https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/W1Q9OL&version=DRAFT

**Conflicts of interest**: None

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