

# COVID-19 transmission risk factors

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## Abstract

We analyze risk factors correlated with the initial transmission growth rate of the recent COVID-19 pandemic in different countries. The number of cases follows in its early stages an almost exponential expansion; we chose as a starting point in each country the first day  $d_i$  with 30 cases and we fitted for 12 days, capturing thus the early exponential growth. We looked then for linear correlations of the exponents  $\alpha$  with other variables, for a sample of 126 countries. We find a positive correlation,  $\alpha$  i.e. faster spread of COVID-19, with high confidence level with the following variables, with respective  $p$ -value: low Temperature ( $4 \cdot 10^{-7}$ ), high ratio of old vs. working-age people ( $3 \cdot 10^{-6}$ ), life expectancy ( $8 \cdot 10^{-6}$ ), number of international tourists ( $1 \cdot 10^{-5}$ ), earlier epidemic starting date  $d_i$  ( $2 \cdot 10^{-5}$ ), high level of physical contact in greeting habits ( $6 \cdot 10^{-5}$ ), lung cancer prevalence ( $6 \cdot 10^{-5}$ ), obesity in males ( $1 \cdot 10^{-4}$ ), share of population in urban areas ( $2 \cdot 10^{-4}$ ), cancer prevalence ( $3 \cdot 10^{-4}$ ), alcohol consumption ( $0.0019$ ), daily smoking prevalence ( $0.0036$ ), UV index ( $0.004$ , smaller sample, 73 countries), low Vitamin D serum levels ( $0.002-0.006$ , smaller sample,  $\sim 50$  countries). There is highly significant correlation also with blood type: positive correlation with types RH- ( $3 \cdot 10^{-5}$ ) and A+ ( $3 \cdot 10^{-3}$ ), negative correlation with B+ ( $2 \cdot 10^{-4}$ ). We also find positive correlation with moderate confidence level ( $p$ -value of  $0.02 \sim 0.03$ ) with: CO<sub>2</sub>/SO emissions, type-1 diabetes in children, low vaccination coverage for Tuberculosis (BCG). Several of the above variables are correlated with each other and likely to have common interpretations. We thus performed a Principal Component Analysis, in order to find the significant independent linear combinations of such variables. We also analyzed the possible existence of a bias: countries with low GDP-per capita, typically located in warm regions, might have less intense testing and we discuss correlation with the above variables

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