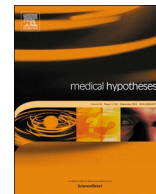Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Relation between BCG coverage rate and COVID-19 infection worldwide

To The Editor:

The available numbers on COVID-19 have shown a huge difference in incidence rates worldwide [1]. The explanation for these differences is certainly multifactorial and more time is needed for accurate data analysis and to a complete understanding. However, we can assume that there are factors directly influencing COVID-19 incidences, such as population age or mitigation measures. In this new disease, the initial immunization rate is 0. Still, can we hypothesize that vaccination coverage, resulting from each country vaccination program, can influence immunological status in such a way that it modifies COVID-19 spread? We analyzed data on vaccination coverage rates, per vaccine, in countries all over the World. The data included BCG, DTP, HEPB, HIB, MCV, PCV, ROTA, RCV and Polio coverage in the years of 2018, 2008, 1998 and 1988 [2]. A significant moderate negative correlation between BCG coverage and the number of COVID-19 cases per million inhabitants was found, using a partial correlation analysis, adjusted for population age and including data of 125 countries (Table 1). The analysis per world regions showed a significant negative correlation in the Western Europe countries. The remaining vaccines coverage showed no significant correlation with COVID-19 infection rates. United States (US) data, per state, showed no correlation between vaccination coverage rates and COVID-19 cases [3].

We also found an association between national BGC immunization programs and a lower rate of COVID-19 infection. BCG is not covered by national vaccination programs in several countries. BCG is not recommended for generalized use in the US. Similarly, in Italy BCG was never part of the national vaccination plan, and Spain stopped BCG systematic immunization in 1981, Germany in 1998 and United Kingdom in 2005–7[4]. We leave the explanation for these findings open and underline that they do not seem to be random at all. Our results could open doors for future research both in the field of the development of a new vaccine for COVID-19 and in a more complex analysis on the effect of vaccination coverage on emerging viral diseases.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Table 1
BCG immunization coverage per country versus CODIV-19 cases and deaths per per million inhabitants worldwide.

Immunization coverage	Cases/1 M population	Deaths/1 M population
BCG2018	−0.396 (0.000)	−0.252 (0.004)
BCG2008	−0.423 (0.000)	−0.282 (0.001)
BCG1998	−0.380 (0.000)	−0.260 (0.003)
BCG1988	−0.183 (0.040)	−0.129 (0.149)

Pearson Correlation (sig. 2-tailed).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.mehy.2020.109816.

References

[1] https://www.worldometers.info/coronavirus/#countries (accessed in 4/4/2020 at 13.00 pm GMT).
[2] WHO/UNICEF national immunization coverage estimates, 2018 revision; United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Prospects 2019.
[3] https://www.cdc.gov/vaccines/imz-managers/coverage/childvaxview/datareports/dtap/dashboard/2017.html (accessed 4/4/2020).
[4] Zwerling A, Behr MA, Verma A, Brewer TF, Menzies D, Pai M. The BCG World Atlas: a database of global BCG vaccination policies and practices. PLoS Med 2011;8(3):e1001012.

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