Testing the socioeconomic determinants of COVID-19 pandemic hypothesis with aggregated Human Development Index

Khalatbari-Soltani *et al*[1] emphasised the need to complement WHO standard COVID-19 case reports with measures of socioeconomic position (SEP) factors of infected individuals. Their argument develops the idea that WHO's clinical report is concentrated on age, gender, locations of diagnosis and residency, whereas additional factors of the social environment such as occupation, income or education might preventively uncover high-risk SEP disadvantaged individuals and populations. The importance of 'non-medical' data becoming 'clinical' predictors is extensively reviewed in the literature.[2]

Although currently infeasible to palliate backwards such data deficiencies at an individual level, this critical information gap might be indirectly approached through country-sensitive aggregated socioeconomic indexes as independent variables predicting cumulative COVID-19 official statistics (eg, total cases or total deaths per million). The yearly published aggregated Human Development Index (HDI) fits the needs of this exercise. Although criticised for construction weaknesses in its early phase (1990),[3] HDI decreasingly ranks 189 UN member states on a scale of 0 to 1, aggregating >12 indicators, 9 of which are directly linked to SEP conditions/country.[4]

Linear regression results of the ratio of cumulated (European Centre for Disease Control (ECDC): 31 December 2019 to 31 October 2020) observed/expected total deaths per million for 162 countries—included in the HDI list with no missing ECDC data—as dependent variable and HDI values and total cases/country as independent predictors are presented in figure 1, along HDI ranks and values. The regression is strong since Durbin-Watson test ≈2.04 and analysis of variance is significant at 0.000. Expected total deaths per million/country are calculated after this model. For better visualisation of information, countries' ratios are grouped per continent after ECDC geographical classification and contrasted to their HDI value and rank. Value of the ratio=1 indicates that observed and expected total deaths are equal; corresponding logical conclusions arise when ratios' values are >1 or <1.

The most intriguing result is that many countries of the high HDI group (ie, values 0.800–0.955), especially in Europe and North America, are those with the worst performance in dealing with COVID-19. The null hypothesis could be that SEP factors per se are not 'so' determinant as thought. Several alternative hypotheses might be announced, for example, that the biological traits of SARS-CoV-2 virus confer particular infectiousness and transmissivity overcoming intracountry SEP inequalities, or public health policies engaging social restrictions in liberal states and economies were treated with suspicion and delays by both decision-makers and citizens.

In any case, Khalatbari-Soltani *et al*[1] SEP hypothesis is a strong signal for the future.

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Contributors This letter is an attempt to indirectly test predictions of a paper to this journal, by Khalatbari-Soltani *et al* (2020), emphasising the need for SEP factors inclusion in standard WHO's COVID-19 case reports. We introduce the idea of using UNDP/HDI as predictor of intercountry comparisons of public health performance. Results as is do not confirm the original hypothesis, alternative explanations are proposed. The final conclusion is however that the initial SEP hypothesis should be taken into consideration in the future.

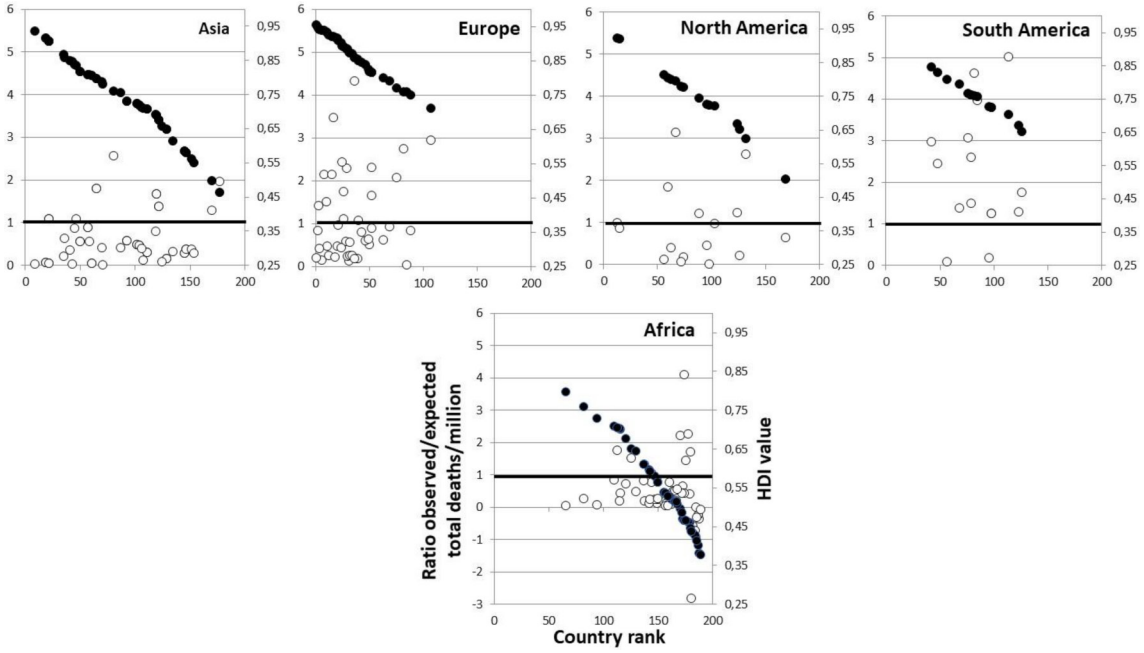

Figure 1 Scatterpots of the ratio between COVID-19 observed/predicted total deaths per million in 162 countries, along their HDI rank poisition -and value. Deaths numbers are cumulative (31 December 2019 – 31 October 2020), retrieved from ECDC data base. Countries are grouped per continent according ECDC classification; 3 Oceania countries (Australia, New Zealand and Fiji) are not presented in a separate panel; they were included however in the overall regression analysis. Bold black line highlighting the ratio value = 1 separates underperforming countries from the general pool/continent.Black dots represent HDI value/country.

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REFERENCES

1 Khalatbari-Soltani S, Cumming RC, Delpierre C, *et al*. Importance of collecting data on socioeconomic determinants from the early stage of the COVID-19 outbreak onwards. *J Epidemiol Community Health* 2020;74:620–3.
2 Singu S, Acharya A, Challagundla K, *et al*. Impact of social determinants of health on the emerging COVID-19 pandemic in the United States. *Front Pub Health* 2020;8:406.
3 Høyland B, Moene K, Willumsen F. The tyranny of international index rankings. *J Dev Econ* 2012;97:1–14.
4 Human Development Report 2019. Beyond Income, Beyond Averages, Beyond Today - Inequalities in Human Development in the 21st Century; 2019.