

Relationship between the Country's Safety and Health Rating and the Morbidity Indicators of COVID-19

Olesia V. Bubnovskaia^{1*}, Vitalina V. Leonidova¹, and Denis V. Leonidov²

¹Laboratory for interdisciplinary research of safety and risk, School of Economics and Management, Far Eastern Federal University (FEFU), FEFU Campus, 10 Ajax Bay, Russky Island, Vladivostok, 690922, Russia

²Department of Philosophy and Religious Studies, School of Arts and Humanities, Far Eastern Federal University (FEFU), FEFU Campus, 10 Ajax Bay, Russky Island, Vladivostok, 690922, Russia

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Abstract

Background: The article analyzes the safety and health indicators in comparison with COVID-19 morbidity data in the population of 167 countries based on the Legatum Prosperity Index (2019), considering the results of the study of safety perception.

To identify the correlation between the achieved level of safety and health of countries and the morbidity indicators of COVID-19.

Methods: The research includes an analysis of COVID-19 data and safety and health indicators in the sample of 167 countries presented in the Legatum Prosperity Index. The methods of statistical data processing include the methods of descriptive statistics, correlation and comparative analyses.

Results: The health rating is more related to the morbidity of coronavirus than the safety rating; the groups of countries with a higher safety and health index have a higher mortality rate than the countries with a lower health index.

Conclusion: The countries with a good safety rating show both a higher number of infections and a significant mortality rate, both in comparison with each other and with the poor countries. This may be due to the confidence of the population of well-off countries in the provision of safety and health with external tools and a lower personal responsibility for their protection. In this regard, new epidemiological conditions have to be considered in the context of ensuring public health with the need to balance safety and security.

Keywords: safety; security; health; covid-19; well-being; comparative analysis.

Introduction

The impact of the situation with COVID-19 in various population groups is intensively researched: individual characteristics of attitudes to the pandemic [1] and perceptions of the population [2], health workers and politicians [3–5] are analyzed. The problems of safety and well-being are also examined: stress [6–8]; physical [9,10] and mental [11, 12] health risks. Increased uncertainty causes people's stress and fear for their lives, leads to restrictions that disrupt the usual ways of social

functioning. Therefore, the perception of security and the approaches to ensuring it are changing.

The governments of several countries have taken quite strict measures against the spread of coronavirus by prohibiting free movement of people and requiring social distancing and isolation. In fact, the restrictions lead to securitization of health protection, that is, to the strengthening of external security tools aimed at preventing threats.

In order to confirm the assumption about the relationship between the concerns about the safety

and health of the population and the development of pandemic, we have analyzed the reflection of the rating of countries according to the Prosperity Index (The Legatum Prosperity Index, 2019, <https://www.prosperity.com/rankings>) on the indicators of morbidity.

We have assumed that the morbidity statistics of COVID-19 in different countries are related to their safety and health indicators. To confirm the hypothesis, we have analyzed the safety and health data indicators of countries, as well as the indicators of morbidity of coronavirus infection based on the information from Johns Hopkins University and official statistics of the surveyed states. In addition to the number of infections and COVID-19-related deaths which depend on the population in the country, the research includes a mortality indicator (the number of deaths per 100,000 population), which allows to group the countries for comparative analysis.

Materials and Methods

The relationship between the COVID-19 morbidity indicators in various countries and the indexes of safety and health was studied with the method of statistical analysis of COVID-19 data and safety and health indicators in the sample of 167 countries presented in the Legatum Prosperity Index. The methods of statistical data processing include the methods of descriptive statistics and correlation coefficient and comparative analyses including the nonparametric statistical criteria (Spearman's rank correlation coefficient, Mann–Whitney U test); the calculations were performed in the Python software.

Procedure

The research design includes a correlation and comparative analysis of COVID-19 data morbidity (mortality, number of infected and deceased people) and safety and health indicators of 167 countries covered by the rating in the Prosperity Index for 2019.

Analysis of secondary samples of countries was also carried out: 26 countries with a death rate of 10 and higher, 141 countries with a death rate of less than 10; a group of countries occupying the top 50 places of the rating and its last 50 positions (from 118 to 167 places) by the level of safety in 2019.

The sample of countries with a mortality rate higher than 10 was divided into two groups for a more detailed comparative analysis: with mortality values from 10 inclusive to 20 and from 20 inclusive and higher; the countries with mortality values <10 were divided into groups: with zero mortality; with mortality values above 0 to 1, from 1 and above to 5, from 5 and above to 10.

Results

Safety (Safety and Security) and health (Health) data indicators for countries according to the Prosperity Index, including the state's position in the ranking points, considering the morbidity of COVID-19 in these same countries, are presented in Table 1. The information is provided for the first and last 5 countries according to the safety index in descending order of values for ease of perception.

According to the data, even in the countries with high indicators of life safety and population health, the situation with the incidence of COVID-19 can be alarming. For example, Switzerland, which ranks first in terms of safety and third in terms of health in the Prosperity Index for 2019, has a high number of COVID-19 cases and a high rate of death from the virus compared to Hong Kong or Denmark, which have lower safety and health indicators in the index for a comparable population. While in Hong Kong the number of deaths was 7, in Switzerland it was 10 966.

Significant results of correlation analysis of safety and health level indicators with coronavirus morbidity are presented in Table 2, which includes the correlation coefficient values for the entire sample (all countries), as well as for groups of countries: states with a mortality rate of up to 10 and above 10; countries with high and low safety positions.

In the sample for all countries, a significant positive relationship is observed for the safety indicator with the death rate and health rating (0.342 and 0.672, respectively, $p < 0.001$). The health indicator in the same sample shows, in addition to safety, significant positive correlations with the number of infected and dead (0.352 and 0.307 at $p < 0.001$), as well as with the death rate (0.454, $p < 0.001$).

Table 1: Safety and health indicators by the Legatum Prosperity Index-2019 considering the morbidity of COVID-19

Country	SS	H	infected	dead	mortality
Switzerland	93.967	84.165	32 448	10 966	23.1
Norway	93.840	83.374	8 950	251	4.7
Luxembourg	93.245	81.442	4 650	110	18.2
Hong Kong	92.964	83.097	1366	7	0.51
Denmark	92.934	82.760	12 900	609	10.6
Syria	25.477	65.941	358	13	0.1
Yemen	25.231	51.545	1 265	338	1.2
Iraq	22.615	61.237	60 479	2 473	6.4
Afghanistan	20.858	49.853	898	2.4	
South Sudan	19.197	34.042	38	0.3	

Abbreviations: SS = Safety and Security. H = Health

Table 2: Correlations of safety and health indicators according to the Legatum Prosperity Index-2019 and morbidity of COVID-19

	dead	mortality	infected	SS/H	variables
Entire sample	0.026	0.342***	0.038	0.672***	SS
	0.307***	0.454***	0.352***	0.672***	H
Groups:					
M	-0.124	0.208	-0.324	0.826***	SS
M	0.145	0.264	-0.134	0.826***	H
M ⁻	-0.192*	0.187*	-0,125	0.595***	SS
M ⁻	0.128	0.301***	0.226**	0.595***	H
Top-50	0.167	0.193	0.202	0.736***	SS
Top-50	0.326*	0.178	0.377**	0.736***	H
Top-50 ⁻	-0.145	-0.005	-0.012	0.436**	SS
Top-50 ⁻	0.164	0.314*	0.245	0.436**	H

* $p < 0.05$, ** $p < 0.01$ *** $p < 0.001$.

Abbreviations: SS = Safety and Security. H = Health. M – countries with a mortality rate > 10 , M – < 10 . Safety rating: Top-50 – countries with the top 50 positions. Top-50 – last 50 places.

In the secondary samples, safety and health indicators also have a positive correlation with a high level of significance ($p < 0.001$). The health indicator is positively associated with mortality in group C↓ (0.301, $p < 0.001$), as well as with the number of people infected in the countries of group C↓ (0.226) and Top-50↑ (0.377), $p < 0.01$.

In the remaining groups of the secondary sample, no significant relationship between the safety and health indicators and the incidence of coronavirus was found.

In the field of uncertainty ($p < 0.05$), there was a negative correlation of safety with the number of deaths (-0.192) and a positive correlation with mortality from COVID-19 (0.187) in a group of countries with a death rate from the virus below 10; a positive relationship between the health indicator and mortality in the Top-50↓ group (0.314); also in one case, the health indicator positively correlates with the number of deaths – in the Top-50↑ group (0.326). Considering all the presented significance levels, including $p < 0.05$, the health indicator has no correlations only in one of the secondary samples of countries, namely in the group of states with a high rate of death from COVID-19.

In general, the correlation analysis allows us to conclude that the health rating is more related to the morbidity of coronavirus than the safety rating.

A comparative analysis between the groups was performed with secondary samples data on safety and health indicators using the Mann-Whitney U-test. Significant differences in mortality rates and health index between the Top-50↑ and Top-50↓ groups of countries were found ($U = 637$ and $U = 226$, respectively, $p < 0.01$).

Significant differences in the safety index were found between groups with mortality values from 10 to 20 and from 0 to 1 ($U = 154$, $p < 0.01$); groups with values over 20 and the following groups: the zero group ($U = 57$, $p < 0.01$), the group with values from 1 to 5 ($U = 217.5$, $p < 0.01$), from 5 to 10 ($U = 87$, $p < 0.01$).

Groups with high mortality have a higher safety index than groups with low mortality.

In terms of health, differences were found between groups with values from 10 to 20 with the following groups: zero ($U = 32$, $p < 0.01$), a group with a value from 0 to 1 ($U = 162.5$, $p < 0.01$); groups with mortality values

over 20 and the following groups: zero ($U = 26$, $p < 0.01$), with values from 0 to 1 ($U = 156.5$, $p < 0.01$), from 1 to 5 ($U = 120$, $p < 0.01$), from 5 to 10 ($U = 61$, $p < 0.01$); zero group with a group with values from 5 to 10 ($U = 92$, $p < 0.01$); groups with values from 0 to 1 and from 1 to 5 ($U = 1067.5$, $p < 0.05$).

A comparative analysis of selected groups with different levels of mortality from COVID-19 on the health indicator shows that in groups of countries with a higher health index, the mortality rate is higher than in countries with a lower health index.

Conclusion

The comparison of the Legatum Prosperity Index and COVID-19 morbidity data showed significant correlations of health and safety indicators with the statistics of infected persons, deaths, and mortality. At the same time, the health rating shows a greater connection with the COVID-19 data than the safety rating. The comparative analysis revealed differences in the level of health and safety in the countries with high and low mortality from COVID-19. The countries that demonstrated high levels of safety and health before the new infection occurred in the world have worse mortality rates than the countries that are less well-off in the corresponding indices.

The situation with the morbidity of the virus does not reflect the data of Prosperity Index for safety and health in different states. The countries with good safety ratings show both a higher number of infections and a significant mortality rate, both in comparison with each other and with the poor countries of the Prosperity Index. This may be due to the confidence of the population of well-off countries in the provision of safety and health with external tools and a lower personal responsibility for their protection. In this regard, new epidemiological conditions have to be considered in the context of ensuring public health with the need to balance safety and security.

The limitations of the study caused by the factors of coronavirus spread, such as the area of the country, the population, or the effectiveness of epidemiological measures have not yet been studied in a complex. It should be noted that the common principles for counting COVID-19 victims and the death rate from the virus do not work so far.

Strict statistical processing tools that allow us to identify the conditionality of variables and conduct their factor and regression analysis require an array of comparable data that allows us to comprehensively assess the relationship of safety and health indicators with the COVID-19 incidence pattern. In the analysis of the safety and health rating, it would be useful to examine the dynamics of changes of Index. Therefore, the study needs to be refined considering the emerging circumstances, the appearance and explanation of new data about the coronavirus.

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*Corresponding author: Olesia V. Bubnovskaia, PhD, Laboratory for interdisciplinary research of safety and risk, School of Economics and Management, Far Eastern Federal University (FEFU), FEFU Campus, 10 Ajax Bay, Russky, Island, Vladivostok, 690922, Russia;

Phone: +7(4232) 652424 (ext. 2467);

E-mail: bubnovskaia.ov@dvfu.ru