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Inter-Country Variations in COVID-19 Incidence from a Social Science Perspective

Uzi Rebhun[1]

Abstract

COVID-19 has spread unevenly among countries. Beyond its pathogenicity and its contagious nature, it is of the utmost importance to explore the epidemiological determinants of its health outcomes. I focus on the thirty-six OECD member states and examine country-level characteristics of the timing of the coronavirus outbreak and its morbidity and case-fatality rates. I harvested data on dependent variables from daily WHO reports and information on the independent variables from official publications of major world organizations. I clustered the latter information under three rubrics—socio-demographic, risk behaviours, and economic and public health—and subjected the totality of the data to OLS regressions. Independent variables successfully explain much of the overall variance among OECD countries in the timing of the outbreak (R 2 =63.0%), in morbidity (R^2=50.0%) and mortality (R^2=41.5%). Immigration stock enhanced the outbreak of the pandemic in host countries; it did not, however, had a significant effect neither on morbidity nor on mortality rates. Country economic status and healthcare services are significant in moderating the health outcomes of coronavirus infection. Nevertheless, the paramount determinants for restraining contagion and mortality are governmental measures. I speculate that this may reshape the equilibrium between push and pull factors hence, the international migration system in near future.

Keywords: *COVID-19; OECD; outbreak; morbidity; mortality*

Introduction

On 31 December 2019, the authorities in Wuhan, capital of China's Hubei province, reported to the local office of the World Health Organization (WHO) on several patients who presented with viral pneumonia, later becoming the first confirmed cases of the SARS-CoV-2 virus, aka COVID-19 disease. In subsequent weeks, the novel coronavirus spread throughout dozens of countries and was declared a global pandemic—one that, however, caused levels of morbidity and death that varied from one country to another. Given the rapid contagion of the virus, it is of the utmost importance to explore not only its pathology but also the epidemiological determinants of its health outcomes.

Hence, the present study focuses on the thirty-six OECD member states and examines the effect of country-level socio-demographic characteristics, risk behaviours, and environmental, economic and public-health factors on three dependent variables of coronavirus susceptibility and severity: the timing of its outbreak, the extent of its morbidity, and its case-fatality rate (CFR). Special attention is called to the effect of immigration on the manifestations of the lethal virus. Immigrants are at several kinds of disadvantage that may amplify their

[1] Uzi Rebhun, Professor and Head, Division of Jewish Demography and Statistics, The A. Harman Institute of Contemporary Jewry, The Hebrew University of Jerusalem, Israel. E-mail: uzi.rebhun@mail.huji.ac.il.

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vulnerability to contagion. Some are typified by unstable legal status—illegal, undocumented, refugees, migrant workers, or noncitizens (Blinder and Allen, 2016; Massey and Bartley, 2005). Such people strive to remain undocumented in all contexts (Degenova, 2002) and, accordingly, lack health insurance and avoid any test of being carriers of the virus. Typically, immigrants, especially those with short veterancy, have deficient or paltry command of the local language (Alba and Nee, 2003; Chiswick and Miller, 2001) and may not always understand instructions from the government about safety measures that they must take or, when contagion occurs, may communicate with medical staff in disrupted and incomplete ways that obviate or impair quick and appropriate treatment. Immigrants on arrival tend to settle in ethnic enclaves and the least affluent may stay apart for much time, creating places that exhibit a 'sticky' spatial configuration (Portes and Rumbaut, 2014) that makes it difficult to maintain physical and social distance and uphold rigid principles of hygiene.

We further explore the effect of measures taken by local government to cope with the coronavirus. Significant inter-country variations may alter the way immigrants/future immigrants appreciate their origin and destination countries. This, in turn, is likely to change the extent and the directions of international migration. Insofar as immigrants tend to be infected more than locals, their origin country may not allow them to return home. No less important is the potential for fear, stigmatization, and discrimination against immigrants under conditions of catastrophe. It is imperative to provide empirical evidence that will refute prejudices against immigrants for ostensibly exacerbating the spread of the pandemic or, if such views are confirmed, will help to develop means of reducing morbidity among the newcomers and planning action to ease tensions between locals and foreigners. Notably, we also look at a complementary component of international border-crossing—tourism—and how it determines local patterns of the pandemic.

My aim is to augment the literature that evolved in the first months of the coronavirus havoc and assessed health aspects of the crisis among different types of immigrants (Devillanova et al., 2020; Greenaway et al., 2020; Page and Flores-Miller, 2021), immigrants' rights and entrance policy (Amir, 2020; Gareth, 2020), the effectiveness of response strategies for preventing large gatherings and, hence, transmission of the virus (Andersen 2020; Karako et al., 2020; Chang et al., 2020) and, more generally, preparations to stanch the importation of the coronavirus to Europe (Goniewitz et al., 2020), Latin America (Rodrigues-Morales et al., 2020), and Africa (Gilbert et al., 2020). Here, I tackle the immigration–Covid-19 nexus more directly, focusing on the main destination countries of contemporary international migration. On the basis of the empirical findings of this study, the Discussion raises several policy implications that may be helpful in attenuating the pandemic and its significance for international migration.

Empirical Basis

This study examines the relations between country-level factors and major health outcomes of the novel coronavirus. It distinguishes among three groups of independent variables: socio-demographic; risk behaviour; and environmental, economic, and public health. The socio-demographic variables are life expectancy,[2] proportion of people with college degrees, level of religiosity (weekly attendance in religious services), immigration stock (number of foreign-

[2] I ran a couple of sensitivity models with median age instead of life expectancy. The coefficients were less significant and the explanatory power was reduced. Inserting both variables results in multicollinearity, harming the robustness of the models.

born in a given country), international tourism (number of yearly departures), and residential patterns (percentage of urban population or density per square kilometre). Risk behaviour refers to one variable: smoking rate. The third group is comprised of temperature (average for the month of March in capital city), per-capita Gross Domestic Product (GDP) in current US$, number of hospital beds per thousand inhabitants, and a safety score based on government and other actions to mitigate the health and economic consequences of COVID-19.[3] (See Table 1 for detailed definitions and lowest/highest values for the thirty-six countries.)

Table 1. Definitions and Summary Statistics for the Analysis Variables

Variable	Definition	Values	
		Lowest	Highest
Time from 'patient zero'[a]	Number of days passed since first cases in China were reported to WHO	21	73
Morbidity rates[b]	Patients per 100,000 population	1.8	528.7
Mortality rates[b]	Deaths per 1,000 patients	1.03	133.5
Life expectancy[c]	Life expectancy at birth (total)	74.8	84.2
Education[d]	Percentage with bachelors or higher degree	15.0	44.0
Religiosity[e]	Percentage attending religious services on a weekly basis	2.0	45.0
Immigration[f]	Migration stock (in absolute numbers)	37,522	46,627,102
Tourism[g]	Yearly number of departures (million)	668	108,542
Urbanity[h]/Density[i]	Percentage of urban population/population per km^2	53.7/3.0	98.6/512.0
Smoking[k]	Percentage of people who smoke	12.5	42.7
Temperature[l]	Average for March in capital city	-3	18
GDP[m]	Per-capita Gross Domestic Product (current US$)	9,370	116,639
Public health[n]	Hospital beds per 1,000 population	1.4	13.1
Safety score[o]	Country scores by actions to mitigate consequences of COVID-19 (measures of quarantine efficiency, monitoring detection, management efficiency, emergency-care readiness)	518.9	632.3

a. World Health Organization. *Coronavirus Didease (COVID-19).* Situation Report 1-79. I followed these daily reports that provide information on new confirmed cases by countries. When a country showed up for the first time I calculated the number of days that has passed from December 31, 2019 to the respective date.
b. World Health Organization. (8 April 2020). *Coronavirus Disease 2019 (COVID-19).* Situation Report-79. https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200717-covid-19-sitrep-179.pdf?sfvrsn=2f1599fa_2. For morbidity rates: I divided the number of confirmed cases in each country by the size of the local population (from UN publication) multiplied by 100,000. For Mortality rates I divided the number of deaths (Table 1, Column D) by the number of confirmed cases (Table 1, Column B) multiplied by 1000.
c. OECD. http://oecd.org/coronavirus/en (by countries).
d. OECD. http://www.oecd.org/education/education-at-a-glance
e. Conrad H, Kramer S., and Schiller A. (2018). *The Age Gap in Religion around the World.* Washington DC: Pew Research Center.

[3] The safety score is comprised of 130 parameters derived from hundreds of reputable sources of data. These parameters represent six major categories of management of the pandemic: quarantine efficiency (e.g., scale of quarantine, criminal penalties for violating quarantine, travel restrictions); government efficiency (e.g., level of security and defense advancement, legislative efficiency); monitoring and detection (e.g., testing efficiency, reliability of transparency of data); healthcare readiness (e.g., level of healthcare progressivity); regional resilience (e.g., geopolitical vulnerability; infection spread risk); and emergency preparedness (e.g., social emergency resilience, previous national emergency experience). Each parameter was weighted commensurate with its importance for the country's overall safety and stability. The detailed analytical framework and methodology of the safety score is available at http://analytics.dkv.global/covid-regional-assessment-200-regions/methodology.pdf

f. United Nations. (2015). *Trends in International Migration Stock: The 2015 Revision*. Department of Economic and Social Affairs, Population Division (Table 1).
g. World Bank. http://data.worldbank.org/indicators/ST.INT.DPRT
h. United Nations. unstats.un.org/unsd/demographic-social/products/dyb/documents/DYB2018/table06.pdf
World Data Atlas. https://knoema.com/atlas/country/urban-population
i. World Population Review. (2020). https://worldpopulationreview.com/countries/countries-by-density
10. World Population Review. (2020). https://worldpopulationreview.com/countries/smoking-rates-by-country
https://www.smokefree.org.nz/smoking-its-effect/facts-figures (for New Zealand).
https://www.macrotrends.net/countries/CZE/czech-republic/smoking-rate-statistics (for Czech Republic).
k. https://www.holiday-weather.com
l. World Bank. data.worldbank.org/indicator/NY.GDP.PCAP.CD
m. OECD. http://oecd.org/coronavirus/en (by countries).
n. Deep Knowledge Group. (12 April 2020). https://www.dkv.global/covid
o. Four OECD countries did not qualify for inclusion in the top-forty COVID-19 safety rankings (in alphabetic order): Chile, Iceland, Mexico, and the U.S. For this study, I assigned them to the lowest score on the top-forty ranking.

The first dependent variable is the timing of the coronavirus outbreak in the country, expressed by the number of days that passed from 'patient zero' in China (31 December 2019) to the outbreak. The second is the cumulative number of patients per 100,000 inhabitants by Day 100 after the onset of the pandemic in China (8 April 2020). The third variable is the death rate per 1,000 diagnosed patients as of Day 100 (Table 1). Morbidity and mortality rates in all countries were measured in terms of a constant 100-day period because all countries have been aware of the global pandemic over a similar period and, hence, have prepared and protected their population.

Data on the coronavirus diseases were harvested from daily WHO reports.[4] Information for the independent variables is based on official publications of organizations such as OECD, WHO, the World Bank, and the United Nations. Special efforts were made to access the most up-to-date data for each of the independent variables, most of which relating to 2019 or a year or two years earlier.

Levels of Coronavirus Susceptibility and Severity

It took three weeks for the coronavirus to present outside of China. The first two countries that reported confirmed cases were also in Asia: Japan and South Korea (Fig. 1A). Several days thereafter, contagions were reported in North America, Australia, and Europe, starting with France, Germany, Finland, Italy, Spain, Sweden, the UK, and Belgium several days apart. Two months after 'patient zero', the virus reached several additional countries in Europe and spread to new areas including Israel, New Zealand, and South America. The last country that diagnosed 'corona' within its borders was Turkey. The time lapse between the first OECD member country that reported positive cases and the last country to confirm was fifty-two days.

Substantial inter-country variations exist in morbidity rates (Fig. 1B). The rank of countries does not attest to any clustering according to continents. Mexico has the lowest morbidity rate, at one per 100,000 of population; Japan and Hungary also report rates below 10. At the other extreme, high morbidity rates (>200) are found in Italy, Switzerland, and Spain. The highest rates occur in Luxembourg and Iceland, but it should be taken into account that given

[4] As noted, I rely on published data from the WHO. This information should be taken with a slight grain of salt because China may have delayed acknowledging the start of the crisis, causing other countries not to act as quickly as they might have otherwise. Some countries discounted the severity of the virus, possibly affecting the official statistical accounts. Nevertheless, the WHO is the most comprehensive and reliable source for this investigation.

Fig. 1A. Days Passed from 'Patient Zero' in China to First Reported Local Patient, by Countries

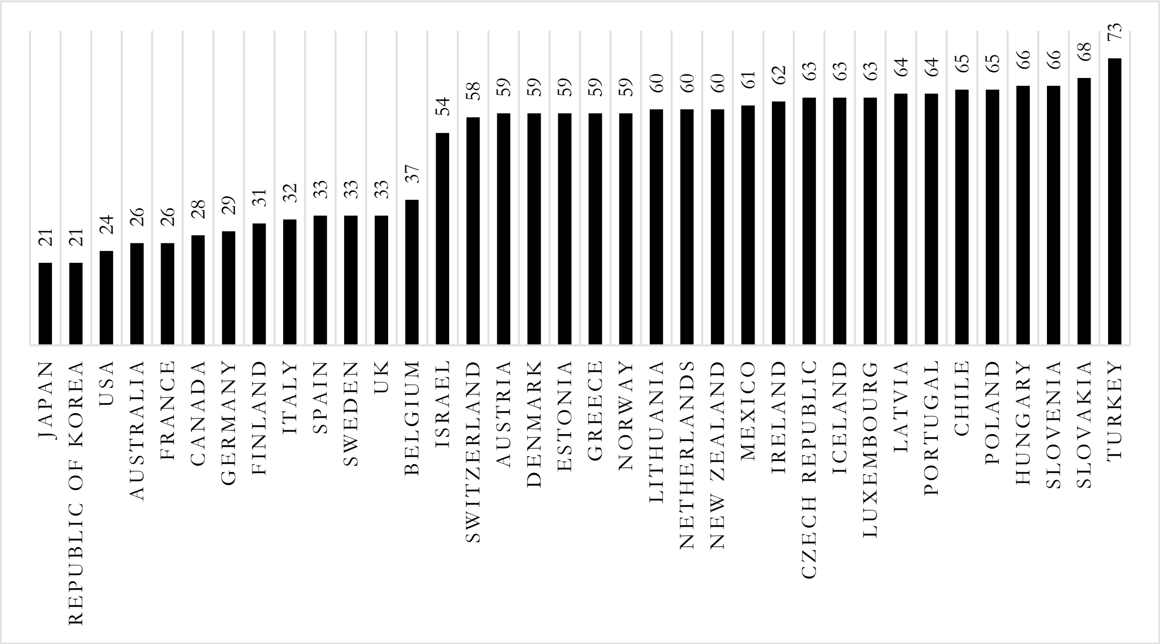
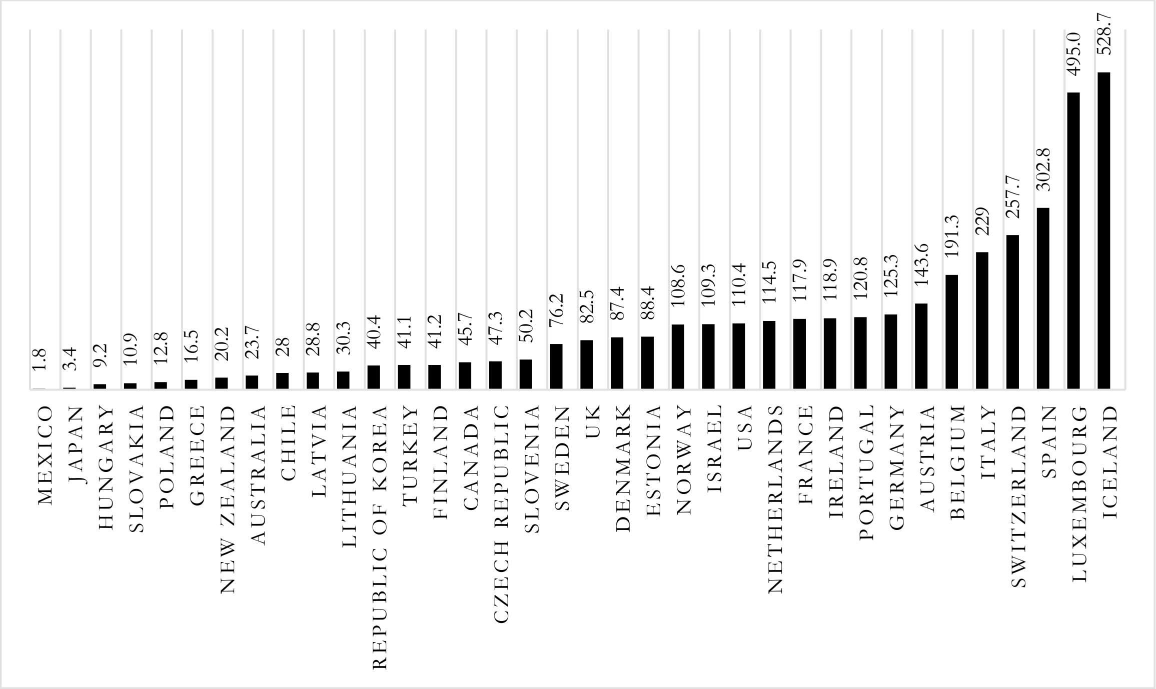


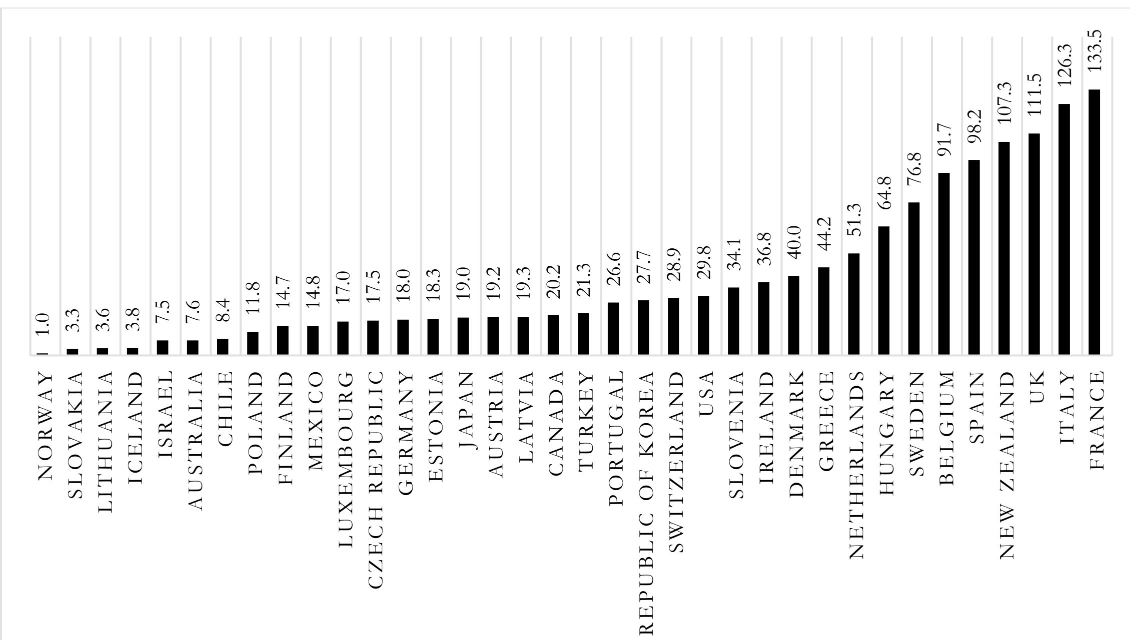
Fig. 1B. Morbidity Rate (Patients per 100,000 of Population), by Countries



the very small populations of these countries, even a small absolute increase may create a salient upturn in rates. The impression is that countries in Asia, Oceania, and Latin America, along with several countries in East-Central Europe, appear in the lower part of morbidity rates; Scandinavian countries, the U.S., Israel, and several West European countries rest in the middle; and small-population countries but also Italy and Spain occupy the upper end of the morbidity continuum. Note that the order of countries by morbidity rate is much different from that defined by the timing of the outbreak: the correlation between these variables is weak and insignificant at Pearson's r=.020.

The highest number of deaths per 1,000 patients is found in France: 130 times higher than the lowest mortality rate, that of Norway (Fig. 1C). High rates (>100) also appeared in Italy, the UK, and New Zealand. Countries with low rates (50–100) include the Netherlands, Sweden, and Spain, among others. Canada, the U.S., and South Korea, to mention a few, rank within the interval of 20–50 per 1,000 patients; and some Latin American countries, Australia, Israel and a few in East Central Europe, as well as Scandinavia, are at the bottom, with low mortality rates.

Fig. 1C. Case-Fatality Rate (CFR) **(**Deaths per 1,000 Cases), by Countries



Determinants of Timing, Morbidity, and Death

To evaluate the determinants of three health outcomes of COVID-19—timing of outbreak, morbidity, and death—I subjected the data to a multivariate analysis. Given the nature of the dependent variables, all of which are continuous, I applied the ordinary least square regression (OLS) method. The model is formulated as follows:

$$\text{HEALTH}_i = a + \beta_1 X_1 + \ldots \beta_n X_n + e$$

where HEALTH, the dependent variable (Y), is the predicted incidence of a given health outcome, 'a' is a constant, β (beta) is the standardized coefficient (extent of standard-deviation increase/decrease in Y per unit of SD change in given X, all other independent variables held constant), X is the observed value of the respective independent variable, and *e* is the residual or prediction error. The explanatory power of the model is provided by the coefficient determination R^2. For each health outcome, I present three models: Model 1 with the socio-demographic characteristics, Model 2 adding the independent variable of risk behaviour, and Model 3 regressing the health outcomes on all independent variables including environmental, economic, and public-health factors.

All else being equal, longer life expectancy, an indicative of a large number of elderly people, is found positively associated with early outbreak of COVID-19 (Table 2, Model 3). High religiosity postpones the detection of patients as believers may use religious faith to cope with illness and, accordingly, do not rush to receive medical treatment. Countries with high rates of immigration stock have to cope with the illness earlier than do those with smaller foreign-born populations. Somewhat surprisingly, a high proportion of smokers inhibits the outbreak of the disease. I speculate that people who smoke suffer more regularly from respiratory distress and initially do not associate it with the novel virus and, in turn, do not turn to testing. Likewise, the general preponderance of low socioeconomic status among smokers may somewhat limit their financial ability to purchase medical services. GDP, reflecting people's well-being, also inhibits the penetration of the disease into countries. The significant negative relation between number of hospital beds and time of first patient detection suggests that countries that spend more on healthcare are better prepared and organized and have more efficient ways of diagnosing COVID-19 patients.

Table 2. OLS Regression (Standardized Coefficients [Beta]) of Days Since 'Patient Zero' COVID-19 Originated Outbreak on Socio-Demographic Characteristics, Risk Behaviour and Environmental, Economic, and Public-Health Factors[a]

Independent variables	Model 1	Model 2	Model 3
Socio-demographic characteristics			
Life expectancy	-0.379* (.931)	-0.364* (.957)	-0.534***(.950)
Education	0.008 (.301)	0.029 (.316)	-0.034 (.296)
Religiosity	0.036 (.197)	0.055 (.205)	0.228^i (.188)
Immigration	-0.153 (.000)	-0.139 (.000)	-0.379^i (.000)
Tourism	-0.440* (.000)	-0.444* (.000)	-0.258 (.000)
Urbanity	-0.121 (.210)	-0.115 (.213)	-0.168 (.179)
Risk behaviour			
Smoking	-	0.080 (.328)	0.301* (.300)
Environmental, economic, and public-health factors			
Temperature	-	-	0.039 (.390)
GDP	-	-	0.466** (.000)
Hospital beds	-	-	-0.314* (.795)
(N)	(36)	(36)	(36)
R^2-adjusted	46.4%	45.1%	63.0%

*p<.05; **P<.01; ***p<.001 ^{i}<.10

[a] Numbers in parentheses are standard errors.

Looking at all three models, one finds that before controlling for the environmental, economic, and public-health factors, a large number of outgoing international travellers (who eventually return to their home country) is a strong predictor of an early outbreak of COVID-19, although it becomes statistically insignificant in the pooled model in favour of religiosity and immigration. The socio-demographic and risk-behaviour variables account for almost half of the inter-country variation in the timing of the outbreak after 'patient zero'; incorporating the environmental, economic, and public-health factors boosts the explanatory power of the independent variables to as high as 63.0 percent.

Socio-demographic and risk-behaviour variables are insignificant in inter-country variations in morbidity (Table 3) with the exception of the level of concentration in urban localities, which raises the ratio of patients to 100,000 of population. GDP is strongly and positively associated with the likelihood of contagion (β =.606 at p<.01). It stands to reason that the quality of life in high-GDP countries includes frequent social gatherings, outdoor entertainment, and cultural patterns of direct interaction among people, exacerbating susceptibility of the coronavirus. Concurrently, countries prepared and organized themselves differently to cope with the pandemic; actions such as quarantining, tracking and detection, management and emergency treatment did much to attenuate morbidity (β=-.524 at p<.01) hence, spatial differences. The pooled model effectively explains 50.0 percent of the variation, well above the explanatory power of the two partial models, 1 and 2.

Table 3. OLS Regression (Standardized Coefficients [Beta]) of COVID-19 Morbidity Rate on Socio-Demographic Characteristics, Risk Behaviour, and Environmental, Economic, and Public-Health Factors[a]

Independent variables	Model 1	Model 2	Model 3
Socio-demographic characteristics			
Life expectancy	0.302[i] (8.744)	0.305 (9.046)	0.260 (10.081)
Education	0.164 (2.832)	0.168 (2.987)	0.012 (2.526)
Religiosity	-0.105 (1.847)	-0.101 (1.936)	0.053 (1.697)
Immigration	0.121 (.000)	0.124 (.000)	-0.042 (.000)
Tourism	-0.144 (.001)	-0.145 (.001)	0.103 (.001)
Urbanity	0.172 (1.973)	0.173 (2.014)	0.322* (1.634)
Risk behaviour			
Smoking	-	0.015 (3.097)	0.043 (2.870)
Environmental, economic, and public-health factors			
Temperature	-	-	-0.151 (3.319)
GDP	-	-	0.606** (.001)
Hospital beds	-	-	0.162 (8.555)
Safety score	-	-	-0.524** (.507)
Day COVID-19 outbreak	-	-	0.373 (1.737)
(N)	(36)	(36)	(36)
R^2-adjusted	11.4%	8.2%	50.0%

*p<.05; **P<.01; ***p<.001 [i]<.10

[a] Numbers in parentheses are standard errors.

A sensitivity analysis revealed that population density (per km^2) is a better predictor of mortality rates than the distinction between urban and rural populations; hence, the former replaces the latter in the equations of Table 4. This variable is positively associated with high mortality rates among those infected. In contrast, mortality rates decline commensurate with increases in religiosity; the latter observation comports with the literature on the religiosity–health nexus (Miller and Thoresen, 2003). As for morbidity, the higher the country is on the safety score in its attempts to defeat the pandemic, the less likely are those infected to die after falling ill. The safety score is a paramount determinant of inter-country variations in mortality, as evidenced by the size of its standardized coefficient (β=-.525 at p<.05). Overall, incorporating the environmental, economic, and public-health factors (model 3) quadrupled the explained variation in inter-country mortality rates to as high as 41.5%.

Table 4. OLS Regression (Standardized Coefficients [Beta]) of COVID-19 Mortality Rate on Socio-Demographic Characteristics, Risk Behaviour, and Environmental, Economic, and Public-Health Factors[a]

Independent variables	Model 1	Model 2	Model 3
Socio-demographic characteristics			
Life expectancy	0.122 (2.558)	0.063 (2.673)	0.022 (3.378)
Education	-0.368^{i} (.908)	-0.448* (.973)	-0.304 (.902)
Religiosity	-0.336^{i} (.615)	-0.412* (.652)	-0.388* (.583)
Immigration	0.182 (.000)	0.190 (.000)	0.019 (.000)
Tourism	0.095 (.000)	0.064 (.000)	0.029 (.000)
Density	0.362^{i} (.057)	0.427* (.060)	0.606** (.053)
Risk behaviour			
Smoking	-	-0.201(.964)	-0.147 (.948)
Environmental, economic, and public-health factors			
Temperature	-	-	0.015 (1.105)
GDP	-	-	-0.031 (.000)
Hospital beds	-	-	-0.208 (2.824)
Safety score	-	-	-0.525* (.163)
Day COVID-19 outbreak	-	-	-0.244 (.545)
(N)	(36)	(36)	(36)
R^2-adjusted	10.9%	11.4%	41.5%

*p<.05; **P<.01; ***p<.001 ^{i}<.10

[a] Number in parentheses are standard errors.

The Significance of Social Behaviour and Preparedness

As life scientists, geneticists, and MDs conduct laboratory experiments to explore the structure of the coronavirus and develop efficient vaccines and medications, including those that address its new mutations, and until a critical mass of the population develops efficient antibodies, it is imperative to assess how structural affinities of the population, the environment, the economy, and the public-health services, along with safety measures, can mitigate the devastating health outcomes of the coronavirus, foremost morbidity and mortality. Multivariate analysis of data of the foregoing characteristics successfully explain much of the overall variance among OECD countries in morbidity and mortality rates. The paramount determinants for diminishing the likelihood of contagion or death are associated with the country's economic status, public-health services, and, especially, government measures to restrain the pandemic. These means are fluid and, through careful planning, may be improved further and deployed around the globe.

A large presence of immigrants enhanced the outbreak of the pandemic in host countries. It would be fair to say, however, that given the fact that all countries were eventually exposed to the virus, immigrants cannot be accused of importing it. Further, the number of immigrants is not a significant determinant of the level of morbidity. The interpretation of this finding is that immigrants, provided of course that they were tested for the virus, infected neither themselves nor others more than did the overall population. Even more unequivocal is that immigrants do not determine mortality rates. These observations should be adopted by member states and the OECD leadership more generally to protect their immigrant populations and combat anti-immigrant prejudice.

It stands to reason that the coronavirus will last for a while. In the past few weeks, we witnessed the evolution of new mutations and, at the present writing, it is not yet clear whether and to what extent the various vaccinations are effective against them. The nature of future mutations is mysterious. Likewise, the series of infectious viruses that the world has seen in the past two decades—SARS, MERS, and now COVID-19—suggests that more viruses may break out with no early warning. Hence, inter-country variations in safety and preparedness for pandemics may become important determinants of the international migration system in the coming years.

References

Alba, R. and Nee, V. (2003). Remaking the American mainstream: Assimilation and contemporary immigration. Cambridge, MA: Harvard University Press.

Amir, T. 2020. Flatting the curve, constitutional crisis, and immigrants' rights protections: The case of Israel". Frontiers in Political Science (Accepted, 21 October).

Andersen, M. (2020). Early evidence on social distancing in response to COVID-19 in the United States. Available at SSRN 3569368.

Blinder, S. and Allen, WL. (2016). Constructing immigrants: Portrayals of migrant groups in British national newspapers, 2010-2012. International Migration Review 50(1):3-40.

Chang SL., Harding N., Zachreson C., Cliff OM and Prokopenko M. (2020). Modelling transmission and control of the COVID-19 pandemic in Australia. arXiv preprint arXiv:2003.10218.

Chiswick, BR. and Miller, PW. (2001). A model of destination-language proficiency acquisition: Application to male immigrants in Canada. *Demography* 38:391-409.

De Genova, NP. (2002). Migrant illegality and deportability in every day life. Annual Review of Anthropology 31: 419-447.

Devillanova, C., Colombo, C., Garofolo, P. and Spada, A. (2020). Health care for undocumented immigrants during the early phase of the Covid-19 pandemic in Lombardy, Italy. European Journal of Public Health 30:6, 1186-1188.

Gareth, D. (2020). Does evidence-based EU law survive the Covid-19 pandemic? Considering the status in EU law of lockdown measure which affect free movement". Frontiers in Human Dynamics (October 8).

Gilbert, M., Pullano, G., Pinotti, F., Valdano, E., Poletto, C., Boëlle, PY, D'Ortenzio E., Yazdanpanah Y., Eholie SP., Altmann M., Gutierrez, B., Kraemen MUG and Colizza V. (2020). Preparedness and vulnerability of African countries against importations of COVID-19: A modelling study. The Lancet 395(10227), 871-877.

Goniewicz, K., Khorram-Manesh, A., Hertelendy, AJ., Goniewicz, M., Naylor, K., and Burkle, FM. (2020). Current response and management decisions of the European Union to the COVID-19 outbreak: A review. Sustainability, 12(9), 3838.

Greenaway, C., Hargreaves, S., Barkati, S., Coyle, CM., Gobbi, F., Veizis, A., and Douglas. P. (2020). COVID-19: Exposing and addressing health disparities among ethnic minorities and migrants. Journal of Travel Medicine 27:7.

Karako, K., Song P., Chen Y. and Tang W. (2020). Analysis of COVID-19 infection spread in Japan based on stochastic transition model. Bioscience Trends 14(2), 134-138.

Massey, DS. and Bartley, K. (2005). The changing legal status distribution of immigrants: A caution. International Migration Review 39(2): 469-484.

Miller WR. and Thoresen CE. (2003). Spirituality, religion and health: An emerging research field. American Psychologist 58(1), 24-35.

Mogi, R. and Spijker, J. (2020). The influence of social and economic ties to the spread of COVID-19 in Europe. https://doi.org/10.31235/osf.io/sb8xn

Page KR., and Flores-Miller, A. (2021). Lessons we've learned — Covid-19 and the undocumented Latinx community. New England Journal of Medicine 384 (1): 5-7.

Portes, A. and Rumbaut, RG. (2014). Immigrant America: A portrait. Oakland: University of California Press (Fourth Edition).

Rodriguez-Morales, AJ., Gallego, V., Escalera-Antezana, JP., Mendez, CA., Zambrano, LI., Franco-Paredes, C., Suarez, JA., Rodriguez-Enciso, HD., Balbin-Ramon, GJ., Savio-Larriera, E., Risquez, A. and Cimerman, S. (2020). COVID-19 in Latin America: The implications of the first confirmed case in Brazil. Travel Medicine and Infectious Disease (101613).

Van Bavel, JJ. et al. (2020). Using social and behavioural science to support COVID-19 pandemic response. Nature Human Behaviour, 4, 460-471.

Verelst, F., Kuylen, E., and Beutels, P. (2020). Indications for healthcare surge capacity in European countries facing an exponential increase in coronavirus disease (COVID-19) cases, March 2020. Eurosurveillance, 25(13), 2000323.