Original Research

# The relationship between measures of individualism and collectivism and the impact of COVID-19 across nations

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A R T I C L E   I N F O

A B S T R A C T

Background: The global COVID-19 pandemic has been characterized by marked variations in prevalence, mortality and case fatality across nations. The available evidence to date suggests that social factors significantly influence these variations. The sociological concepts of individualism and collectivism provide a broad explanatory framework for the study of these factors. There is evidence to suggest that cross-cultural variations in collectivism may have emerged via a process of natural selection, as a protective mechanism against infectious diseases. As a test of this hypothesis, this paper examined the association between indices of individualism and collectivism and the prevalence, mortality and case fatality rates of COVID-19 across nations.

Study design: This study was a population-level association study based on data in the public domain and from prior publications.

Methods: Data on four standard measures of individualism/collectivism were obtained from the original publications. These were correlated with estimates of the nation-wide prevalence, mortality and fatality rates for COVID-19 in 94 countries, obtained from the Johns Hopkins Medical University real-time dashboard.

Results: Individualism was positively correlated with COVID-19 prevalence, mortality and case fatality rates; conversely, measures of collectivism were negatively correlated with these parameters. The strongest association was between scores for individualism and mortality rate, and remained significant after correcting for several potential confounders.

Conclusions: These findings are consistent with the prior hypothesis of a relationship between individualism-collectivism and the impact of infectious disease across populations, and have implications in terms of social strategies aimed at minimizing the impact of COVID-19.

## 1. Introduction

The global pandemic of COVID-19, an acute respiratory illness of variable severity caused by the novel betacoronavirus SARS-CoV-2, has emerged as the defining public health crisis of our times. To date, over 16 million cases of COVID-19 and over 650,000 deaths due to this disease have been reported from around the world [1]. Besides its direct impact in terms of morbidity and mortality, this pandemic has been associated with a significant burden of psychological, social and economic adversity, caused both by the disease and the measures necessary to contain its spread [2,3].

From the earliest stages of this pandemic, marked variations in the spread, severity and mortality of COVID-19 have been noted, both across nations and within different regions of the same country [4–7]. Evidence for a biological explanation for these variations, such as viral or host genetic variations, has not been convincingly demonstrated to date [6,8, 9]. Instead, several authors have suggested that social factors, such as customs related to social interaction [4,10], speed and extent of governmental responses to the pandemic [4,10], poverty [9], patterns of travel and migration [11], and levels of trust in institutional measures among the general population [10], are significantly associated with regional and cross-national variations COVID-19 prevalence and mortality rates.

Understanding the effect of social factors on the impact of COVID-19 across populations requires not only experimental observations but a conceptual framework that can be used to analyze and interpret these observations. One concept that may be useful as a guiding principle in this context is societal individualism/collectivism [12,13]. According to this concept, human societies are viewed as existing on a continuum, ranging from highly collectivistic to highly individualistic. Broadly

speaking, collectivist societies privilege group membership over the self, and favour obedience and conformity, while individualist societies privilege the self and favour a positive sense of self or self-image [12,13]. Some societies, particularly those with a multi-cultural composition, may include elements of both [13]. The individualist/collectivist dichotomy is particularly important in the context of infectious disease outbreaks, because there is evidence to suggest that collectivist social norms, such as conformity and reduced contact with individuals outside a particular group, evolved as a defence mechanism in geographical regions with a historically high pathogen load. In regions with lower pathogen prevalence, such benefits may be minimal and individualistic norms may be favoured instead [12]. At the individual level, self-reported collectivist ancestry is associated with an increase in salivary levels of immunoglobulin A (IgA) in response to images of disease or injury, further underlining the postulated relationship between collectivism and defences against infectious disease [13]. Thus, certain behaviours and customs associated with collectivist social norms may form part of the "behavioural immune system" – a system of behaviours that minimize the risk or impact of infectious disease, in parallel with cellular or humoral immune mechanisms [14].

Indirect evidence for a relationship between individualism/collectivism and behaviours designed to minimize the spread or impact of COVID-19 already exists in the literature. For example, it has been suggested that the strict isolation and quarantine measures imposed in China may not be feasible or acceptable in more individualistic societies [4], and levels of trust in governmental authorities – an indirect indicator of collectivistic social norms – have been associated with lower COVID-19 mortality in a study of twenty-five European countries [10]. It has also been noted that self-reported measures of collectivism were correlated with anxiety and emotional distress in response to COVID-19 in a sample of Italian youth [15]. However, the association between individualism/collectivism and variations in the impact of COVID-19 across nations has not been examined specifically to date. Therefore, this paper examines the relationship between four standardized measures of individualism or collectivism and indices of the impact of COVID-19 – its prevalence, mortality and case fatality rates - from a cross-national perspective.

## 2. Methods

The current study is a population-level association study, examining the possibility of a monotonic relationship between measures of individualism/collectivism and standard epidemiological measures of the impact of COVID-19: a) the prevalence, defined as the total number of confirmed cases per 1 million population, b) the crude mortality rate (CMR), defined as the total number of confirmed deaths due to COVID-19 per 1 million population, and c) the case fatality ratio (CFR), defined as the ratio of deaths to total number of cases, expressed as a percentage. Based on the existing literature, we hypothesized that measures of collectivism would be negatively correlated with these indices.

*Measures of individualism and collectivism:* For the purposes of this study, four standard measures of individualism/collectivism were used, based on a prior study examining the relationship between these constructs and pathogen prevalence [12]. The first was based on the work of Hofstede (henceforth designated "Hofstede") [16], which assessed social attitudes and values in 100,000 adult subjects across 68 distinct geo-political regions. Higher scores on the Hofstede index indicate higher individualism. The second was based on the work of Suh and colleagues (henceforth designated "Suh") [17], who combined the work of Hofstede with numerical ratings from cross-cultural psychology research. As with the Hofstede index, higher scores on the Suh index indicate higher individualism. The third, based on the work of Gelfand et al. (henceforth designated "Gelfand") [18], focused on group collectivism practices across 57 regions; higher scores on the Gelfand index indicate higher collectivism. The fourth, based on the work of Kashima and Kashima, assesses whether it is acceptable to omit first- and second-person pronouns in a given spoken language across 70 regions, with "pronoun drop" indicating greater collectivism. Unless the other measures, this index (henceforth designated "Kashima") is a binary variable [19]. The coding of this data was based on the earlier research of Fincher et al. [12].

*COVID-19 – related indices:* Information on COVID-19 prevalence, mortality and case fatality rates was obtained from the Johns Hopkins Medical University's live web-based dashboard, accessible at https://coronavirus.jhu.edu, which provides country-wise data on total numbers of cases, deaths and fatality rates [1]. Using this data, prevalence and mortality rates were computed using country-wise population data available from the World Bank, accessible at https://data.worldbank.org/indicator/SP.POP.TOTL.

*Data analyses:* While scores for individualism/collectivism were normally distributed, none of the COVID-19 indices showed a normal distribution ($p < 0.01$ for all three indices, Shapiro-Wilk test). Therefore, Spearman's rank correlation coefficient ($\rho$) was used to test for a monotonic relationship between these indices and the Hofstede, Suh and Gelfand indices of individualism/collectivism. As the Kashima and Kashima index was a dichotomous variable, the Mann-Whitney $U$ test was used to compare median values of the three COVID-19 indices between those societies classified as "individualist" or "collectivism" according to this parameter. All tests were two-tailed. Owing to the exploratory nature of this study, all bivariate analyses were corrected for multiple comparisons using Bonferroni's method, and a corrected p-value of $<0.05$ was considered significant Several potential factors have been identified as contributing to mortality in COVID-19 in the existing literature, including age [7,20], economic inequality [21,22] and health infrastructure [22]. As these may act as possible confounders in examining the relationship between culture and COVID-19 outcomes, measures of these factors were obtained from the following sources:

- Data on *median age* for each country was obtained from the Central Intelligence Agency's World Fact Book, available at https://cia.gov/library/publications/the-world-factbook/fields/343rank.html.
- Data on the *Gini coefficient,* a measure of economic inequality, was obtained from the United Nations' Human Development Report for the year 2020.[23]
- Data on the *number of hospital beds available per 100,000 population,* a measure of available health infrastructure, was obtained from the same source.[23]

Independent bivariate analyses were then carried out to identify if these variables were significantly associated with COVID-19 indices. Where this was the case, additional partial correlation analyses (Spearman's partial correlations) were performed to examine the impact of these variables on the link between measures of individualism-collectivism and COVID-19 indices.

## 3. Results

Data on at least one measure of individualism/collectivism could be obtained for 98 countries. Of these, COVID-19 data could not be retrieved for four countries (Hong Kong, Guam, Northern Ireland and Puerto Rico). Thus, data was analyzed for a total of 94 countries. The three continuous measures of individualism-collectivism were all significantly correlated with each other (Hofstede – Suh: $r = 0.908$, $p < 0.001$; Hofstede – Gelfand: $r = -0.747$, $p < 0.001$; Suh – Gelfand: $p = -0.850$, $p < 0.001$), indicating good convergent validity. COVID-19 prevalence was significantly correlated with mortality ($\rho = 0.832$, $p < 0.001$) but not case fatality ($\rho = -0.075$, $p = NS$), while mortality and case fatality rates were significantly and positively correlated ($\rho = 0.567$, $p < 0.001$).

Bivariate correlations between measures of individualism/collectivism and COVID-19 indices.

The results of these analyses are presented in Table 1. For the 66

**Table 1**

Bivariate correlations between measures of individualism-collectivism and COVID-19 indices.

| Index | COVID-19 prevalence | COVID-19 mortality rate | COVID-19 case fatality rate |
|---|---|---|---|
| **Individualism, Hofstede** | $\rho = 0.287$ | $\rho = 0.414^*$ | $\rho = 0.324$ |
| | $p_{corrected} = 0.180$ | $p_{corrected} = 0.008$ | $p_{corrected} = 0.072$ |
| **Individualism, Suh** | $\rho = 0.334$ | $\rho = 0.563^*$ | $\rho = 0.479^*$ |
| | $p_{corrected} = 0.135$ | $p_{corrected} = 0.008$ | $p_{corrected} = 0.009$ |
| **Collectivism, Gelfand** | $\rho = -0.296$ | $\rho = -0.405^*$ | $\rho = -0.303$ |
| | $p_{corrected} = 0.252$ | $p_{corrected} = 0.018$ | $p_{corrected} = 0.234$ |

**Abbreviations:** $\rho$, Spearman's correlation coefficient; $p_{corrected}$, significance level after Bonferroni's correction for a $3 \times 3$ table.

* Significant at $p < 0.05$ after correction.

countries for which the Hofstede index was available, this variable was significantly and positively correlated with COVID-19 crude mortality ($\rho = 0.414$, $p_{corrected} = 0.008$). Though positive associations were also observed for prevalence ($\rho = 0.287$, $p_{corrected} = 0.18$) and case fatality rate ($\rho = 0.324$, $p_{corrected} = 0.072$), they were not significant after correction.). A very similar result was obtained for the 54 countries for which the Suh index was available, with positive correlations being noted for the mortality ($\rho = 0.563$, $p_{corrected} = 0.008$) and case fatality rates ($\rho = 0.479$, $p_{corrected} = 0.009$) and a non-significant trend towards a positive association for prevalence ($\rho = 0.334$, $p_{corrected} = 0.135$). These results suggest a positive correlation between societal individualism and deaths due to COVID-19.

For the 54 countries for which the Gelfand index was available, a significant negative correlation was obtained between this variable and the COVID-19 mortality rate ($\rho = -0.405$, $p_{corrected} = 0.018$), with non-significant trends in a similar direction being observed for the prevalence ($\rho = -0.296$, $p_{corrected} = 0.252$) and case fatality rate ($\rho = -0.303$, $p_{corrected} = 0.234$).

The Kashima and Kashima index was available for 67 countries. Analysis of this variable revealed that those societies coded as "collectivist" had significantly lower mortality rates (Mann-Whitney U = 700.5, p = 0.003) and case fatality rates (Mann-Whitney U = 679.5, p = 0.007) than those coded as "individualist". No significant difference in prevalence was observed between the two groups.

### 3.1. Relationships between potential confounders and COVID-19 indices

The results of these analyses are presented in Table 2. It was found that median age was significantly and positively correlated with COVID-19 prevalence, mortality rate and case fatality rate (p < 0.05 for all three analyses), while hospital bed strength was positively correlated with the COVID-19 case fatality rate (p = 0.014). The Gini coefficient was not significantly associated with any of the three COVID-19 indices.

**Table 2**

Bivariate correlations between potential confounding factors and COVID-19 indices.

| Index | COVID-19 prevalence | COVID-19 mortality rate | COVID-19 case fatality rate |
|---|---|---|---|
| **Median age** | $\rho = 0.274$ | $\rho = 0.373$ | $\rho = 396$ |
| | $p = 0.008^*$ | $p < 0.001^*$ | $p < 0.001^*$ |
| **Gini coefficient** | $\rho = -0.110$ | $\rho = -0.119$ | $\rho = -0.132$ |
| | $p = 0.324$ | $p = 0.299$ | $p = 0.249$ |
| **Hospital bed availability per 100,000 population** | $\rho = 0.076$ | $\rho = 0.210$ | $\rho = 0.262$ |
| | $p = 0.471$ | $p = 0.051$ | $p = 0.014^*$ |

**Abbreviations:** $\rho$, Spearman's correlation coefficient.

* Significant at $p < 0.05$.

### 3.2. Partial correlation analyses of individualism/collectivism and mortality

In view of the independent relationship between age and COVID-19 prevalence and mortality rates, a partial correlation analysis of the relationship between the Hofstede, Suh and Gelfand indices and COVID-19 prevalence, crude mortality and case fatality rates was performed, using median age as a covariate. The results of this analysis revealed a positive correlation between the Hofstede index and COVID-19 prevalence (partial $\rho = 0.279$, p = 0.024) and mortality rate (partial $\rho = 0.361$, p = 0.003), and a stronger positive correlation between the Suh index and COVID-19 prevalence (partial $\rho = 0.363$, p = 0.008) and mortality rate (partial $\rho = 0.517$, p = 0.001). There was a trend towards a negative correlation between the Gelfand index and COVID-19 mortality rate when correcting for age (partial $\rho = -0.265$, p = 0.056).

As both median age and hospital bed strength per 100,000 population were significantly associated with the case fatality rate, a partial correlation analysis of the relationship between the Hofstede, Suh and Gelfand indices and the case fatality rate was carried out, using both these variables as covariates. In this analysis, a significant positive correlation between the Suh index and the COVID-19 case fatality rate was observed (partial $\rho = 0.345$, p = 0.015) even after correcting for these variables.

### 4. Discussion

The above findings suggest that a statistically significant relationship exists between measures of societal individualism/collectivism and country-wise mortality and case fatality rates due to COVID-19. Broadly speaking, higher scores for individualism were positively associated with these parameters, while the inverse was true, to a slightly lesser extent, of measures of collectivism. These results remained significant even after correcting for potential confounding factors such as age, economic inequality and the availability of health infrastructure. Though the current study was not designed to specifically test for the possibility of a causal relationship, these results are consistent with it, as well as with the general hypothesis proposed by Fincher et al. in which collectivist social norms are considered to have a protective effect against infectious pathogens [12]. They are also in line with earlier results which have found an association between individualistic cultural values and outbreaks of infectious and zoonotic disease [24].

What are the possible mechanisms that underlie this association? As already suggested in the literature, collectivist social norms may favour adherence to stricter governmental guidelines regarding quarantine, social distancing and hygiene, even when these appear unduly restrictive or harsh by individualistic standards [4]. There is evidence to support this mechanism from the literature: measures of collectivism were correlated with the intent to follow social distancing and hygienic measures in a sample of 704 adults of mixed nationalities during the COVID-19 pandemic. [25], while individualism was associated with a lower adherence to epidemic control measures [26]. Similarly, collectivist social norms have been shown to moderate sickness behaviour, including the readiness to seek medical attention in general [27]. The net effect of such behaviours would be twofold: early diagnosis of COVID-19 may result in better outcomes at the individual level, while adherence to hygienic and distancing norms would result in reduced disease transmission, including transmission to groups such as the elderly who have higher COVID-19 fatality rates.

Second, collectivist social values have been associated with broader social-political tendencies such as reduced contact with people "outside" a defined group or community, and reduced social mobility including travel [12,13,28]. Given the relationship between international travel and the spread of COVID-19 [29,30], it is possible that reduced travel and "out-group" contact in members of collectivist societies could have impeded the spread of the disease in certain cases.

Third, there may be aspects of individualistic societies that may

accelerate the spread of COVID-19. For example, in the study by Biddlestone et al. cited above, it was observed that measures of individualism were positively correlated with conspiracy theories related to COVID-19 and reduced willingness to adhere to social distancing measures [22]. These psychological and behavioural responses may be associated with an increased risk of disease spread in some, but not all, individuals [31].

A fourth possibility, though speculative and not directly supported by published literature, has to do with specific customs linked to collectivist societies, such as customs related to social behaviour or food preparation [12,32]. For example, social interaction that does not involve contact such as touching or kissing may reduce the spread of COVID-19 [4], and it has been suggested that certain spices or plant products used in "traditional" societies may have anti-viral or immunomodulatory properties [33,34]. In such a scenario, the protective effect would be due to these specific behavioural or dietary factors, and not to collectivistic social values *per se*.

A fifth possibility has to do with the observation that individuals with collectivist ancestry demonstrate increased IgA responses to visual cues of disease or injury. Such an effect may be mediated through a psychoimmune mechanism, involving modulation of the activity of the hypothalamic-pituitary-adrenal axis [13], resulting in a potential "priming" of the immune system in response to the threat of exposure to infectious diseases. The merit of this hypothesis is that it would account for the findings of the current study concerning mortality and fatality rates, as higher IgA levels have been observed in survivors of patients with clinically severe forms of COVID-19 [35].

Though all these possibilities merit further investigation, it must be noted that this study's results are subject to several limitations. First, they are based on simple measures of individualism/collectivism that may fail to capture the complexities of large multicultural societies [13]. Second, though the indices of individualism/collectivism used in this study have been validated in previous studies, they are based on data which is two decades old, and which may no longer reflect the cultural realities of a globalizing world [36]. Third, these results are based on a cross-sectional analysis of data, which cannot capture the relationship between individualism/collectivism and temporal trends related to the spread of COVID-19. Fourth, there may be numerous other confounding factors not considered in this study, such as the quality and accessibility of health care or socioeconomic inequality, which could have an independent influence on the impact of COVID-19 [7].

Fifth, it is possible that the dichotomous measures of culture adopted in this study may have obscured other important differences in attitudes and behaviour that could affect the spread and outcome of COVID-19 across countries. For example, collectivist societies have been traditionally associated with a higher level of respect accorded to the elderly, who are seen as repositories of wisdom, though this is gradually changing under the influence of globalization, economic development and increases in life expectancy in collectivist societies [37,38]. As it was not possible to assess specific behaviours with regards to such vulnerable groups with the methodology adopted in this paper, their impact may have been under-estimated in an ecological analysis of this kind.

Finally, it must also be noted that historical pathogen prevalence exerts selection pressure on cellular and humoral immune mechanisms themselves [39], and that these factors may be more relevant to geographical variations in the prevalence and mortality of COVID-19. In fact, the possibility of convergent evolution influencing both humoral and behavioural immune responses must be taken into account when critically appraising data of this kind [12].

Nevertheless, the above findings, taken together with the results of studies in individuals cited above, suggest that cultural values associated with the individualism/collectivism continuum may play a role in moderating the impact of COVID-19 across countries and geographical regions. Further research should aim at testing this hypothesis by means of multi-centric studies covering a wide range of cultures, and at

examining the relationship between these cultural factors, as well as the other dimensions of culture identified in Hofstede's model [40], and other individual and societal vulnerability and resilience factors.

### Ethical approval

As this study is based on the statistical analysis of pre-published data and did not involve any human or animal subjects, it did not require ethical approval as per the author's institutional guidelines.

### Declaration of conflict of interest

The author reports no conflicts of interest for the work presented in this paper.

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### 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 – YES.

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