Culture And COVID-19 Related Mortality- A Cross Sectional Study of 53 Countries

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Research Article

Keywords: mortality, culture, population, Economic

Posted Date: November 2nd, 2021

DOI: https://doi.org/10.21203/rs.3.rs-942150/v1

Abstract

The aim of this paper is to investigate the influence of culture on COVID-19 related mortality relying on Hofstede's six dimensional concept of culture. Retrieving data from 53 countries a multivariable regression model was fitted that controls for health related, economic and policy related variables that have been found to be associated with mortality. In particular we included the percentage of population above 65 years of age, the prevalence of relevant co-morbidities (i.e. diabetes, hypertension, cancer. obesity), and tobacco usage as health related variables. Economic variables were GDP per capita and the connectedness of a country as measured by the number of international arrivals. As policy variables we included the Oxford stringency index as well as stringency speed, and the Global Health Security index. The results suggests that individualistic societies can navigate well through the pandemic when they are also characterized by low power distance which reflects a low acceptance of inequality within a society. This finding contradicts with previous studies that supported the popular narrative that autocratic societies with an obedient population are better positioned to manage the pandemic.

1. Introduction

Due to the relevance and omnipresence of COVID-19, a considerable steam of literature exists that analyses factors influencing the spread of infection and resulting mortality. So far COVID -19 has claimed more than 25 million lives globally [1]. Most studies take clinical and socioeconomic variables into account to explain mortality while culture as an influencing factor has received little attention in this context. Among some notable exceptions is the study by Gokmen et al [2] who build upon Hofstede's work on national culture. Hofstede's pioneering model consists of six dimensions that constitute cultural norms [3,4]: Power distance, individualism, masculinity, uncertainty avoidance, long term orientation, and indulgence. In their empirical analysis Gokmen et al. reported significant and positive associations between COVID-19 incident rates in selected European countries' and both individualism and indulgence while power distance was negatively related to COVID-19 incidence. Individualism in Hofstede's sense is defined as a social preference for a "loosely-knit social framework in which individuals are expected to take care of only themselves and their immediate families" [5]. The link between individualism and COVID-19 cases was interpreted in the way that individualistic cultures feel less responsible for achieving collective goals such as the containment of a pandemic and, therefore, are less supportive towards policies that restrict individual rights even though the society at large might benefit from them. Moreover, in individualistic countries privacy is highly valued [6] which make some containment measures such as contact tracking difficult. Conversely, a more collectivistic society people are more willing to sacrifice personal freedom for the sake of collective benefits [7].

A similar argument was put forward for the impact of indulgence. Indulgence stands for "a society that allows relatively free gratification of basic and natural human drives related to enjoying life and having fun" [3]. The antipode of indulgent cultures are restraint societies with strict social norms [8]. It was argued, that such societies more easily accept restrictions in daily life at the expense of quality of life.

Lastly, power distance describes to which extent to less powerful members of societies accept an unequal distribution of power. It is argued that societies with a high power distance are less likely to follow orders by state authorities which makes containment measures less effective.

Another study that has empirically linked cultural variables with COVID-19 outcomes is by Chen et al [9]. They found that individualistic cultures are slow to respond to the COVID-19 pandemic and that a higher speed of implementing containment measures leads to a lower COVID-19 related mortality. This result partly echoes the findings Cao et al.[10] who established a negative correlation between Hofstede's individualism dimension and both incidence and mortality rates.

Notwithstanding the substantial new insights that those studies provided to the reader, none of them controlled for clinical parameters that are known to be associated with COVID-19 related mortality. Clinical variables might be might be even more important in terms of effect size and their omittance would result in an underspecified model. Omitted variables can lead to biased and inconsistent coefficient estimates. We therefore want to have a fresh look on the relationship between culture and COVID-19 related mortality while taking set of variables into consideration. For instance, age, obesity, and co-morbidities such as cancer, cardiovascular diseases, and high blood pressure are found to be associated with both COVID-19 incidence and mortality [11,12,13,14]. Controlling for those factors allows for a better specification of the model and therefore might lead to different results.

2. Methods

Variables and Data Sources

We assembled a cross sectional dataset consisting of 53 countries spanning from the beginning of the pandemic (Jan 1st 2020) until April 27th 2021

The outcome variable in our model is the COVID-19 related mortality rate defined as the cumulative number of confirmed deaths per million population and are taken from a publicly accessible data set assembled by the University of Oxford [15]. We prefer the mortality rate over infection counts because a large proportion of infections with COVID-19 from non-risk individuals are mild and therefore, measurement errors might occur with regard to the incidence rate. In addition, there are large differences between countries in the availability and quality of testing. In contrast, data on death rates can be more easily and reliably collected.

The independent variables of interest are the six cultural dimensions of Hofstede. The current six cultural dimensions according to Hofstede are the power distance index (PDI), individualism versus collectivism (IDV), masculinity versus feminism (MAS), the uncertainty avoidance index (UAI), long term versus short term orientation (LTO) and indulgence versus restraint (IVR). PDI describes how a society deals with inequality, with a higher value associated with greater acceptance of inequality. High IDV scores indicate a preference for a loose society with a focus on the individual. The collective self-image here is defined

more as "me" as opposed to "we." The MAS dimension attempts to enact a society between competitive and consensual values. UAI is concerned with a society's attitude toward an uncertain future. A high value in this dimension is associated with intolerance of deviant behavior, while a low value suggests a more relaxed attitude. High LTO scores describe a society with a high focus on the future. Low values describe more traditional attitudes, with aversion to major change. The sixth dimension, IVR, places nations between free enjoyment and restraint [16]. The original research consisted of the results of a value study of over 110,000 IBM employees from 40 countries, between 1967 and 1973. Hofstede used factor analysis to define four cultural dimensions based on this data set, which were later expanded to six dimensions after replication studies in other countries. Although the model and its simplification of culture to a few cultural dimensions is not considered uncontroversial, especially for multiethnic societies [17], it still represents an important tool for understanding culture in an international comparison as well as in a professional context [18].

The following covariates were used in our analysis: The prevalence of co-morbidities that might be associated with a severe course of the diseases are from the World Health Organization. This included the percentage of the population with obesity (i.e. body mass index [BMI] above 30) [19], and hypertension [20], that was reported to be a risk factor for severe disease aggravation [21]. From the same database we also include the percentage of the population that regularly uses tobacco products [22], because patients with a smoking history have a higher likelihood of developing a more severe disease course [23]. The prevalence of cancer as another relevant co-morbidity is from the Global Health Data Exchange [24]. We also include the proportion of the total population over age 65 from the Worldbank database [25] because age is major risk factor for COVID-19 related mortality [26,27]. Finally, we use the proportion of the population between 20 and 79 with diabetes [28] because a recent meta-analysis suggested that diabetes is one major cause of COVID-19 related mortality [29].

Besides the clinical covariates we use the GDP per capita as an economic performance indicator. People in richer countries have better access to health care and modern treatments. Values are in constant 2017 USD using purchasing power parities as exchange rates. Those data are taken from the World Bank as well [30]. Moreover, we take the Global Health Security Index that represents an attempt to quantify, how prepared a country is for a pandemic outbreak [31]. Other variables that were used to explain COVID-19 mortality include the connectedness of a country measured as the number of international arrivals [32]. We use this as well and take the data from the Worldbank [33].

Finally, we include two variables that aim to assess government measures of pandemic containment. First, we take the “COVID-19 government response tracker” stringency index [15]. This index consists of several subscores on different restriction measures, as well as an overall index, which is used in our analysis It is intended to quantify the severity of national pandemic containment measures. Here, only the overall index is included as the mean of the daily total index since the beginning of the pandemic as a control variable. Second, we include the stringency speed index that relates to the time it takes for the government to impose containment measures. Reaction speed is considered to be more effective than

the level of stringency. For example, a study suggests the elapsed time between the first national death and the ban on public events as a significant factor [34]. Stringency Speed is calculated as the as the marginal rate of change of stringency index and is taken from Chen et al. [9].

Statistical Analysis

We employ a multivariate regression model that examines the association of Hofstede's six cultural dimensions with the cumulative number of COVID-19 deaths in a country. The value a country achieves on each dimension is included as a single variable in the model. Furthermore, the model includes a number of control variables that were outlined above. Absolute data are divided by the number of million inhabitants to make them comparable, relative data and indices are kept unchanged. Correlations between individual variables are calculated and displayed in a correlation matrix. Combinations of variables with the greatest correlation coefficients are then examined by means of an interaction plot to examine whether interaction effects between variables are present.

3. Results

The country selection includes 53 culturally and geographically diverse nations, as shown in figure 1. Regional differences in deaths per million population are represented by different color shadings.

Figure 2 displays the correlation matrix of the variables. It is evident that some of the independent variables are related, mostly strongly power distance and individualism with correlation coefficient of -0.74.

The results of the best fitted multivariable model is reported in table 2.

The result of the complete regression model reaches an adjusted R-squared of 0.53. The model as a whole is highly significant according to the F-test result. After performing a Breusch-Pagan test, the null hypothesis of homoscedasticity of the data cannot be rejected. Furthermore, scale-location, normal Q-Q and residual vs. fitted plots suggest a good model fit.

According to our results prevalence of obesity and cancer, as well as the share of the population older than 65 years is significantly associated with the COVID-19 related death rate. The stringency index is positively associated with mortality as well while stringency speed exhibit a significant negative correlation.

Masculinity and long term orientation is positively associated with the mortality rate. The effect of Individualism is moderated by power distance in that its associated with a higher mortality rate in countries that are characterized by a high power distance index. Conversely, individualism is negatively related to the mortality rate when power distance is low. However, the significance level of this interaction effect is only 10%. The interaction plot in figure 4 further illustrates the relation between individualism

and mortality contingent on power distance. Other interaction effects were not detected and other variables were insignificant.

4. Discussion

The results partly mirror those of previous studies. In particular, the influence of obesity and age on death rates is supported by the model. The speed of implementation of containment measures is associated with lower mortality, which was reported in previous studies as well [35,36]. Somewhat surprising, the average level of the stringency index was positively correlated with mortality, which is at odds with most of the literature [29,37,38]. Therefore, our results could be due to reverse causality that would lead to a biased parameter estimate. Controlling for this so called simultaneity bias would require the utilization of instruments which are usually hard to find. On the other hand, a recent study did not find evidence that COVID-19 related death trigger interventions, which would cause reverse causality issues. Instead it was shown that are more likely to follow the policies of nearby countries leading to badly timed lookdowns that are implemented either to early or too late [39]. This finding suggests that reverse causality might be less of a problem. Using instrumental variables and other methods to control for endogeneity Bjørnskov (2021) found no evidence of reversed causality as well and concluded that stringency measures had no or even a positive effect on mortality [40]. He used the discretionary power of governments as instrument variable because policy responses are stronger in countries in which the constitution allows for strong political responses irrespective of the pandemic situation [41]. For this reason, the instrument is correlated with the stringency index but not with mortality. Appositive relation between stringency and mortality could be observed when people subtitle gatherings in restaurants with meetings at home where they pay less attention to hygiene and distance keeping.

Turning to the culture variables, we find that individualism is related with mortality and moderated by power distance. Specifically, higher scores on the individualism dimension are related to higher death counts in presence of high values in power distance and vice versa. However, this interaction effect is only weakly significant.

The results suggests that individualistic societies can navigate well through the pandemic when they are also characterized by low power distance. Power distance on the other hand reflects decision making of authorities in a persuasive vis a vis an autocratic style and also reflects to what degree “critical thinking” is valued by a society. Therefore, our finding contradicts with the popular narrative that autocratic societies such as China are better positioned to manage the COVID 19 pandemic. For instance the UK based Daily Mail newspaper recently titled that “China was able to get a quicker grip on the virus, because people are more obedient and follow the rules” [42]. With regard to China’s containment policies the term ‘Authoritarian Advantage’ was coined [43]. Our results rather indicate that individualism that goes along with personal responsibility and critical attitude towards authority does not necessarily constitute an obstacle to the management of a pandemic.

We also observe that long term orientation shows a significant positive influence on mortality. According to Hofstede, pragmatic societies score high in this dimension in their strive to prepare for the future. Traditional societies on the other hand that value time-honored norms have relatively low scores. Moreover, in low scoring countries there is more focus on short-term and quick results. This mind set might have helped to handle the pandemic.

Finally, we observe a positive coefficient for the masculinity variable. The counterpart of masculinity is feminity that stands for a preference for cooperation, and caring for the weak and the society at large is more consensus oriented in those countries. Apparently, those characteristics are well suited to navigate through the pandemic.

In conclusion, our results suggests a significant influence of some of the culture dimensions on COVID-19 related mortality. To us, the most striking finding is that after controlling for major clinical variables, we observe that low power distance is associated with lower death rates in individualistic societies while it is associated with higher death rates more collectivistic societies. We therefore conclude that collectivism and obedience is not necessarily a good prerequisite for handling this pandemic as previous studies suggested. We also conclude that there is no universal blue print for COVID-19 containment measures and an effective policy needs to find country-specific approaches that build on local cultural circumstances.

Declarations

Conflict of interest: On behalf of all authors, the corresponding author states that there is no conflict of interest.

Competing interests: The authors declare no competing interests

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Tables

Table 1 Descriptive Statistics

Variable	Designation in model	Min	Max	Median	Std
Cumulative deaths per million population	DeathsMio	1.5	2 577.7	962.9	713.8
% of population with elevated blood pressure (SBP>=140 or DBP>=90)	Blood_Pressure	11.0	32.4	20.6	5.1
% of population with BMI > 30	Obesity	3.4	37.3	24.5	8.4
% of the population with regular tobacco use	Tobacco_Use	7.9	44.7	24.3	8.3
GDP per capita (PPP) in constant 2017 USD	GdpCapita	4 753.7	114 323.4	33 221.5	22 833.5
Annual foreign arrivals per million inhabitants	ArrivalsMio	1 981.0	14 756 238.0	763 516.3	2 473 137.0
% of population over 65	Population65	5.2	28.0	17.3	5.7
% of the population between 20 and 79 with diabetes	Diabetes	3.2	16.7	6.6	2.5
Cancer cases per 100 000 inhabitants	Cancer	100.2	1 278.5	319.4	196.1
Average daily Oxford Stringency Index since the beginning of the pandemic	Ox	33.3	72.4	55.3	8.8
Stringency Speed	speed	0.09	1.524	0.313	0.2521
Global Health Security overall index	Ghs	35.0	83.5	57.6	11.3
Hofstede – power distance	pdi	11.0	104.0	60.0	21.0
Hofstede – individualism	idv	13.0	91.0	46.0	23.3
Hofstede – uncertainty avoidance	uai	8.0	112.0	70.0	23.6
Hofstede – masculinity	mas	5.0	95.0	48.0	19.8
Hofstede – long term orientation	lto	13.0	100.0	47.0	22.3
Hofstede – indulgence	ivr	13.0	97.0	48.0	20.9
Interaction term – power distance * individualism	pdi:idv	605.0	4 875.0	2 378.0	899.9

Table 2 Regression Results

	Estimate	Standard Error	P-Value	Significance
Intercept	-2294	1768	0.203899	
Blood_Pressure	43.50	27.32	0.121443	
Obesity	40.69	16.59	0.019980	*
GdpCapita	-0.002069	0.005079	0.686620	
Tobacco_Use	-18.85	12.06	0.128266	
ArrivalsMio	0.00001913	0.00003957	0.632150	
Population65	69.02	31.15	0.034174	*
Diabetes	-21.47	37.21	0.568062	
Cancer	1.436	0.7699	0.071593	.
Ox	51.80	11.83	0.000126	***
Speed	-1346	505.9	0.012274	*
Ghs	0.6626	11.22	0.953279	
PDI	-30.57	20.05	0.137378	
UAI	-11.46	8.357	0.180112	
IDV	-60.24	27.18	0.034142	*
MAS	8.156	4.774	0.097521	.
LTO	16.09	5.818	0.009479	**
LVR	8.510	6.271	0.184582	
Pdi:idv	0.8129	0.4107	0.056697	.
Residual Standard Error: 504.2 on 31 degrees of freedom				
Multiple R-squared: 0.7002				
Adjusted R-squared: 0.5262				
F-statistic: 4.023 on 18 and 31 degrees of freedom, p-value 0.0003376				

Significance level: 0.001 (***); 0.01(**), 0.05 (*); 0.1 (.1)

Figures

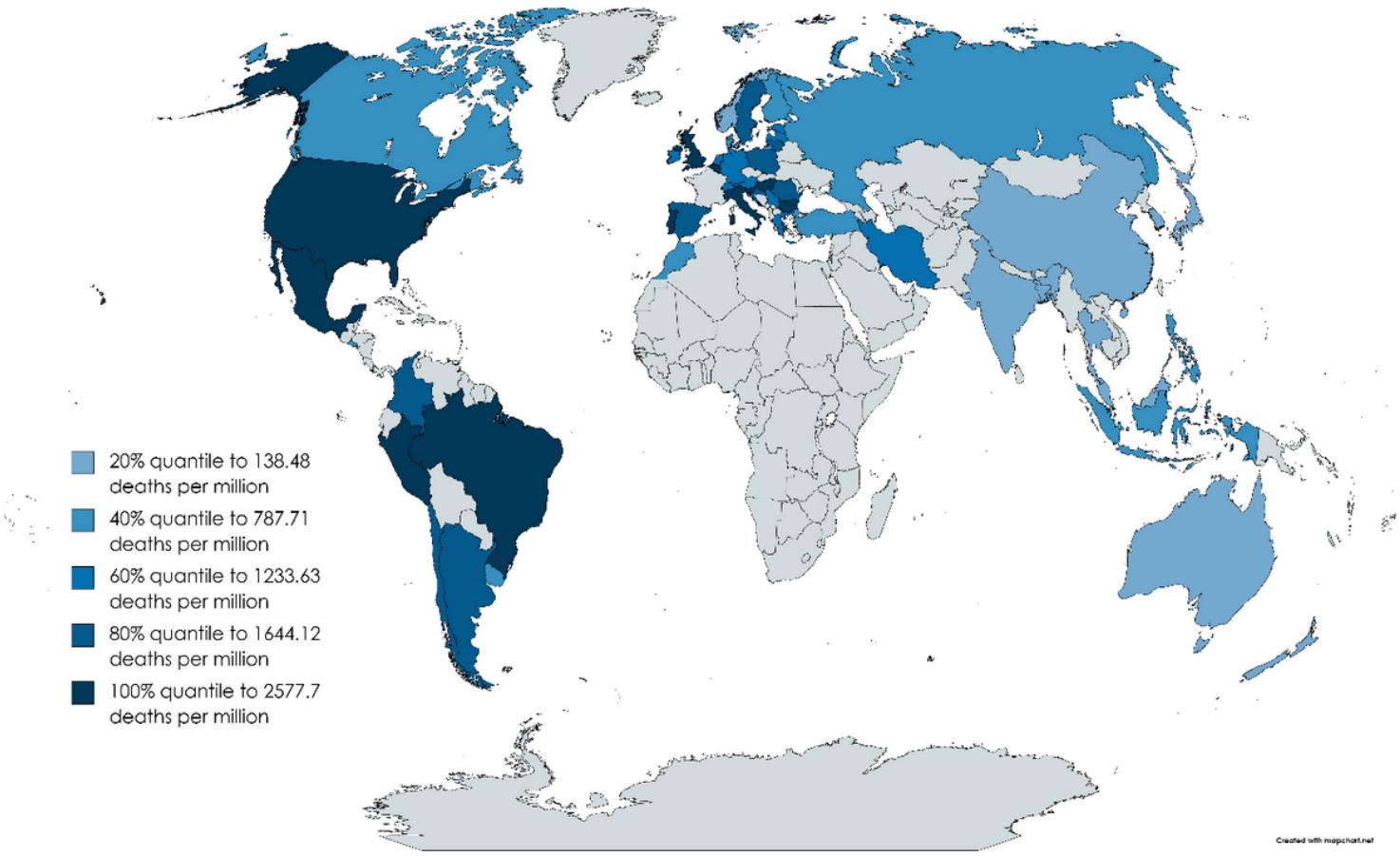

Figure 1

Map of countries included in the analysis. Shading corresponds to quantiles of deaths per million inhabitants.

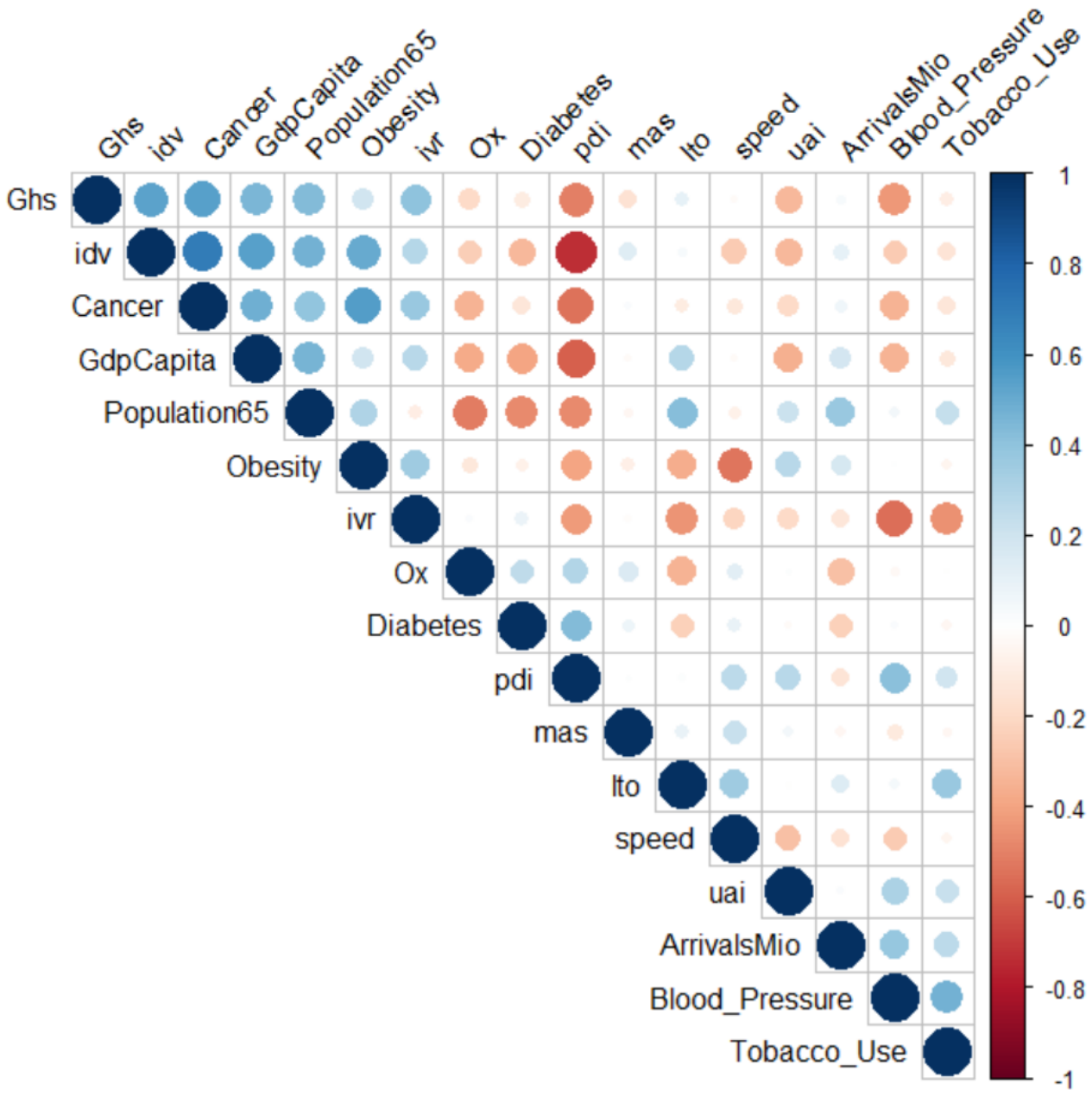

Figure 2

Correlation matrix

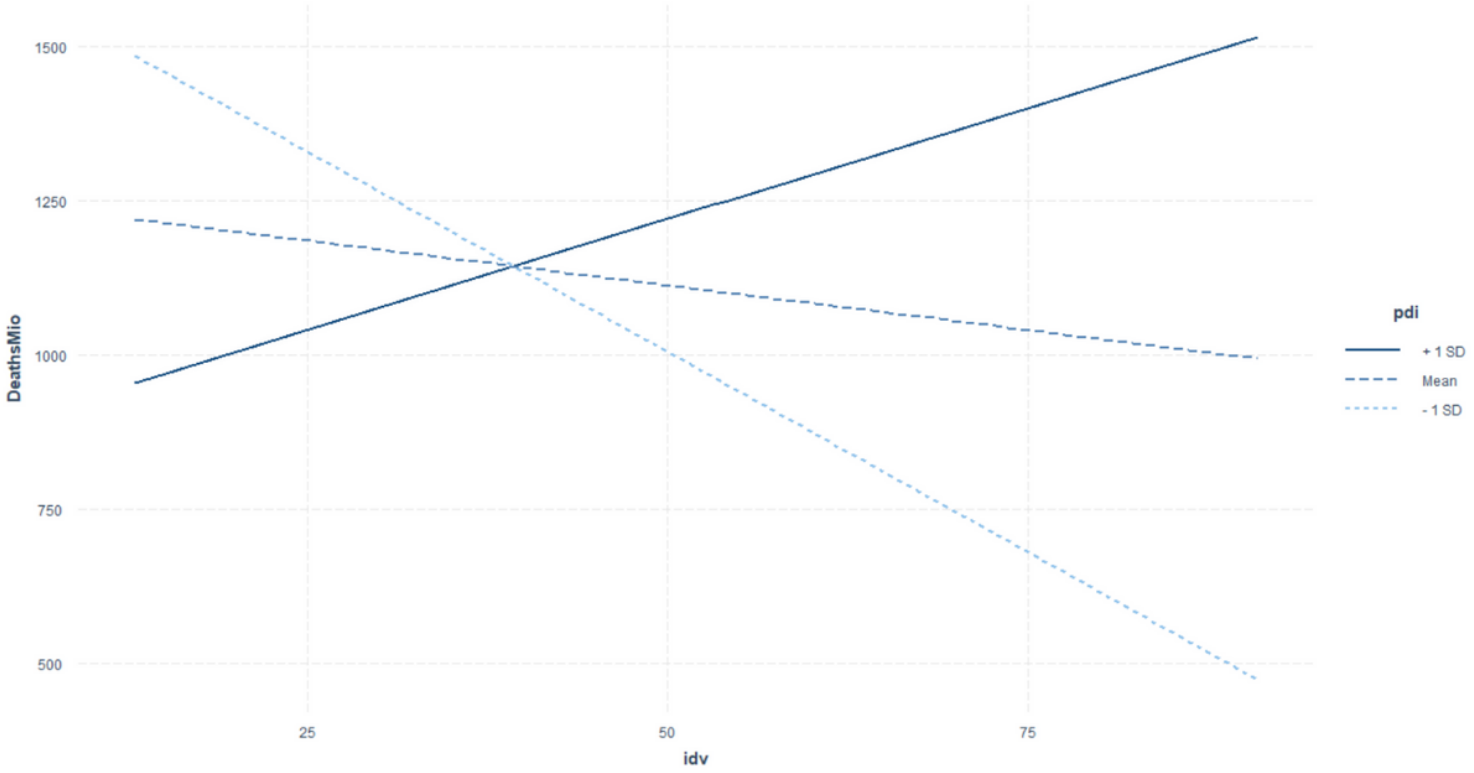

Figure 3

Interaction plot between individidualism and power distance on deaths per million population