


Worry much? Preventive health behaviours related to worry across countries amid COVID-19

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Hansika Kapoor^{1,2}  and Anirudh Tagat¹

Abstract

This study examined the relationship between worry and health behaviours using an online survey of 69,033 respondents from 32 countries. We hypothesized that past health behaviours predicted worry experienced, which in turn predicted future health behaviours, and included a metric of cultural distance from the US. Past behaviours such as maintaining physical distance predicted higher worry, whereas worry reduced the likelihood of going outside. Being culturally dissimilar to the US was associated with lower worry. However, cultural distance was not associated with future health behaviours. We analyse worry as an approach-avoidance motivator of health behaviours from a cross-cultural perspective, to facilitate effective health communication strategies.

Keywords

approach-avoidance, COVID-19, cross-cultural, preventive health behaviours, public health

The novel coronavirus (COVID-19) has spread to over 215 countries and territories across the globe; as of February 2021, there are more than 111 million confirmed cases worldwide and over 2.4 million deaths due to the virus (Dong et al., 2020). In order to contain the spread, some nations have enforced lockdown restrictions and strict social distancing guidelines in an effort to ‘flatten the curve’. This paper compares the behavioural and psychological outcomes associated with state-sanctioned measures to curb the spread of COVID-19, using online survey data from respondents in 32 countries. Several of these nations enforced lockdown measures early and swiftly to control the spread of the virus. Typically, this involves restricting the movement of citizens, closing of non-essential businesses and service providers and prohibiting social events. Further, regular communication from national health agencies has emphasized

the importance of handwashing, avoiding public gatherings and maintaining sufficient (at least 2 m) distance from others as preventive measures.

Given that the COVID-19 pandemic is a global public health crisis, when examining behavioural and psychological impacts, it is important to factor in variations in cultural context (e.g. Bish and Michie, 2010; Guan et al., 2020). There is already extensive research on mental health outcomes and preventive health

¹Monk Prayogshala, India

²University of Connecticut, USA

Corresponding author:

Hansika Kapoor, Department of Psychology, Monk Prayogshala (Sec 8), 4114, Oberoi Garden Estates, Near Chandivali Studios, Powai, Mumbai, Maharashtra 400072, India.

Email: hk@monkprayogshala.in

strategies across diverse countries such as Brazil (Giordani et al., 2020), China (Liang et al., 2020), Italy (Somma et al., 2020) and Spain (Odrizola-González et al., 2020), to name a few. Research has also suggested that public health responses at the individual and national levels can be influenced by cultural orientations (e.g. Jansen and van der Kroef, 2019; Leijen and van Herk, 2020). More recently, Muthukrishna et al. (2020) have developed a tool for measuring cultural distance – the extent to which countries exhibit differences in psychological and cultural characteristics, like Hofstede’s (1984) cultural dimensions, tightness-looseness of societies, Schwartz’s (2006) values and the Big Five personality traits, among others. Specifically, the tool assesses how culturally distant (similar or dissimilar) countries are as compared to the United States’ cultural composition. In the current investigation, the sampled countries ranged from those that were culturally similar to the USA, like Australia, and others that were more culturally distant, like Malaysia (see also Muthukrishna et al., 2020). The former countries are typically referred to as WEIRD (Western, Educated, Industrialized, Rich and Democratic), whereas the latter are non-WEIRD. There has been a recent emphasis on expanding psychological and behavioural research beyond WEIRD samples (e.g. Henrich et al., 2010; Rad et al., 2018). This also applies to mental health outcomes such as worry, which have been found to vary across cultures (Marques et al., 2011). Similarly, incorporating socio-cultural contexts in examining the determinants of health behaviours has been recommended (Singer, 2012). In line with a more inclusive research design, the present investigation also factored in cultural distance from the US when examining preventive health behaviours and worry in the context of COVID-19.

The pandemic has resulted in the formation of several new habits (social distancing) or reinforcing earlier habits (handwashing). Such behaviour patterns are likely to have consequences on daily lives, including the extent to which people worry, not just about adhering to new norms, but also regarding their health more

broadly (see also Arora and Grey, 2020). Past research found that higher anxiety was associated with complying with health behaviours, such as wearing a face mask in public, among the residents of Great Britain (Rubin et al., 2009) and Hong Kong (Liao et al., 2014) during the H1N1 flu outbreak in 2009. Recent research has also identified the mediating effect of social support on worry experienced during the COVID-19 pandemic (Zysberg and Zisberg, 2020), highlighting the importance of examining the correlates of this emotion. Given the stressful nature of adopting and maintaining new health behaviours (McKenzie and Harris, 2013), the first research question posed was:

RQ1: Do past health behaviours related to COVID-19 affect the extent to which people worry in countries culturally similar to the US versus those culturally different from the US?

In a similar vein, worry can also motivate future compliance with sustaining healthy behaviours (Sweeny and Dooley, 2017) as it is associated with adaptive preparation and planning (Watkins, 2008). From an evolutionary perspective, affective experiences like worry can facilitate adaptation by triggering approach and avoidance behaviours (Tooby and Cosmides, 2008). Individuals might adopt a cost-benefit analysis to determine whether to move towards or away from a stimulus. In such cases, emotions like worry could help in promoting adaptive behaviour. Research has suggested that such approach-avoidance motivations vary by culture (Elliot et al., 2001; Hamamura et al., 2009): persons from individualistic cultures are often motivated by approaching positive outcomes, whereas those from collectivistic cultures tend to be motivated by avoiding negative outcomes. This is likely on account of differences in information processing, with individuals from collectivist cultures paying more attention to the presence or absence of unfavourable information, whereas those from individualistic nations are prone to paying attention to the presence or absence of favourable information (Hamamura

et al., 2009). This is also supplemented by evidence that individuals from collectivist cultures engage in more avoidance-regulation as a goal, relative to those from individualistic cultures (Elliot et al., 2001). For instance, social support networks, beliefs in superstitions, among various other factors, have been found to be important for managing health-related stress in Indian samples, relative to their British counterparts (Jobanputra and Furnham, 2005). Moreover, research has found that disease threat perception varies across countries and cultures (De Zwart et al., 2009), thereby impacting the behavioural outcomes associated with the same. Therefore, the second research question posed was:

RQ2: Does the level of worry affect future behaviours in countries culturally similar to and different from the US, specifically the likelihood of leaving the house during the pandemic?

The present study was an exploratory analysis using a sample of countries that were culturally diverse, in line with past research recommending the inclusion of cultural composition when examining health behaviours, health communication and the development of public health policies (e.g. Jansen and van der Kroef, 2019; Singer, 2012). Thus, the effects on and of worry with respect to past and future health behaviours were investigated from a cross-cultural perspective.

Method

This study used data from an international survey of COVID-19 perceptions and behaviours by Fetzer et al. (2020) conducted between 20 March and 16 April, 2020. The survey contains information on past and future behaviours related to COVID-19, personal attitudes about coronavirus measures taken by governments, and perceptions about others' beliefs, government response and their efficacy. It also canvassed information on worries, depression and personality, alongside socio-demographic information from all participants. As of April

27, 2020, 113,362 participants from 179 countries had participated in the online survey. To ensure meaningful variation in within-country data, this study considered only those countries that had at least 200 participants as of April 16, 2020 which yielded 107,815 participants from 58 countries. Furthermore, we matched the measure of cultural distance from the US to the survey data using country names of respondents. The final sample size on which we have both survey data, as well as data on cultural distance, is 69,033 participants from 32 countries. These included Argentina, Australia, Brazil, Chile, China, Colombia, Ecuador, Germany, India, Japan, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Nigeria, Peru, Philippines, Poland, Qatar, Romania, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Thailand, Turkey, Ukraine, United States and Uruguay.

Participants

Participants were recruited via an invitation to participate in the online survey, hosted by Fetzer et al. (2020) on the web page covid19-survey.org. The link to participate in the surveys was circulated online via social media, with the only requirement being that participants should be above 18 years of age in order to take the survey. The survey was made available online in 68 different languages. Nearly 56% of all respondents in the final sample were women. The average age of respondents varied between countries, with the average age being 38.26 years, with a standard deviation of 12.92. As the survey was conducted online, sample weights constructed by Fetzer et al. (2020) were used in the analyses to ensure representativeness of data. The weights account for socio-demographic variations in income, age, years of education and gender. Data on population structure (age and gender) were gathered from the United Nations Statistical Agency (United Nations Statistics Division, 2020), whereas data on incomes came from the Gallup World Poll. The aggregate individual-level weights used in this study are computed by multiplying the

weights across different sociodemographic categories. Weights that account for varying country-level sample sizes were computed by dividing the value of the weights by the total number of observations in the sample. More details are available in Appendix F of Fetzer et al. (2020).

Measures

Worries index. Worry was measured using five items (Appendix A) along a five-point Likert scale (1=*does not apply at all* to 5=*strongly applies*); a sample item from the scale was ‘I am nervous when I think about current circumstances’. The worries index was cumulatively scored and moderately consistent across countries, $\alpha=0.58$.¹

Past health behaviours. Past COVID-19-related behaviours were assessed using five items: staying at home, maintaining social distance, avoiding social gatherings, informing others of exhibited symptoms and frequent handwashing, on a 100-point scale of applicability, ranging from 0=*does not apply at all* to 100=*applies very much*. Each behaviour was included as an individual standardized measure.

Future health behaviours. This comprised 11 items assessed via binary responses (0=no, 1=yes); future health behaviours related to going outside the house for various good or bad reasons. Good behaviours consisted of six items: leaving home to work, to walk their pet, doing physical activity (exercising, jogging), to visit a pharmacy, to visit a hospital or receiving medical treatment or to provide care to dependents. Bad behaviours consisted of five items: leaving home to meet with friends or relatives, because they were tired of staying indoors, being bored, potential adrenaline from breaking the law and to exercise one’s freedom. Three composite, standardized indices were computed, which measured the likelihood of going out for good reasons, for bad reasons, or for both.

Cultural distance. Cultural distance was measured using a fixation index (CF_{st}) as described in Muthukrishna et al. (2020). The underlying data comes from the World Values Survey that are expressed in terms of phenotypic differences (i.e. the responses to the items are expressed in terms of variation in culture, genes and personal experiences, among others). CF_{st} does not assume homogeneity in groups and compares distributions rather than point estimates. Cultural distance, as measured in this study represented the overall index, across all dimensions. The measure takes higher values if the country is more culturally distant to the United States (a maximum value of 1), and lower values if the country is culturally similar to the US (the US itself will take a value of 0). We chose the US as the point of comparison in this study as it is a prototypical example of a WEIRD nation (Gardiner et al., 2020).

Control variables. This included standardized variables that measured age (in years), income (in local currency), number of household members, years of education completed and health status (measured via an item that asks ‘How healthy are you?’), and responses ranged on the scale of 1=*poor* to 4=*excellent*). Binary indicator variables for gender (1=women) and marital status (1=married) were also included. The number of coronavirus cases at the time of survey completion was used as an additional control in all regressions.

Model Specification

This study hypothesized that the worries index would be explained by past engagement in COVID-19-related behaviour, as moderated by cultural distance from the United States. Thus, to answer RQ1, an ordinary least squares (OLS) regression model was estimated, where the worries index was the dependent variable, and past COVID-19 behaviours were interacted with cultural distance (a continuous variable) as explanatory variables, with the aforementioned controls. To address RQ2, the index of future

Table 1. Summary statistics of participant characteristics, attitudes and behaviours related to COVID-19.

Variables	Mean	SD
Worries index	16.93	3.615
Socio-demographic factors and controls		
Years of education completed	16.80	4.34
Income (in local currency)	538,011	4,816,000
Household size	2.95	1.76
Age in years	38.49	13.00
Average confirmed COVID cases	0.18	0.23
Applicability of past COVID-19-related behaviours		
Stayed at home	80.80	24.52
Avoided social gatherings	90.10	24.33
Maintained distance of two metres	74.44	28.44
Informed others if exhibiting symptoms	92.93	18.88
Washed hands more frequently	91.91	19.23
Likelihood of engaging in 'Good' behaviours in next 5 days:		
Going to work	0.23	0.42
Walking a pet	0.08	0.28
Doing physical activity (e.g. exercising, jogging)	0.20	0.40
Going to the pharmacy	0.16	0.36
Going to the hospital/receiving medical treatments	0.05	0.21
Taking care of dependents	0.07	0.25
Overall 'good' behaviours	0.78	0.98
Likelihood of engaging in 'Bad' behaviours in next 5 days:		
Meeting friends or relatives	0.05	0.22
Getting tired of being inside of the house	0.09	0.28
Getting bored	0.04	0.20
Getting some adrenaline (from breaking the law)	0.00	0.04
Exercising my freedom	0.02	0.14
Overall 'bad' behaviours	0.20	0.58
Observations	69,033	

behaviours (with regard to movement outdoors) was the dependent variable and the worries index was used as an independent variable, and also interacted with cultural distance from the US alongside controls. All variables were standardized in line with the procedure outlined in Fetzer et al. (2020) for ease of interpretation. In all estimations, country weights provided by Fetzer et al. (2020) were used and estimations were run using Stata 16.0.

Results

Table 1 presents the sociodemographic and COVID-19 behavioural profile of participants across countries (see also Appendix B).

Figure 1 displays the variation in the extent of worry experienced as associated with cultural distance from the US. Table 2 displays the results of the regression predicting worry on the basis of engagement in past health behaviours interacted with cultural distance from the US (RQ1). Linear associations of past behaviours with the worries index are discussed first, followed by the interaction effects. Past behaviours such as avoiding social gatherings, maintaining physical distance and regular hand washing predicted higher worry; whereas staying at home negatively predicted worry. In linear terms, being culturally distant from the US was associated with significantly lower worry. Among interaction effects, avoiding social

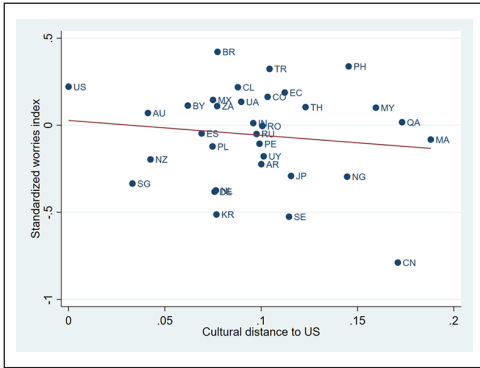


Figure 1. Scatterplot of the worries index and cultural distance from the US.

Table 2. Effects of past behaviour on worries index.

Variables	Standardized worries index
Stayed at home	-0.0405**
Avoided social gatherings	0.146***
Maintained distance of at least 2m to others	0.0913***
Informed others if exhibiting symptoms	-0.0120
Washed hands more frequently	0.130***
Cultural distance to US	-2.326**
Interaction effects	
Stayed at home × cultural distance	0.932
Avoided social gatherings × cultural distance	-2.020***
Maintain distance × cultural distance	-1.030**
Informed others if exhibiting symptoms × cultural distance	0.558***
Washed hands more frequently × cultural distance	0.125
Observations	69,033
R ²	0.121

Note. Coefficients reported are from ordinary least squares regressions that also included individual controls (standardized) of age, years of education completed, marital status, income (in local currency), household size, health status and gender. Also includes the number of coronavirus cases at the time of taking the survey. Both regressions are run using country weights computed by Fetzer et al. (2020).

** $p < 0.01$; *** $p < 0.001$.

gatherings and maintaining physical distance predicted less worry among respondents in countries culturally distant from the US. In contrast, reporting symptoms increased worry in such countries.

Table 3 presents the results of the regression predicting future behaviours pertaining to leaving the house in the next 5 days for various good reasons (e.g. to provide care to others), bad reasons (e.g. meeting friends) and a combined measure of good and bad behaviours, based on the level of worry and its interaction with cultural distance to the US (RQ2). A higher score on the worries index was associated with a reduced likelihood of leaving the home in the next 5 days (more so for ‘bad’ behaviours such as for expressing personal freedoms and meeting others socially). Unlike the worries index, being culturally distant from the US was not significantly associated with (future) going out behaviours. For individuals in countries culturally distant to the US, a higher score on the worries index was associated with a greater likelihood of leaving the house.

Discussion

The purpose of this investigation was to determine the relationship of worry as an outcome of past behaviours and as a predictor of future behaviours related to the ongoing coronavirus pandemic across cultures. Using data from a cross-section of participants from 32 countries, similarities as well as differences were noted in behavioural and affective responses. As of February 2021, there are few other studies that deal explicitly with cultural differences in COVID-19-related behaviours and emotions (but see Gelfand et al., 2021; Gokmen et al., 2021; Muurlink and Taylor-Robinson, 2020). Each of these highlights the potential role of cultural differences, while one (Muurlink and Taylor-Robinson, 2020) looks at the intersection of gender and culture. Finally, recent work has stressed the importance of culture in determining how stringency of COVID-19 responses could be associated with innovation as well (Kapoor et al., 2021). This study contributed to

Table 3. Effect of worries index on future behaviours.

Variables	Bad going out behaviours	All going out behaviours	Good going out behaviours
Cultural distance to US	-1.707	-1.314	-0.680
Standardized worries index	-0.156***	-0.144***	-0.0925***
Worries index \times cultural distance	0.980**	1.386***	1.200***
Observations	69,033	69,033	69,033
R ²	0.033	0.054	0.064

Note. Coefficients reported are from ordinary least squares regressions that also included individual controls (standardized).

** $p < 0.01$; *** $p < 0.001$.

the ongoing understanding of health behaviours in a pandemic, but included variations in cultural contexts within which such behaviours take place. In general, engaging in past health behaviours such as avoiding social gatherings, maintaining social distance and frequent handwashing increased the level of worry experienced. Estimating a spatial distance of 2 m constantly required additional cognitive capacities, such as the application of conscious control on a seemingly automatic social activity (Bargh and Chartrand, 1999). For instance, Johnson et al. (2009) found that having varying goals (e.g. urgency) affects the estimation of spatial distances, as well as subsequent sense of anxiety.

Similarly, more worry was associated with higher frequency of handwashing across all respondents. This may be possibly due to the fact that regular and frequent handwashing was one of the earliest interventions communicated by the WHO as well as national health agencies across countries. In general, a positive association has been found between experiencing worry during an outbreak and handwashing behaviours (e.g. Rubin et al., 2009; White et al., 2020), largely motivated by fear and disgust sensitivity to avoid pathogens (see also Curtis et al., 2011). On the other hand, staying at home lowered worry; it is important to note that the data used in the current analysis was from the early months of the pandemic, where stay-at-home orders may not yet have had long-term effects on mental health. However, subsequent

research has identified dire impacts on mental health as a result of state-sanctioned stay-at-home orders (e.g. Tull et al., 2020). Less worry was also associated with cultures more dissimilar to the US. This is consistent with earlier research identifying lower prevalence rates of anxiety disorders in Asian, Latin American and African-American populations than in White populations (Marques et al., 2011). One of the reasons for this discrepancy could be that current conceptualizations of worry and anxiety do not adequately represent somatic complaints more frequently reported in cultures distant from the US.

When health behaviours and cultural distance were considered in conjunction, it was found that past health behaviours (avoiding social gatherings and maintaining physical distance) predicted less worry among respondents in countries culturally distant from the US. By avoiding public gatherings, individuals in such nations were adhering to the binding moral foundations of ingroup/loyalty and authority, indicative of a socially-oriented moral stance (Jia and Krettenauer, 2017; Khan and Stagnaro, 2016). This may have impacted the experience of worry, as avoiding social interactions could have been perceived as contributing to the collective good. Such participation could have led to greater self-worth, potentially reducing worry (Becker et al., 2011). On the other hand, cultures similar to the US tend to be individualistic in nature; thus, it is likely that personal freedoms are highly valued. Further, those who

hold liberal opinions tend to be WEIRDer than conservatives, even if they belong to the same country (Talhelm et al., 2015). Overall, this implies that restricting personal freedoms (such as freedom of movement) could be associated with experiences of greater worry.

In contrast, reporting symptoms increased worry in countries culturally distant from the US. This was consistent with past evidence on health behaviours during pandemics (Bish and Michie, 2010), where anticipated, experienced and current worry were positively associated with protective health behaviours (Liao et al., 2014). Further, it is likely that individuals in non-WEIRD countries who reported symptoms may experience worry on two accounts: first, due to the potential virus transmission that may be leading to symptoms, and/or second due to variations in public trust in health care systems (Zhao et al., 2019). However, the present investigation did not consider the latter.

Worry was perceived differently as an approach or avoidance motivator (Roth and Cohen, 1986) across countries, where more worry reduced the likelihood of leaving home in the next 5 days, for both good and bad reasons. In general, cultural distance from the US did not impact future going out behaviours. However, when both worry and cultural distance were considered together, greater worry implied leaving the house more in countries culturally distant from the US. In such non-WEIRD countries, worry motivated individuals to go out of their homes for various prosocial and selfish reasons to maintain existing relationships. Non-WEIRD nations are relatively more collectivist than their WEIRD counterparts, with thicker social networks based on higher relational and communal behaviour (Hofstede Insights, 2020). At the same time, due to cultural differences in threat perception, worry may not have been at a high enough level to prevent leaving the house. It is likely that illness representations vary across cultures (Leventhal et al., 1998), thereby influencing the appraisal of illness as well as coping mechanisms associated with the same (see also Rüdell et al., 2009). In the context of the present investigation, it is possible that effective coping during the pandemic was conceptualized as leaving the house

more in countries culturally distant from the US. Although research has emphasized our general tendency to seek rewarding social interactions (Krach et al., 2010; Lahvis, 2016), we do not have evidence to suggest that such motivations differ across cultures.

On the other hand, greater worry indicated that citizens in countries culturally similar to the US would stay at home, consequently avoiding the virus. Research has shown that there is adaptive benefit to this kind of worry, which can facilitate taking more precautions concerning health behaviours, due to increased processing of the threat (Notebaert et al., 2014). Further, WEIRD countries are relatively more individualistic, with an emphasis on a lower degree of interdependence within networks in society.

Capitalizing on such differences in approach-avoidance motivations across cultures can help inform health communication strategies (Sherman et al., 2011). For instance, highlighting potential losses from not following stay-at-home instructions (e.g. contracting the virus, transmitting the virus to loved ones) may be more effective in collectivistic cultures motivated to avoid negative consequences. Likewise, emphasizing potential gains from engaging in health behaviours (e.g. protecting oneself and loved ones) may be more successful in individualistic cultures driven towards positive consequences. Such congruence between approach-avoidance motivations and health message framing increases compliance with health-oriented behaviour (e.g. Sherman et al., 2006).

Limitations and conclusion

The study was not without limitations. First, the survey data were cross-sectional in nature and did not provide longitudinal estimates of the quarantine behaviours or of worry. Future waves of data can be appended to the current study as and when they become available. Second, most data were collected before 3 April 2020, suggesting that there may be a lag in the behavioural and emotional consequences of the lockdown which this study does not address. Third, other relevant variables like self-efficacy

with respect to health behaviours, personality and public trust in health systems could influence the relationship between worry and past/future behaviours; subsequent research can explore such associations.

In sum, this study highlighted the behavioural antecedents and consequences of worry among respondents from 32 nations, with reference to the ongoing COVID-19 pandemic. The present work also provides motivation to incorporate measures of cultural distance as a means to capture variations in culture, particularly in behavioural studies using survey data across countries (see also Gardiner et al., 2020). This is more evident when such studies have significant policy implications, like those associated with the COVID-19 pandemic. Cross-cultural differences in approach-avoidance motivations can help inform appropriate health policy responses in WEIRD and non-WEIRD countries.

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ORCID iD

Hansika Kapoor  <https://orcid.org/0000-0002-0805-7752>

Data sharing statement

Datasets and code for this paper comes from Fetzer et al. (2020) and can be accessed at <https://osf.io/3sn2k/>

Note

1. Data on additional measures, such as the Big Five personality traits, were available but had

low reliability; Cronbach's alpha ranged from 0.28 to 0.67. Prior research has indicated less than favourable personality measurement and assessment using this Ten-Item Personality Inventory (e.g. De Francisco Carvalho et al., 2012).

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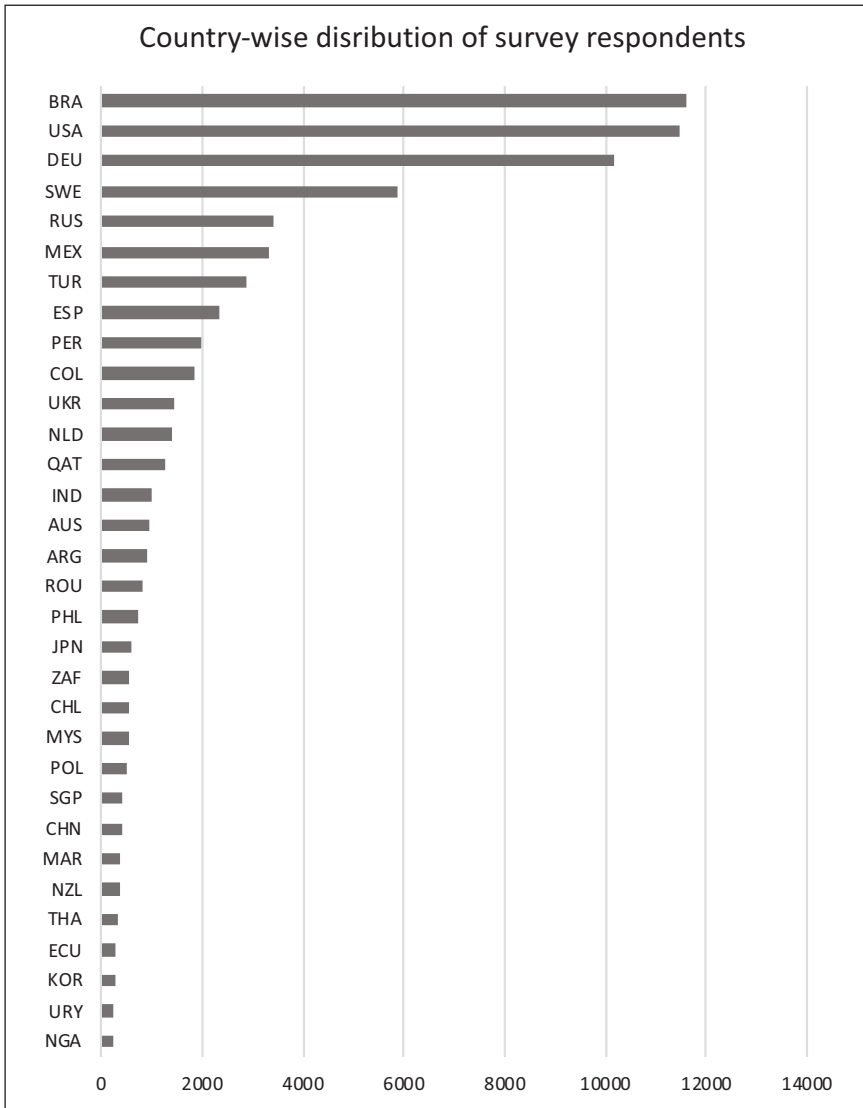
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Appendix A: The worries index (Fetzer et al., 2020)

1. I am nervous when I think about current circumstances.
2. I am calm and relaxed (reverse scored).
3. I am worried about my health.
4. I am worried about the health of my family members.
5. I am stressed about leaving my house.



Appendix B. Country-wise distribution of participants.