“Blessed are the Nations with High Levels of Schizophrenia”: National Level Schizophrenia Prevalence and Its Relationship with National Levels of Religiosity

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Abstract
Schizophrenia is correlated with religious delusions but, heretofore, the relationship between schizophrenia prevalence and religiosity has not been explored at the national level. Examining this relationship, we find that national level schizophrenia prevalence is correlated with national level religiosity and strongly negatively correlated with national level atheism across 125 countries. When controlling for cognitive performance and economic development in multiple regression analyses, the proportion of the variance explained was 2.9% ($p < .005$) for Religiousness and 5.1% for Atheism ($p < .00005$). Alternative causal interpretations of this association are discussed.

Keywords Religion · Atheism · Schizophrenia · Health · Intelligence

Introduction
The extent of belief in God or gods and adherence to religious ideas varies vastly across individuals and between countries. Why is this? Religiosity seems to have a profound influence on peoples’ behaviour and experiences, including on their physical health, psychological well-being, and quality of life, as reviewed by Koenig (2012). Religiosity is, therefore, of great importance and has strong implications for how people conduct themselves in groups and form their societies. Schizophrenia is one factor that has been implicated in this regard, as it is associated with religious delusions and hyper-religiosity.

That such associations exist makes a great deal of theoretical sense. Schizophrenia is conceived of, in part, as hyper-mentalism. Mentalising involves being...
observant of external cues of many kinds, and being interested in deducing people’s mental states from these cues. There is a range of severity to schizophrenia-type conditions. Mild symptoms are summarised as ‘schizoid personality.’ This is characterised by anhedonia and apathy. More severe is ‘schizotypal personality,’ where the schizoid symptoms are accompanied by social anxiety, paranoid ideation, unconventional, or paranoid beliefs and, sometimes, psychosis (Hodgekins, 2015, p. 184). Diagnosable schizophrenia is a particularly severe manifestation of these characteristics (Dowson & Grounds, 2006). Badcock (2003) has argued that schizophrenics practice mentalising to a pathological degree. They are obsessed with such cues and are so hyper-sensitive to them that they read too much into them. This means that a frown could be interpreted as murderous intent, leading to schizophrenics becoming paranoid. This extends to how schizophrenics experience the world. They strongly perceive cues of a mind from everyday observation of the world itself. This heightened propensity to perceive associations and patterns also seems to be associated with creativity, in terms of attaining artistic education (MacCabe et al., 2018) and producing academic publications (Dutton et al., 2020).

Empirically, we find that an individual’s placing on the spectrum that has schizophrenia at one extreme is correlated with experiencing religious delusions, as for example in a study of the Xhosa (Connell et al., 2015), and believing in the paranormal (Thalbourne, 1994) and outlandish conspiracy theories (Barron et al., 2018). See Rogers and Paloutzian (2006) for a review. On the basis that religious delusions are associated with religiosity, we would expect schizophrenia to also be associated with hyper-religiosity. One third of schizophrenics are indeed very strongly involved with their local mainstream church, and a further 10% are involved in small sects that tend to be fervently religious, known as New Religious Movements, according to data from Switzerland (Huguelet et al., 2006). These are much higher proportions than in the general population. A systematic literature review looked at finer grained relationships, such as between schizophrenia and types of religiosity, but, similarly, concluded that hyper-religiosity is a robust correlate of schizophrenia (Grover et al., 2014). It is therefore reasonable to assume that a person’s position on a dimension from the lowest level of schizotypal personality to a schizophrenia diagnosis is to some extent associated with that person’s level of religiousness.

This raises the question of whether this association is also reflected at the group level. There are substantial and robust national differences in how religious people in different countries are (e.g. Zuckerman, 2007). This tendency may also include believing in a metaphysical reality, for example. Furthermore, there are differences in religiosity between ethnic groups within multi-ethnic societies, and these persist even when controlling for factors that might influence religiosity, such as socioeconomic status (Kanazawa et al., 2007; Chatters et al., 2009). Controlling for these factors is important because stress, mortality salience, and feelings of social exclusion have been shown to elevate religiosity (Norenzayan & Shariff, 2008). Schizophrenia also seems to be influenced by stress, at least in individuals with a genetic propensity for this condition (e.g. Gomes & Grace, 2017). It might therefore be argued that hardships such as poverty contributes to country level differences in schizophrenia, which would be consistent with the fact that schizophrenia is less prevalent in developed, wealthy countries (World Health Organisation, 2004, p. 35).
There are nevertheless also pronounced differences in religiosity between socioeconomically and culturally similar countries. For example, based on data from 2007, 68% of Finns claim to believe in God, compared to 45% of Swedes (Dutton, 2014, Ch. 12). Similarly, there are national differences in the prevalence of schizophrenia (e.g. Saha et al., 2005) and, in some cases, there are very substantial differences between neighbouring (and socioeconomically and culturally relatively similar) countries, such as between Sweden and Finland, with the Finnish schizophrenia prevalence being double that of Sweden (Suvisaari et al., 1999). Indeed, Finland provides a natural control for nationality, in that 1.5% of Finns have been diagnosed with schizophrenia compared to 0.7% of Finland’s Swedish-speaking minority (Suvisaari et al., 2014). In the USA, it has been found that African-Americans are twice as likely as Whites to suffer from schizophrenia, even when controlling for socioeconomic factors (Bresnahan et al., 2007). The heritability of schizophrenia is extremely high, at the level of about 0.8 (Ekelund et al., 2000; Hiker et al., 2018). One should therefore expect group differences in schizophrenia to follow ethnic lines, which typically coincide with national states (see Salter, 2007). Thus, assuming that a group’s average level of schizotypy is reflected by its schizophrenia prevalence, we would expect the latter to be associated with its average level of religiousness. This is a reasonable assumption, as it has been shown that the higher people score on the schizotypy scale, the greater is their risk of schizophrenia (Lenzenweger, 2018).

Religiosity has decreased rapidly in the industrialised world in recent centuries, which has largely coincided with its economic development. Across countries, there remains a strong negative correlation between religiosity and level of economic development (for a review, see Lynn et al., 2009). We cannot say to what extent the causality goes in one or the other direction, but because of the rapid secular change it would seem likely that any factors associated with economic development, such as higher level of education, better healthcare, stronger rule of law, and higher levels of security might reduce the need for, and deter people from, religious worship. In any case, we must control for the level of economic development, as mentioned above, with a suitable proxy being per capita gross domestic product (GDP). Furthermore, wealth and income are in turn robustly correlated with intelligence, and intelligence is in turn negatively correlated with schizophrenia (for a meta-analysis, see Mesholam-Gately et al., 2009). This association seems to have common genetic influences (Hagenaars et al., 2016), which suggests it would be very strong at the level of nations, which represent the average across huge numbers of individuals who are typically more genetically similar than across country borders (see Salter, 2007). A negative correlation between religiosity and intelligence might therefore be driven entirely by the association between intelligence and schizophrenia, so we have to control for intelligence.

Thus, we test the hypothesis that there is a positive relationship between religiosity and schizophrenia prevalence at the national level, controlling for economic development and cognitive ability.
Method

General Approach and Data Collection Procedures

Data were compiled from several different sources, as described in detail below. There are almost two hundred countries in the world, and an additional few dozen demographic territories that are meaningful units of analysis for the present questions. Several countries and territories do not participate in various measurement programs, however, and data are therefore not available for all countries. Moreover, the number of countries that have complete data decreases the more measures that are required for a particular analysis. Based on the availability of data, we used 125 out of our list of 220 countries and territories. These are found in Table 6 together with the raw variables used in the present analyses. For religiosity, we draw upon two different measures from two different reviews that compile data from the World Values survey, and intelligence is gauged via student achievement test scores. Schizophrenia prevalence estimates come from the World Health Organisation. All of these measures, except the GDP, are based on samples of the country populations that have been selected by the organisations that have measured them, and we refer to these sources for more detailed information about sample sizes and sampling procedures. However, being a cross-sectional design, it cannot inform about causality with regard to the national level religiosity-schizophrenia nexus. Analyses were performed in Statistica v. 7.1 (Statsoft, Inc.) and IBM SPSS Amos v. 21.

Religiosity and Atheism

Zuckerman (2007) reviewed a number of surveys and other studies reflecting the proportions of people claiming to be religious or otherwise in different countries. He noted a range of potential problems with these data, including low response rates and political climates that may deter respondents from disclosing their atheism or religiosity, and that these factors differ across countries. Nevertheless, data from the World Values Survey, conducted between 1999 and 2002 would seem to be the best available data, according to Lynn et al. (2009). Thus, the data used in the present study were taken from Lynn et al. (2009), who calculated the atheism variable, and from Lynn and Vanhanen (2012), who calculated the religiosity variable, using the following questions in the World Values Survey:

A006. Religion important. Question: for each of the following aspects, indicate how important it is in your life. [Religion]. Response: very important (%).
F024. Belonging to a religious denomination. Question: Do you belong to a religious denomination? Response: Yes (%).
F028. How often do you attend religious services? Question: Apart from weddings, funerals and christenings, about how often do you attend religious services these days? Response: Once a month or more (%).
F034. Religious person. Question: Independently of whether you go to church or not, would you say you are... Response: A religious person (%).

F050. Believe in God. Question: Which, if any, of the following do you believe in? [Believe in God]. Response: Yes (%).

F063. How important is God in your life? Please use this scale to indicate. (10 means very important and 1 means not important at all). Response: codes 7 to 10.

Estimates of the proportion of the population who consider themselves religious were available for 144 countries in total, and for these countries Atheism estimates were missing for Bosnia and Herzegovina, Cyprus, Malta, Myanmar, North Korea, Puerto Rico, and Sudan, which leaves 137 estimates.

**Schizophrenia Prevalence**

Schizophrenia prevalence was obtained for 156 countries using the Daily Adjusted Life Year (DALY) measure, which assesses mortality and morbidity, in terms of the number of years of healthy life lost to a particular disease per 100,000 residents. We used a data set from 2004, which seems to be the most recent set of concurrent data for the countries in the present study (World Health Organisation, 2004). The DALY data were preferred because they are generally more comparable than those from the landmark academic meta-analysis of national differences in schizophrenia (Saha et al., 2005), which involved small and incomparable samples. It might be argued that international comparisons of schizophrenia prevalence are difficult to make due to differences in access to healthcare and even national differences in awareness of mental illness. However, developed countries have reasonably more extensive healthcare, which will detect more cases of schizophrenia, so the fact that developed countries report lower rates of schizophrenia than do developing countries speaks against this confound.

**Gross Domestic Product (GDP) Per Capita**

GDP was extracted from the United Nations statistics website, and we downloaded the most recent figures from 2018, in US dollars, for 212 countries (United Nations, 2020).

**Mean National Level Intelligence Estimates**

We used the World Bank’s National Harmonised Test Scores (NHTS) as a proxy for national levels of intelligence (Patrinos & Angrist, 2018). The best source of national IQ estimates is the work of Lynn and Becker (2019), which compiles and critically evaluates a large body of empirical studies, building on previous reviews (Lynn & Vanhanen, 2002, 2012). However, these estimates do not exist for all countries, which can limit their utility when global relationships are considered. Lynn and Becker report estimates for 168 countries in total, 113 of which overlap with countries that we also have religiousness data for. NHTS data were available for
175 countries, 120 of which overlap with the religiousness data. The validity of the NHTS as a proxy for intelligence is supported by a Pearson correlation of 0.854 with the Lynn and Becker data for the 109 countries that had estimates for both.

Control for Spatial Autocorrelation

There are likely many factors that may influence the key variables schizophrenia and religiousness and atheism other than the ones included in our analyses. Many of these are associated with a country’s geographical location, through climate, culture, and other environmental influences. We control, to some extent, for such spatial autocorrelation by categorising the countries into regions identified to account for such major differences by anthropological research. Specifically, each country was dummy-coded into one of Murdock’s (1949) six regions, namely Africa, Insular Pacific, East Eurasia, North America, South America, and West Eurasia.

Results

The availability of data differed across the countries: GDP (212), Schizophrenia (156), NHTS (175), Religiousness (144), and Atheism (137). Because the pattern of available data varied across variables, only 116 countries had complete data. A meaningful analysis should include at least Schizophrenia and one index of religiosity. This condition was fulfilled for 125 countries for Religiousness and 121 countries for Atheism, as no country with an Atheism estimate lacked a Religiousness estimate. The selected countries and their raw values for each of the five variables are listed in Table 6 in the Appendix.

Table 1 lists the descriptive statistics across countries, showing that for all variables except GDP and Atheism, the raw values were sufficiently normally distributed to fulfil the assumptions behind the parametric analyses, with skewness and kurtosis estimates within ±2.0 (George & Mallery, 2010). This could be achieved also for GDP and Atheism, by taking the natural logarithm of GDP and the inverse of Atheism ((1 + X)^-0.5). The variables and their transformations used in the following analysis are marked in bold in Table 1.

Table 1 Descriptive statistics, including transformations

| Variables                  | N   | M     | Min    | Max    | SD    | Skewness | Kurtosis |
|----------------------------|-----|-------|--------|--------|-------|----------|----------|
| GDP per capita ($)         | 125 | 15,354| 99.57  | 82,708.51| 20,341.4| 1.701     | 2.112    |
| Log GDP per capita         | 125 | 8.65  | 4.60   | 11.32  | 1.55  | −0.0925  | −0.894   |
| NHTS                       | 121 | 428.13| 304.97 | 575.3  | 64.05 | 0.132     | −0.994   |
| Religiousness (%)          | 125 | 86.74 | 44.60  | 99.50  | 14.14 | −0.0965  | −0.514   |
| Atheism (%)                | 121 | 9.24  | 0.50   | 64.00  | 14.05 | 1.980     | 3.473    |
| Inverse Atheism            | 121 | 0.54  | 0.124  | 0.820  | 0.260 | −0.232    | −1.627   |
| Schizophrenia              | 125 | 239.96| 164.25 | 321.87 | 36.06 | −0.0865  | −0.514   |

Variables used in the analyses are bold
Table 2 shows that all Pearson zero-order correlations between the selected variables exhibit medium to strong correlations, which were all statistically significant.

To account for the unique association between Schizophrenia and the two religiosity measures, one multiple regression was computed for each of these, as seen in Table 3. When combined together, the four predictor variables apparently account for 56.7% and 67.4% of the variance, for Religiousness and Inverse Atheism, respectively. While the contribution of GDP is negligible and also non-significant, Schizophrenia seems to make a small but significant contribution, even though it is dwarfed by the large effect of NHTS. We computed the squared semi-partial correlations as estimates of the unique variance, indicating unique contributions of between 3 and 5%.

Table 2 Pearson zero-order correlation matrix for all selected variables

|       | 2   | 3   | 4   | 5   |
|-------|-----|-----|-----|-----|
| 1 Religiousness | 0.872 | 0.592 | -0.749 | -0.616 |
| 2 Inverse Atheism | - | 0.639 | -0.790 | -0.686 |
| 3 Schizophrenia | - | - | 0.576 | -0.476 |
| 4 NHTS | - | - | 0.803 | |
| 5 Log GDP per capita | - | - | - | |

All \( p < .00001 \). All \( N = 125 \) except those involving Atheism \( N = 121 \)

Table 3 Results of linear regressions of Schizophrenia, NHTS, GDP, and Murdock region upon the two religiosity measures

|              | \( \beta \) | \( r^2 \) | \( p \) |
|--------------|-------------|-----------|-------|
| **Regression summary for Religiousness**<sup>a</sup> | | | |
| Intercept | | <.00001 | |
| Schizophrenia | 0.207 | 0.029 | <.005 |
| NHTS | -0.553 | 0.105 | <.00001 |
| Log GDP per capita | -0.098 | 0.0034 | =.33 |
| Murdock region | 0.017 | 0.0005 | =.81 |
| **Regression summary for Inverse Atheism**<sup>b</sup> | | | |
| Intercept | | <.00001 | |
| Schizophrenia | 0.276 | 0.051 | <.00005 |
| NHTS | -0.516 | 0.080 | <.00001 |
| Log GDP per capita | -0.098 | 0.003 | =.30 |
| Murdock region | -0.078 | 0.004 | =.22 |

Note. \( r^2 = \) squared semi-partial correlations, <sup>a</sup>\( N = 125 \), \( R = .740 \), \( R^2 = .548 \), Adjusted \( R^2 = .537 \) <sup>b</sup>\( N = 121 \), \( R = .828 \), \( R^2 = .685 \), Adjusted \( R^2 = .674 \)

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Apparently, NHTS also assumes most of the variance associated with GDP, rendering its actual associations with Religiousness and Atheism non-significant. The Variance Inflation Factors ranged from 0.419 to 2.90 for Religiousness and from 0.314 to 3.28 for Inverse Atheism. As that is less than 5, we conclude that there is no substantial multicollinearity (Kutner et al., 2005). Furthermore, we estimated the
skewness of the residual model co-variances to fall between those two values in all cases in order to satisfy the basic requirement for regression analysis.

We mentioned in the Introduction that associations have been found between schizophrenia and stress (e.g. Gomes & Grace, 2017), which might arguably be induced by poverty and its associated conditions. As the regression models run so far do not speak directly to this issue, we ran a third regression to specifically test the association between Schizophrenia and GDP, controlling for all the other variables. This model explained around 35% of the variance, as seen in Table 4, which is substantially less than the 55–67% for the models that predict Religiousness through all the other variables. This model, moreover, exhibited significant associations only between schizophrenia and inverse atheism, the latter of which apparently assumed most of the variance associated with religiousness.

To further elucidate these rather complex associations, we conducted a path analysis to incorporate both measures of religiosity in the same model and assess the overall model fit. Several different models were estimated, and that which produced the best model fit is depicted in Fig. 1, namely $\chi^2(1) = 1.33$, $ns$, CFI = 0.99, RMSEA = 0.051, 90% CI = 0.000, 0.249. Again, both Schizophrenia and NHTS exhibit highly significant paths to both Atheism and Religiousness, even when the two latter occur in the same model. Atheism and religiousness are associated close to unity, while the associations with Atheism appear again to be stronger than those to Religiousness, as seen in Table 5, listing the model parameters.

Overall, the path model renders additional support to the direct effect of Schizophrenia on religiosity. Models with paths from GDP to Schizophrenia exhibited substantially worse fits, which together with the relative strengths of the associations speaks against any significant causal link between these two variables.

**Discussion**

Our key finding is that schizophrenia prevalence is substantially correlated with two different measures of religiosity, namely Religiousness (positively) and Atheism (negatively), and that meaningful associations remain even after controlling for GDP, NHTS, and spatial autocorrelation. The fact that Religiousness is correlated with Inverse Atheism at 0.87 likely reflects the distinction between not believing in

| Table 4 Regression summary for Schizophrenia |
|---------------------------------------------|
| $\beta$  | $r^2$  | $p$    |
| Intercept |        | $< .0001$ |
| Religiousness | $- 0.184$ | $0.008$ | $.22$ |
| Inverse Atheism | $0.554$ | $0.060$ | $< .001$ |
| NHTS | $- 0.178$ | $0.007$ | $.24$ |
| Log GDP per capita | $- 0.130$ | $0.005$ | $.31$ |
| Murdock region | $- 0.092$ | $0.006$ | $.28$ |

Note. $N=124$, $R = .616$, $R^2 = .379$, Adjusted $R^2 = .353$, $r^2 =$ squared semi-partial correlations
God and actively believing that there is no God, a belief known as ‘hard atheism.’ We further conclude that this association is not substantially driven by an association between schizophrenia and GDP, with GDP being a proxy for poverty or stress. The third regression model, which tested the association between schizophrenia as the dependent variable, and all other variables as predictors, explained substantially less variance than the models that pitted the religiosity indicators against all other variables. This indicates that wealth, or its inverse poverty, is not mainly driving the associations between religiosity and schizophrenia, for example through some...
confound with country level differences in development or cultural factors. This has also been shown when making inter-racial comparisons and controlling for key environmental variables such as socioeconomic status (Bresnahan et al., 2007).

**Limitations**

As noted above, religiosity becomes elevated at times of stress, and it has also been proposed that this is the case also for symptoms of schizophrenia (Corcoran et al., 2002). Indeed, a number of analyses have demonstrated that periods of stress seem to induce schizophrenia symptoms in those with a genetic propensity towards the condition (e.g. Gomes & Grace, 2017). On the one hand, this would be consistent with our finding that schizophrenia prevalence correlates with national GDP at -0.47 and the fact that schizophrenia is far less prevalent in developed, wealthy countries (World Health Organisation, 2004). On the other hand this interpretation not supported by the models in Tables 4 and 5, nor by the very high heritability of schizophrenia. For example, the heritability of schizophrenia was estimated to 0.79 in Denmark (Hiker et al., 2018) and 0.83 in Finland (Ekelund et al., 2000). This implies that national differences in schizophrenia are unlikely to be substantially explained by stress, due to poverty. Rather, many researchers argue that schizophrenia, being strongly genetic, leads to poverty (e.g. Jeffries et al., 1990, p. 4).

It is possible that although the disposition for schizophrenia is strongly genetic, the condition is only induced in certain conditions, such as those of poverty or high stress. This is consistent with the finding that the effects of environmental factors on schizophrenia decrease to very small levels when genetics is controlled for (Moffitt & Caspi, 2006, p. 67). For a review of gene-environment interaction effects in schizophrenia, see Moran et al. (2016).

Similarly, there may also be a direct environmental link such that the suffering that schizophrenia inflicts may make those individuals more likely to turn to religion for comfort. However, the average proportion of national populations that are religious is in the order of 85 to 90%, while the average point prevalence of schizophrenia is about 0.28% (Charlson et al., 2018). It is extremely unlikely that this small proportion of individuals would be able to have an impact on the religiousness estimates, even if every one of them actually were religious. Rather, as discussed above, we argue that schizotypy is the driving factor, which is in turn reflected in schizophrenia.

Further, making assertions at the population or country level about the relationship between schizophrenia and religiosity also risks the ‘ecological fallacy,’ whereby a relationship that holds at the individual level is not necessarily true at the group level. For example, at the individual level religiousness is robustly correlated with physical health (Koenig, 2012). However, countries that have relatively poor public health tend to be more religious (Lynn & Vanhanen, 2012). That said, it is a matter of debate whether religiousness makes you healthier or whether religiousness and sound health are expressions of some underlying factor (see Dutton et al., 2018). If, however, schizophrenia causes people to be more religious at the individual level, then we would expect that a group of individuals with a higher schizophrenia
prevalence would, on average, be more religious than a group of individuals with a lower schizophrenia prevalence.

In conclusion, we must ask ourselves which interpretation with regard to the national level religiosity-schizophrenia nexus is the most parsimonious. Is schizophrenia a partial cause of national differences in religiosity or not a cause, meaning that the nexus is entirely mediated by some other factor? To this, we submit that differences in schizophrenia prevalence are likely to be substantially genetic in origin, and that the available evidence suggests the simplest explanation is that schizophrenia is a causal factor in national differences in religiosity. That said, we reach this conclusion with caution, due to the nature of the data at hand.

Appendix

See Table 6.

Table 6 List of all countries included in the analyses, with their raw data

| Country            | Murdock region | GDP       | Religiousness | Atheism | Schizophrenia | NHTS   |
|--------------------|----------------|-----------|---------------|---------|---------------|--------|
| Afghanistan        | EastEurasia    | 551.865   | 99.5          | 0.5     | 253.778       | 354.7588|
| Albania            | WestEurasia    | 5223.809  | 75.8          | 8.0     | 247.412       | 434.1276|
| Algeria            | Africa         | 4114.706  | 91.9          | 0.5     | 239.752       | 374.0891|
| Angola             | Africa         | 3437.295  | 98.0          | 1.5     | 252.602       | 325.9655|
| Argentina          | SouthAmerica   | 11,687.6  | 88.2          | 4.0     | 253.404       | 408.1726|
| Armenia            | WestEurasia    | 4212.133  | 81.6          | 14.0    | 269.694       | 442.9695|
| Australia          | InsularPacific | 58,392.71 | 70.5          | 25.0    | 164.255       | 515.6854|
| Austria            | WestEurasia    | 51,230.28 | 77.4          | 18.0    | 185.116       | 507.6394|
| Azerbaijan         | EastEurasia    | 4717.72   | 85.3          | 0.5     | 269.573       | 415.9462|
| Bangladesh         | EastEurasia    | 1670.796  | 96.7          | 0.5     | 265.704       | 368.3153|
| Belarus            | WestEurasia    | 6311.718  | 57.7          | 17.0    | 206.098       | 488.1431|
| Belgium            | WestEurasia    | 47,292.97 | 62.3          | 43.0    | 186.130       | 516.8079|
| Benin              | Africa         | 906.5387  | 99.3          | 0.5     | 244.670       | 383.9229|
| Bolivia            | SouthAmerica   | 3548.59   | 98.4          | 1.0     | 253.353       |                |
| Bosnia and Herzegovina | WestEurasia   | 5951.383  | 93.0          |         | 241.524       | 416.1341|
| Botswana           | Africa         | 8258.227  | 99.4          | 0.5     | 234.546       | 391.3183|
| Brazil             | SouthAmerica   | 8920.7    | 93.5          | 1.0     | 255.328       | 413.2448|
| Brunei Darussalam  | EastEurasia    | 31,627.23 | 90.1          | 0.5     | 312.101       | 437.5159|
| Bulgaria           | WestEurasia    | 9387.813  | 66.6          | 34.0    | 238.471       | 441.0933|
| Burkina Faso       | Africa         | 820.1744  | 99.1          | 0.5     | 246.534       | 403.6543|
| Burundi            | Africa         | 293.9633  | 99.4          | 0.5     | 242.958       | 422.7478|
| Cambodia           | EastEurasia    | 1512.127  | 74.2          | 7.0     | 274.896       | 451.8896|
| Cameroon           | Africa         | 1534.492  | 99.3          | 0.5     | 244.614       | 378.8688|
| Country          | Murdock region | GDP      | Religiousness | Atheism | Schizophrenia | NHTS  |
|-----------------|----------------|----------|---------------|---------|---------------|-------|
| Canada          | NorthAmerica   | 46,192.38| 74.5          | 22.0    | 185.942       | 533.998|
| Chad            | Africa         | 735.7297 | 99.1          | 0.5     | 246.930       | 333.1113|
| Chile           | SouthAmerica   | 15,923.36| 85.0          | 2.0     | 254.046       | 452.2182|
| Colombia        | SouthAmerica   | 6649.636 | 92.9          | 1.0     | 253.524       | 419.0275|
| Congo-Brazzaville | Africa      | 2702.559 | 97.4          | 2.7     | 241.964       | 370.6141|
| Costa Rica      | NorthAmerica   | 20,705.21| 98.4          | 1.0     | 252.764       | 428.5557|
| Croatia         | WestEurasia    | 14,674.02| 86.6          | 7.0     | 187.935       | 487.5812|
| Cyprus          | WestEurasia    | 28,967.58| 95.6          |         | 273.036       | 502.1622|
| Czechia         | WestEurasia    | 22,992.06| 43.6          | 61.0    | 185.826       | 512.2216|
| Denmark         | WestEurasia    | 61,833.71| 62.0          | 48.0    | 187.542       | 517.8778|
| Dominican Republic | NorthAmerica | 7650.09   | 87.0          | 7.0     | 254.906       | 345.2165|
| Ecuador         | SouthAmerica   | 6344.872 | 98.5          | 1.0     | 253.573       | 420.1486|
| Egypt           | Africa         | 2537.512 | 95.4          | 0.5     | 273.441       | 355.9865|
| El Salvador     | NorthAmerica   | 4058.243 | 93.8          | 1.0     | 254.538       | 435.9228|
| Estonia         | WestEurasia    | 23,241.89| 47.1          | 49.0    | 201.730       | 543.2061|
| Ethiopia        | Africa         | 735.1145 | 99.4          | 0.5     | 238.310       | 348.199|
| Finland         | WestEurasia    | 50,135.72| 68.4          | 28.0    | 187.690       | 533.7076|
| France          | WestEurasia    | 41,358.09| 56.4          | 44.0    | 189.100       | 510.2606|
| Gambia          | Africa         | 716.1203 | 99.2          | 0.5     | 244.150       | 352.8996|
| Georgia         | EastEurasia    | 4396.667 | 82.9          | 4.0     | 235.620       | 399.7663|
| Germany         | WestEurasia    | 47,513.7 | 58.4          | 42.0    | 185.760       | 517.2814|
| Greece          | WestEurasia    | 20,731.2 | 83.0          | 16.0    | 185.063       | 468.6362|
| Guinea          | Africa         | 937.5969 | 99.3          | 0.5     | 247.000       | 408.2491|
| Honduras        | NorthAmerica   | 2500.11  | 98.7          | 1.0     | 256.040       | 399.7508|
| Hungary         | WestEurasia    | 16,264.02| 64.7          | 32.0    | 206.746       | 495.4812|
| Iceland         | WestEurasia    | 76,867.3 | 78.2          | 16.0    | 184.830       | 497.6828|
| India           | EastEurasia    | 2054.757 | 90.4          | 3.0     | 268.900       | 399|
| Indonesia       | EastEurasia    | 3893.493 | 91.9          | 1.5     | 321.870       | 394.9151|
| Iran            | EastEurasia    | 5783.495 | 94.3          | 4.5     | 275.670       | 432.1082|
| Iraq            | EastEurasia    | 5523.079 | 99.3          | 0.5     | 279.360       | 363.4325|
| Ireland         | WestEurasia    | 79,414.6 | 88.0          | 5.0     | 185.620       | 521.3286|
| Israel          | EastEurasia    | 44,214.91| 84.2          | 15.0    | 188.000       | 480.7522|
| Italy           | WestEurasia    | 34,388.51| 79.5          | 6.0     | 185.580       | 492.9878|
| Jamaica         | NorthAmerica   | 5354.253 | 96.4          | 3.0     | 254.050       | 387.133|
| Jordan          | EastEurasia    | 4237.796 | 94.4          | 0.5     | 273.290       | 429.9541|
| Kazakhstan      | EastEurasia    | 9789.5044| 69.9          | 12.0    | 210.640       | 416.1546|
| Kenya           | Africa         | 1710.475 | 99.4          | 0.5     | 234.970       | 454.9584|
| Kuwait          | EastEurasia    | 34,248.84| 98.7          | 0.5     | 269.360       | 383.4022|
| Kyrgyzstan      | EastEurasia    | 1283.756 | 77.3          | 7.0     | 279.940       | 420.0865|
| Lao             | EastEurasia    | 2542.49  | 84.0          | 5.0     | 287.170       | 368.1421|
| Latvia          | WestEurasia    | 17,851.58| 63.6          | 20.0    | 203.750       | 503.8698|
| Lebanon         | EastEurasia    | 8223.658 | 96.2          | 3.0     | 275.760       | 389.889|
| Country       | Murdock region | GDP       | Religiousness | Atheism | Schizophrenia | NHTS       |
|--------------|----------------|-----------|---------------|---------|---------------|------------|
| Liberia      | Africa         | 440.2523  | 98.7          | 0.5     | 247.210       | 331.7459   |
| Libya        | Africa         | 5147.334 | 99.3          | 0.5     | 273.500       |            |
| Lithuania    | WestEurasia    | 19,082.52 | 78.1          | 13.0    | 205.790       | 495.8863   |
| Madagascar   | Africa         | 527.3966  | 99.3          | 0.5     | 244.010       | 350.7733   |
| Malawi       | Africa         | 396.6315  | 99.3          | 0.5     | 237.360       | 359.4841   |
| Malaysia     | EastEurasia    | 11,373.35 | 91.3          | 0.5     | 314.190       | 445.6753   |
| Mali         | Africa         | 900.0966  | 99.4          | 0.5     | 248.110       | 307.365    |
| Malta        | WestEurasia    | 33,122.8  | 92.8          |         | 184.870       | 474.435    |
| Mauritania   | Africa         | 1730.439  | 99.4          | 0.5     | 242.680       | 342.0936   |
| Mexico       | NorthAmerica   | 9694.852  | 91.5          | 4.5     | 245.990       | 430.0651   |
| Mongolia     | EastEurasia    | 4103.687  | 72.9          | 20.0    | 270.020       | 434.6187   |
| Morocco      | Africa         | 3272.948  | 95.8          | 0.5     | 273.580       | 380.4052   |
| Mozambique   | Africa         | 498.9407  | 97.2          | 5.0     | 239.190       | 368.2436   |
| Nepal        | EastEurasia    | 990.5566  | 99.3          | 0.5     | 265.390       | 368.5576   |
| Netherlands  | WestEurasia    | 53,583.14 | 61.5          | 42.0    | 186.280       | 519.6346   |
| New Zealand  | InsularPacific | 43,836.15 | 71.4          | 22.0    | 193.700       | 519.7484   |
| Niger        | Africa         | 571.2738  | 99.4          | 0.5     | 247.160       | 304.9222   |
| Nigeria      | Africa         | 2153.526  | 98.5          | 0.5     | 246.670       | 309.025    |
| Norway       | WestEurasia    | 81,335.65 | 64.1          | 31.0    | 187.490       | 513.5878   |
| Oman         | EastEurasia    | 19,072.78 | 99.1          | 0.5     | 270.000       | 423.5134   |
| Pakistan     | EastEurasia    | 1330.386  | 96.0          | 0.5     | 266.340       | 338.6566   |
| Paraguay     | SouthAmerica   | 5794.576  | 98.6          | 1.0     | 252.610       | 385.5443   |
| Peru         | SouthAmerica   | 6947.25   | 93.4          | 1.0     | 253.060       | 415.0254   |
| Philippines  | EastEurasia    | 3102.727  | 88.6          | 0.5     | 317.070       | 361.646    |
| Poland       | WestEurasia    | 15,444    | 91.7          | 3.0     | 233.870       | 530.0858   |
| Portugal     | WestEurasia    | 23,477.73 | 85.9          | 4.0     | 186.250       | 508.5149   |
| Republic of Moldova | WestEurasia | 2791.034 | 71.8          | 6.0     | 202.680       | 438.6209   |
| Romania      | WestEurasia    | 12,280.84 | 87.4          | 4.0     | 237.220       | 442.1617   |
| Russian Federation | WestEurasia | 11,394.14 | 58.1          | 27.0    | 206.910       | 497.5462   |
| Rwanda       | Africa         | 773.0471  | 99.1          | 0.5     | 240.850       | 358.084    |
| Saudi Arabia | EastEurasia    | 23,217.2  | 98.9          | 0.5     | 270.200       | 398.9689   |
| Senegal      | Africa         | 1501.721  | 99.3          | 0.5     | 244.410       | 412.4539   |
| Sierra Leone | Africa         | 536.1105  | 99.3          | 0.5     | 250.550       | 315.8759   |
| Singapore    | EastEurasia    | 62,720.88 | 74.0          | 13.0    | 311.870       | 575.2722   |
| Slovakia     | WestEurasia    | 19,430.79 | 76.5          | 17.0    | 233.540       | 485.35     |
| Slovenia     | WestEurasia    | 26,005.1  | 67.6          | 35.0    | 187.200       | 520.809    |
| Somalia      | Africa         | 99.57643  | 99.4          | 0.5     | 234.840       |            |
| South Africa | Africa         | 6369.232  | 91.1          | 1.0     | 240.510       | 342.764    |
| Spain        | WestEurasia    | 30,405.83 | 76.8          | 15.0    | 186.360       | 506.6212   |
| Sri Lanka    | EastEurasia    | 4189.688  | 98.3          | 0.5     | 312.270       | 400        |
| Sudan        | Africa         | 1208.441  | 98.9          |         | 234.490       | 379.6337   |
| Sweden       | WestEurasia    | 55,766.81 | 45.3          | 64.0    | 186.010       | 519.3618   |
Table 6 (continued)

| Country                  | Murdock region | GDP      | Religiousness | Atheism | Schizophrenia | NHTS  |
|--------------------------|----------------|----------|---------------|---------|---------------|-------|
| Switzerland              | WestEurasia    | 82,708.51| 74.9          | 17.0    | 188.710       | 515.139 |
| Syria                    | EastEurasia    | 981.3018 | 97.8          | 0.5     | 277.300       |       |
| Tajikistan               | EastEurasia    | 826.6202 | 89.3          | 2.0     | 266.300       | 390.5656 |
| Thailand                 | EastEurasia    | 7273.565 | 88.0          | 0.5     | 315.530       | 426.6  |
| Togo                     | Africa         | 654.7589 | 99.4          | 0.5     | 244.320       | 383.7178 |
| Trinidad and Tobago      | SouthAmerica   | 17,130.34| 94.4          | 9.0     | 254.960       | 458.2889 |
| Tunisia                  | Africa         | 3449.581 | 99.3          | 0.5     | 273.840       | 384.0787 |
| Turkmenistan             | EastEurasia    | 6964.613 | 89.8          | 2.0     | 264.630       |       |
| Uganda                   | Africa         | 704.3946 | 96.5          | 0.5     | 236.840       | 397.1597 |
| Ukraine                  | WestEurasia    | 2956.922 | 67.1          | 20.0    | 209.780       | 478.1733 |
| United Kingdom           | WestEurasia    | 42,526.44| 64.7          | 41.5    | 185.180       | 520.3564 |
| United Republic of       | Africa         | 1044.062 | 97.3          | 0.5     | 239.340       | 388.4802 |
| Tanzania: Main-land      | NorthAmerica   | 62,917.94| 86.8          | 10.5    | 185.620       | 511.7987 |
| United States            | SouthAmerica   | 17,278.06| 68.2          | 12.0    | 257.200       | 437.6966 |
| Uruguay                  | EastEurasia    | 1554.98  | 81.7          | 4.0     | 286.940       | 474.0751 |
| Uzbekistan               | EastEurasia    | 935.8881 | 99.2          | 0.5     | 225.750       | 321.327 |
| Yemen                    | EastEurasia    | 1572.344 | 99.3          | 0.5     | 238.150       | 358.1404 |
| Zambia                   | Africa         | 1683.766 | 96.1          | 4.0     | 238.167       | 396.1388 |

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Declarations

Conflict of interest The authors declare no conflict of interest.

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