The Influence of Religious Homogeneity upon Life Expectancy:

A Cross-National Comparative Analysis

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ABSTRACT

Research upon health and life expectancy has focused primarily upon individual and community level analyses, with extrapolations to national level data. In this study, the unit of analysis is shifted from individual health statistics to the national level. Life expectancy data for every nation and in the world (total n=191, restricted n=138) is explored, controlling for a variety of socio-economic factors. Two hypotheses are tested which offer the explanation homogeneity in both religion (H1) and ethnicity (H2), determines differences in life expectancy between nations. The first hypothesis, that religious homogeneity supports positive health outcomes is supported. The second hypothesis, that ethnic homogeneity supports positive health outcomes, is not. Several explanations for the role of religion in promoting positive health, as measured by life expectancy, are noted and discussed.

Key Words: Life Expectancy, Religion, Health, Inequality

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For nearly 180 years, since Benjamin Gompertz established the Gompertz Curve to explain the patterns of human mortality (Rose 1997; Olshansky 1998), epidemiologists, demographers and more recently sociologists, have sought to understand the variations in human mortality between nations. A desire to understand the patterns of life expectancy and variations in health status across different social groups has motivated countless studies on individual and group level health dynamics that have in turn informed public health policy, prompted health promotion efforts, and made a significant impact on individual health behaviors.

Among the many possible explanations of these variations in longevity and health, one in particular is explored within this paper: The role of religious homogeneity. Durkheim first described the importance of religious solidarity in supporting positive health in his work on suicide in 1897 (1966 [1951]). Since then, the relationship has been the subject of a broad and expanding research tradition. This study hopes to add to the literature by examining this relationship at the population level through a cross-national, comparative framework.

The underlying research question to be addressed in this paper is, "Does the degree to which a nation is homogenous in its religious adherence influence life expectancy at the level of the nation-state?" Given the previous findings at the individual and sub-national levels, there is reason to assume a relationship will be determined to exist.

While this study focuses upon variation in life expectancy, this is used as a proxy for nation level health status. Life expectancy has been shown to be a reliable indicator for a nation's health status (Inglehart 2000; Judge 1995) "almost universally" (Ferris 2002, p. 199), and is "a helpful summary of the hazards of life," (Riley 2005, p. 21).

The Global Health Transition and Variations in Life Expectancy

From 1800 to 2000, mean life expectancy advanced from thirty to sixty-seven years of age in what may be "the crowning achievement of the modern era," (Riley 2001, p.1). Among the many generally accepted causes for the nearly linear progression in life expectancy (Oeppen and Vaupel 2001) are increases in per capita income, improvements in medicine and the institutions providing public health, commitment to ensuring access to education, and reductions in infant mortality and child-bearing related mortality. The demographic historian James C. Riley has suggested that advances in life expectancy can be logically grouped into six primary headings that he terms, 'tactical areas' (2005, p. 193). Each area includes a host of strategies and policies that have combined to support the continuation and dissemination of the health transition throughout the world. These tactical areas include: Public health, medicine, economic development, nutrition, individual and household behavior, and literacy and education.

While each of these tactical areas has played an important role in the health transition, this paper focuses upon variation between nations, not the development of the transition itself. Therefore, two areas in particular are focused upon that have been shown to have a significant influence upon this variation. First is economic development, and second is literacy and education. Economic development is further broken down into the two

separate areas of national wealth status (as measured by per capita Gross Domestic Product (GDP)), and income inequality. Each of these three concepts forms a distinct hypothesis that explains a portion in the variation in life expectancy.

The Wealth Equals Health Hypothesis

The theme that wealth begets health is so consistent within the literature that it is taken almost as a maxim. Kawachi and Kennedy have declared, "…by and large, prosperity makes people live longer," (2002, p. 43). Bloom and Canning suggest that the positive influence of wealth, as measured by per capita income, is "one of the best known relations in international development," (2000, p. 1207). Many of the reasons for this dynamic at the national level mirror those found in individual, group or community dynamics: 1) Poverty restricts access to and availability of services; 2) poverty increases chances of living in unhealthy or at-risk life styles; and 3) poverty establishes a pattern of reverse causation, where health is so poor that opportunity to improve income declines (Bloom and Canning 2000; Kawachi and Kennedy 2002).

While wealth is certainly important in enhancing a nation's health status, it is related to gains in life expectancy only to a point. There appears to be a gradient relationship between wealth and life expectancy that may coincide with a given population's ability to procure essentials needed for healthy lifestyles (Kawachi and Kennedy 2001, 2002; Riley 2001). This leveling-off of the relationship coincided with a per capita income of about $5,000 US in 1990 (Kawachi and Kennedy 2001). Once wealth status moves from subsistence levels, its impact on health status is no longer significant, though there is some evidence that the 'trickle-down' of medical capabilities from rich to poor nations

may also have mitigated the impact of wealth upon health (Preston 1975). However, medical capabilities or spending alone do not explain the gradient. Despite spending 14% of its total world-leading gross GDP on health care spending in 1998, the United States remains a relatively poor performer (comparable to other developed nations) on scales of life expectancy and health (Auerbach and Krimgold 2001).

Beyond the seemingly curvilinear relationship between wealth and health, there are a large number of cases that present exceptions to the rule. As of the year 2000, Riley identified sixty-five nations with per capita incomes of less then $10,000 US and life expectancies over 65 years (2005). Others have also noted that aberrant cases do exist, though the extent of the exceptions identified by Riley were not discussed (Kawachi and Kennedy 2002). Tables One and Two below illustrate the exceptional cases in two ways. First, Table One indicates the fifteen nations with mean life expectancies of at least 67 years with the highest per capita GDP up to Riley's limit of $10,000 US. Table Two takes the exceptional cases to an even more severe level, illustrating the fourteen nations with life expectancies of at least 67 and per capita GDP under $1,000.

The purpose of this illustration is not to refute a clear association between wealth and health, but rather to show that there are far too many exceptions to accept it as a general theory, meaning a theory that explains the complete phenomenon. Rather, wealth explains a large part of the puzzle that is variations in health between nations, but is constrained by factors relevant to each nation's cultural and socio-political environment (Riley 2001).

Table One: Exceptions to Wealth Equals Health – Highest per capita GDP up to $10,000

Nation	Mean Life Expectancy	Per Capita GDP
Barbados	77	9867
Chile	76	4523
Costa Rica	78.2	4189
Croatia	74.2	6389
Czechoslovakia	75.4	8834
Lebanon	73.5	5023
Lithuania	72.6	5203
Malaysia	73.3	4227
Mauritius	72.1	4594
Mexico	73.4	5945
Oman	72.7	7389
Poland	73.9	5355
Saudi Arabia	72.4	8561
Slovakia	73.7	6019
St. Lucia	72.5	4611

Source: Adapted from Riley (2001).

Table Two: Exceptions to Wealth Equals Health – Highest Mean Life Expectancy with per capita GDP under $1,000

Nation	Mean Life Expectancy	Per Capita GDP
Georgia	73.6	770
Sri Lanka	72.9	913
Armenia	72.3	905
Azerbaijan	72.1	853
Sao Tome and Principe	69.9	364
Uzbekistan	69.7	338
Ukraine	69.7	975
Nicaragua	69.6	750
Vietnam	69.3	471
Solomon Islands	69.3	568
Honduras	69	980
Moldova	68.9	459
Tajikistan	68.8	249
Kyrgyztan	68.6	372

Source: Adapted from Riley (2001).

The Inequality Hypothesis

There is a substantial body of literature that supports the hypothesis that, at least among developed nations, inequality within a nation explains variations in health and mortality between them (Collison et al 2007; Hertzman 2001; Newman 2001; Pradhan et al 2001; Wilkinson 1990, 1997, 1998, 1999, 2001). Put simply, this hypothesis states that "Populations tend to be healthier and longer lived where the difference between rich and poor is smaller," (Wilkinson 2001, p. 29).

More important then gross inequalities are the differences in relative income – the ability to purchase or obtain essential needs. These differences represent "…the position of a person in social hierarchy within a given society," (Wilkinson 2001, p. 33) and form the basis for how inequality reduces nation-level health. Strong psychosocial reasons may underlie the mechanism through which inequality leads to worse overall health at the national level. Essentially, the inequality hypothesis suggests that the more dramatic the inequality, the greater the difference between social positions. According to Wilkinson, the greater the distance between social hierarchies, the greater the opportunity for top-down passing of discrimination, prejudice, disrespect, exclusion, aggression and violence from upper level hierarchies downward (Wilkinson 2001).

More generally, at least three pathways may lead from income inequality to negative impacts upon health (Kawachi and Kennedy 2001). First, inequality may lead to underinvestment in public spending and education. Second, inequality may lead to an erosion in both social cohesion and social capital, especially for those social positions at the lower end of the income strata. Third, inequality may lead to increased stress and ill health due to social comparisons with other reference groups.

The few cases of dissent in the inequality literature are methodological in nature, usually dealing with sampling and selectivity in data sets (Judge 1995) or under-specified models (Nichols 2001, p. 132). When attempting to address variation in life expectancy across all nations, regardless of development status, there is insufficient evidence, other then loose inference, to suggest that inequality will remain significant for cases outside of the developed west.

The Education / Literacy Hypothesis

In his case study of Jamaica as an exception to the wealth equals health hypothesis, Riley identified education and literacy as critical elements in pushing Jamaica's life expectancy to levels that would not be expected given its extreme poverty (Riley 2005). As of 2002, Jamaica had a mean life expectancy of 75.8 and per capita GDP of $2,802 US. Only Cuba experienced a higher life expectancy with lower per capita GDP (76.8 years and $2,762 US respectively). Riley identified several factors that influenced Jamaica's health transition, including such strategies as large infusions of outside medical capital from the United Kingdom, and a focused policy initiative to improve Jamaica's health conditions. Education and literacy gains however played a highly significant role, and explain some of the variation between nations of similar economic position.

For Riley, the movement of the United Kingdom's representatives in Jamaica to focus on using the education system to enact changes in individual behavior regarding sanitation and health was essential to the island nation's health transition (2005). Education served three critical roles. First, education and literacy improved access to health related information. Second, education reinforced critical health-related ideals and

practices. Finally, education allowed for cross-generational transference of information. Children brought information home which was implemented, improving health at the family level. At the same time, those same children were developing health 'mastery' before becoming parents.

More generally, literacy may impact health and life expectancy through three primary paths: 1) Access to health-related information and services; 2) improved development of coping strategies; and 3) Improved socialization and solidarity, or increasing social homogeneity (Riley 2001). Together, education and literacy may explain part of the ability of impoverished nations to attain higher then expected life expectancies, though of course this is not a fixed effect, but is rather wholly dependent upon specific national contexts (Riley 2001).

Social Cohesion

One of the recurring themes in the previous literature is that of social cohesion and social solidarity. A diverse and dynamic literature has developed over the past two decades that has advanced the concept of social cohesion far beyond that which Durkheim first expounded upon in his work on suicide (1966 [1951]). Today, social cohesion, or the lack thereof, has been readily acknowledged as a principle force behind the general health, safety and well-being of a given population. Kawachi and Kennedy clearly state that, "A large gap between rich people and poor people leads to higher mortality through the breakdown of social cohesion," (1997, p. 1037). But how is this concept defined? Wilkinson acknowledges that the term is vague (1999) though he uses

it extensively as one of the pathways through which inequality leads to reduced health within a nation.

A concise definition of social cohesion was presented in the context of a Canadian governmental network developed to assess and fully consider the concept as it applied to Canadian health and social policy, and its abbreviated form serves as a clear statement of the concept. "Social cohesion is the ongoing process of developing a community of shared values, shared challenges, and equal opportunity...based upon a sense of trust, hope and reciprocity…" (Jeanotte 2000). Furthermore, social cohesion has been broken down into the following five sets of dichotomies that help to further conceptual understanding: 1) Belonging - isolation, 2) inclusion - exclusion, 3) participation – non-involvement, 4) recognition – rejection, 5) legitimacy – illegitimacy (Jenson 2002).

Durkheim's work on suicide is generally considered in the literature as the first scientific use of the concept of social cohesion. Regardless of the acknowledgement of Durkheim's theoretical genius in identifying such an important concept, there has been little extenuation of the concept through Durkheim's other area of interest – religion. Durkheim is very clear that religion serves as an integrating force by its very nature. Through very real mechanisms, such as dramatic re-enactment or ritual, Durkheim found that religion served to "revitalize the most essential elements of the collective consciousness and conscience," (1995 [1912], p. 379), reinforcing a sense of commonality or communion with society. Durkheim saw that there could be "no society that does not experience the need at regular intervals to maintain and strengthen the collective feelings and ideas that provide its coherence and its distinct individuality,"

(Durkheim 1995, p 429). According to Durkheim, religion serves as the vehicle through which social cohesion is birthed and re-birthed as needed.

Religion and Health

Previous research has shown that social cohesion impacts health, and that religion supports the development of social cohesion. The third leg of the stool upon which this study sits is the presumed relationship between religion and health. This third area of research has focused upon individual and community-level dynamics that can be explored and explained through experimental as well as through survey-based empirical studies. The findings of the vast majority of these studies have indicated a strong relationship between religiosity and health which functions at many levels. While it is important to heed Durkheim's warning that "…it is a profound mistake to confuse the collective type of a society, as is so often done, with the average type of its individual members," (Dukrheim 1966 [1951], p 315), these findings are important to note, as they exemplify that at least at the individual level, a relationship seems to exist.

Around the same time that Durkhiem was drawing his conclusions about variations in suicide, William James noted that religion promoted or constrained an attitude of 'healthy mindedness' that had very real impacts on the health of religious practitioners (James 1961 [1904]). Since that time, religion and its influence upon health, both reactive and proactive, have been studied by medical professionals and sociologists alike**.** Religion has been shown to have a broad influence upon positive health outcomes, particularly in subjective measures of health (Ellison 1991; Idler 1995; Musick 1996). Researchers have found that religion enhances self-efficacy (Musick 1996), locus of control (Mercier and

Powers 1996) and optimism (Quinn et al. 1996), each of which supports positive health. In addition, religious practitioners have been found not only to be protected from the onset of acute health events, but appear to recover more rapidly when they are experienced (Koenig et al. 1998).

Research upon the role of religion in supporting positive health as a mechanism through which social support is activated has had mixed findings. Japanese religious practitioners were found to be more likely to offer aid, and through such provision of assistance to others, received benefits to their health status (Krause et al. 1999). In general, social supports have been shown to be highly protective of health (Johnson 1991; House et al. 1994; Krause et al. 1999; Lin et al. 1999; Krause 2001; Hughes and Waite 2002; Cornwell 2003). However, religion also appears to have effects upon health, at least mental health, that go beyond social support frameworks (Ellison et a. 1989).

Religion as an active coping mechanism has also received a great deal of attention. The principle that religion, and/or spirituality, is important in sustaining a sense of meaning in old age or in the face of health related episodes has been presented by numerous scholars (Kotre 1999; Tornstam 1999; Bondevik and Skogstad 2000; Ai 2000;). The importance of sustaining a belief that life has meaning was brought to the forefront by Viktor Frankl in his first-hand accounts of who among the prisoners of Nazi concentration camps during World War II were able to persevere and go on to live productive lives after the war's end (1985 [1946]). Ellison eloquently summarized these findings that religion is supportive of well-being through its construction of meaning by saying, "…religious symbols and beliefs provide an interpretive framework through which individuals can make sense of everyday reality" (1991, p. 89).

While many might argue that religion acts primarily as a mechanism through which social supports are activated that promote positive health outcomes (Krause 2001), there is also evidence that there is something operant within religion that is separate from social supports in its influence (Idler and Kasl 1997).

The evidence is clear that religiosity influences health in diverse ways and through diverse methods. What remains to be seen is if this relationship extends to the national level. Table Three below repeats the information presented in Table Two, but adds the degree of religious homogeneity (the largest percentage of the population adhering to the same religious belief). The table illustrates that a relationship may be present.

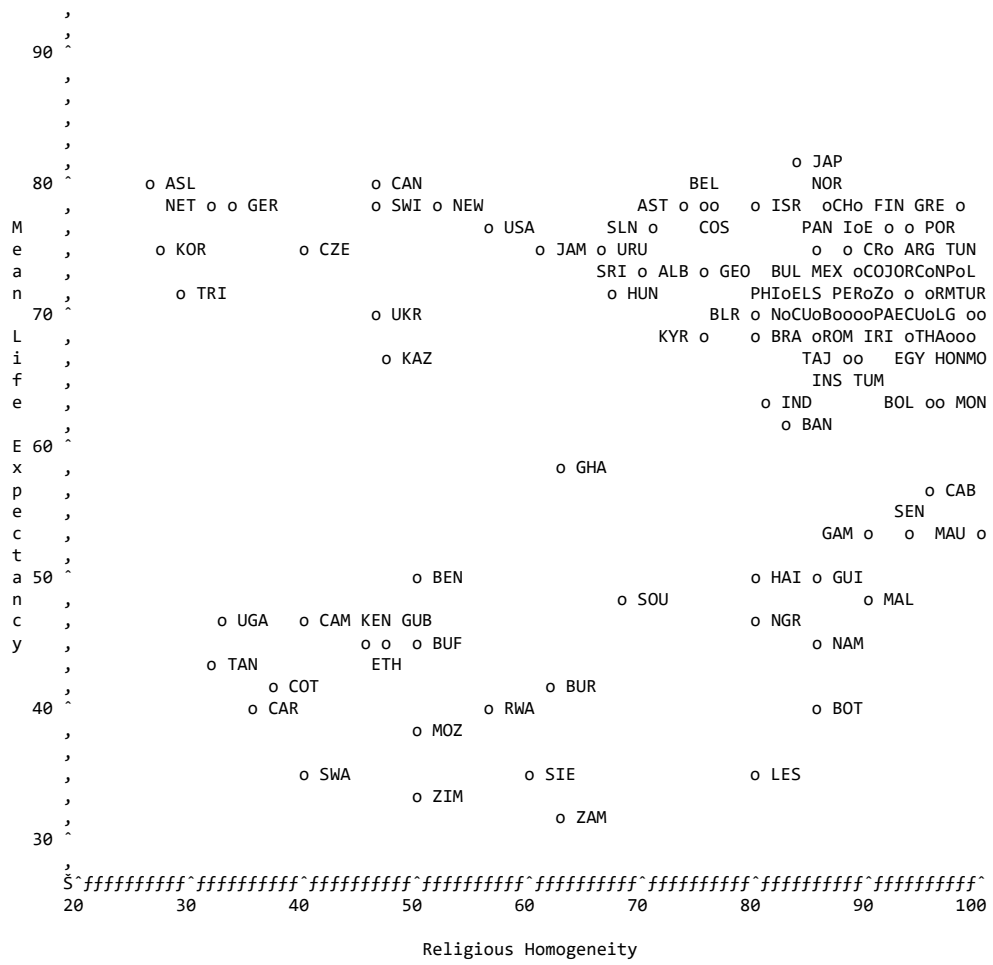
Table Three: Exceptions to Wealth Equals Health – Table Two with Religious Homogeneity

Nation	Mean Life Expectancy	Per Capita GDP	Religious Homogeneity (%)
Georgia	73.6	770	75
Sri Lanka	72.9	913	70
Armenia	72.3	905	94
Azerbaijan	72.1	853	93.4
Sao Tome and Principe	69.9	364	80
Uzbekistan	69.7	338	46.5
Ukraine	69.7	975	88
Nicaragua	69.6	750	85
Solomon Islands	69.3	568	78
Honduras	69	980	97
Moldova	68.9	459	98
Tajikistan	68.8	249	85
Kyrgyztan	68.6	372	75

Source: Adapted from Riley (2001).

In addition, the following scatterplot also corroborates this finding, showing that as religious homogeneity increases, mean life expectancy generally increases as well.

Chart Three: Scatterplot of Religious Homogeneity and Mean Life Expectancy



Source: Author

CONCEPTUAL FRAMEWORK AND HYPOTHESIS

Hypothesis: *The greater the degree of religious homogeneity within a nation, the higher that nation's life expectancy will be, all else being equal.*

The motivating hypothesis for this study suggests that common religious adherence supports positive health status, and thus by proxy, supports increased life expectancy. As this is a solidarity and social cohesion argument, religious homogeneity serves as the explanatory characteristic. Religious homogeneity is defined as the largest percentage of a population that adheres to the same general religious framework. For the purposes of this study, these frameworks are limited only by the data provided by the CIA World Factbook (2004). The actual framework itself is irrelevant to this study. Whether a specific religious doctrine is significant or not will be controlled for through dummy variables. Religious homogeneity focuses solely upon the degree of sameness in religious perspective within a nation. Previous studies have used the concept of religious homogeneity to test such dynamics as suicide rates within US cities (Ellison et al 1997), the differences in economic development between nations (Glahe and Vorhes 1989), and divorce rates in the US (Mullins et al 2004). Measures of homogeneity varied from the use of the Herfindahl index (Ellison et al 1997; Mullins et al 2004) to gross adherence levels within primary religious groupings (Glahe and Vorhes 1989). Due to data limitations related to cross-national comparisons, the latter form is utilized in this study.

The hypothesis tested in this paper does not suggest that religious homogeneity means that all people professing to belong to a specific religion are equally participatory or express equal conviction. However, if supported, it will suggest that the benefits of solidarity in religious adherence may be protective of society as a whole, as well as for individual adherents.

Beyond this hypothesis, the analysis will also test the previous findings relating to wealth, inequality and literacy to determine if they remain significant beyond previously

limited data sets, and to determine the magnitude and direction of their relationship with life expectancy, if present. It is expected that previous findings will be replicated in this study, and that wealth, inequality and literacy will all be significant with strong effects.

Data, Measurement and Methods

Data

The data for this study were drawn from two sources. First, data were taken for 183 member states and territories from the Untied Nations Statistics Division for the dependent variable of life expectancy[i], as well as for the control variables of total population, per capita GDP, the Gini Index and illiteracy rates. The second data source was the 2004 World Factbook, generated and provided by the Central Intelligence Agency (CIA) of the United States. All racial and religious data were derived from the CIA data set.

While broad based, inclusive, and continuously updated, the CIA World Factbook is not entirely comprehensive for all nations. This analysis of the relationship between life expectancy and religious homogeneity was conducted utilizing a conservative 'listwise' deletion process, and the gaps in the CIA data, as well as the UN data on inequality, limited the statistical power of this analysis. Where complete information was not available for a given nation or territory, that political entity was removed from the analysis. This resulted in a dramatic decrease in sample size. Regardless of the decrease in useable observations, the CIA data set was utilized for its consistency in data collection sources and processes. Attempting to use other data sets in order to fill out the empty spaces in the CIA statistics would have, in this investigator's opinion, caused more

harm then good by potentially compromising the integrity of the data through reducing controls in definitions and measures. While limited by its incompleteness, the CIA data set remains consistent and supports a reasonable presumption that the methods of collection and presentation are likewise consistent.

The initial data set for this analysis included observations for 183 nations and territories. Due to missing or incomplete data the final sample utilized was reduced to n = 98. After the deletion of observations containing missing values, the remaining sample of nations contained sufficient variation in each of the predictors. A complete list of the nations used in the analysis for this study is located in Appendix A.

Measurements

A variety of characteristics were operationalized into variables for use within this study. Each variable is described and defined below. Descriptive statistics are summarized in Table Four following the measurement section.

Life expectancy: The dependent variable for this analysis is mean life expectancy, measured as the expected number of years from birth an individual born in 2004 is likely to live for each nation and territory listed in by the United Nations Statistics Division. The raw data for life expectancy was presented separately for both males and females. An average of the two is used to form a single, continuous dependent variable. Life expectancy varies significantly throughout the world, with values ranging from 32.4 years of age in Zambia to 81.5 in Japan. The mean life expectancy for this sample is 64.07 with a standard deviation of 14.08.

Religious Homogeneity: The extent of religious homogeneity within a nation is primary variable of interest for this study. Since it is the extent of homogeneity and not composition that is relevant for this analysis, the percentage of the largest religious group is utilized as the operationalized term. For example, the largest religious grouping in the Central African Republic is 35% (practitioners of indigenous or shamanistic religions in this case). The remaining 65% of religious membership categories are not pertinent to this analysis. Where a range is provided by the CIA in lieu of a single percentage, the mean point is utilized as the measurement of homogeneity. Because the CIA World Factbook lists data for some nations by Protestant denominations and others as simply Protestant, only the broad Christian divisions of Protestant, Christian, and Orthodox are used. Similarly, Shiite and Sunni are used to define Moslem homogeneity as opposed to simply listing homogeneity under a single definition of Moslem. A more restrictive test analysis was performed using simple homogenous definitions of any Christian and any Moslem, and no significant differences emerged, so the more precise definition was used.

The variation of religious homogeneity among nations was remarkable, ranging from 26.1% homogenous in Australia to the 100% experienced in five nations or territories (Marshal Islands, Mauritania, Saudi Arabia, Somalia and Tonga). The mean is 73.6% religiously homogenous, with a standard deviation of 21.48%. It is important to note that religious homogeneity does not imply that all members of a religious category are active practitioners. For instance, Italy is considered a largely homogenous Catholic nation, yet the percentage of those who regularly attend mass is only 40% (Davie 2000). The religious homogeneity data should be considered in terms of "religious allegiance" (Davie 2000, pp. 5-13), not religious commitment.

Per Capita GDP: Per-capita Gross Domestic Product (GDP) is provided as a measurement of a nation's economic capacity, and serves as an important predictor for national status in terms of development, infrastructure, and economic capacity. By using per capita values as opposed to simple GDP, the measure better reflects individual economic position and thus is a better control in terms of impacts on health. All values are presented in annualized 2004 US dollars. Per-capita GDP ranged from $86 in Burundi to $48,881 in Norway with a mean of $6,537.43 and a standard deviation of $11,221.30. Because per capita GDP is skewed to the left, the logged form is used is in this analysis. The mean of the log of per capita GDP is 7.49 with a standard deviation of 1.64.

Illiteracy Rates: National educational levels are controlled for through the use of illiteracy rates, given as the percentage of a nation's population which is functionally illiterate. There was a wide variation in this variable, with values ranging from 0 in five nations (Australia, Czech Republic, Finland, Iceland and Luxembourg) to 83.85 in Niger. The mean illiteracy rate is 19.77 with a standard deviation of 22.83.

Gini Index: The Gini index serves as the predictor of inequality within a given nation. This variable is an indexed form of the Gini coefficient, meaning it is the coefficient multiplied by 100 to produce a percentage term. Inequality varies dramatically around the world, ranging from a low of 24.7 in Denmark, to a high of 74.3 in Namibia. The mean of the Gini index is 41.02 with a standard deviation of 10.71.

Racial Homogeneity: This term is used as a control for an alternate view of solidarity at the nation level. As was the case with religious memberships, racial homogeneity is operationalized by using the highest majority racial or ethnic group. Within the CIA

World Factbook, ethnic variation was presented for relatively few nations, leaving broad racial headings as the norm overall. Because there can be sharp divisions between ethnic sub-groups that may impact social cohesion in a way that transcends a broader racial categorization, these are used where presented. As was the case with religious homogeneity, any ranges within the CIA data set for race were averaged. Racial homogeneity varied along similar lines to that evidenced for religion with frequencies ranging from 38% in Suriname to 100% homogenous in 34 different nations. Mean racial homogeneity was 76.46% with a standard deviation of 22.8%.

Population Size: A control variable for population size (in thousands of people) was included to ensure that each nation was treated equally in the analysis regardless of dramatic variations in the number of people counted as citizens. Populations ranged from 1,032,000 in Swaziland to 1,323,345,000 in China. The mean population size was 52,379.32 with a standard deviation of 175,494.28.

Religion Dummy Variables: In order to ensure that the effects of religious homogeneity were not capturing any specific benefits reliant upon a certain faith membership, dummy variables were constructed for majorities within the Moslem, Hindu, Buddhist, Indigenous and Jewish faith traditions. Christian was used as the omitted category for these variables. Issues regarding multicolinearity emerged with the use of Buddhist dummy variable. Since it was non-significant and removing it from the analysis did not alter the results, it was removed after thorough testing of its effects. The result was an improved model with no loss in explanatory power.

Racial Dummy Variables: Dummy variables were also constructed for racial categories, again to ensure that no effects pertaining to specific racial membership were

captured by the racial homogeneity variable. Dummy variables included Black, Asian / Pacific Islander, Indigenous (Aboriginal), and Mixed (which is particularly present in South and Central America and the Caribbean). For this set of dummy variables, White was the omitted category. Similarly to the issues with Buddhism, the dummy variable for Asian/Pacific Islander introduced multicolinearity. This variable was also non-significant and its removal did not alter the results.

Several additional variables were included in early stages of this analysis. These included variables for poverty rates, anticipated levels of education, fertility rates, unemployment rates, the human development index, the democracy index and physicians per 1000 population. In each case, strong correlations and multicolinearity with other variables made their use problematic. Per capita GDP fully mediated the effects of the democracy index, the human development index and the number of physicians per 1000 population, and their removal did not significantly impact either model fit or the statistical significance of the predictors. Furthermore, the use of per-capita GDP sufficiently controls for the economic considerations that both poverty and unemployment rates also attempted to explain. Similarly, illiteracy rate serves as an adequate measure for education level cross-nationally.

Table Five: Descriptive Statistics

Variable	N	Mean	Std Dev	Minimum	Maximum
Mean Life Expectancy	98	64.07	14.08	32.40	81.50
Per Capita GDP	98	6,537.43	11,221.30	86.00	48,881.00
Log of Per Capita GDP	98	7.49	1.64	4.45	10.80
Illiteracy Rate	98	19.77	22.83	0.00	83.85
Religious Homogeneity	98	73.60	21.48	26.10	100.00
Racial / Ethnic Homogeneity	98	76.46	22.80	17.00	100.00
Total Population	98	52,379.32	175,494.28	1,032.00	1,323,345.00
GINI Index	98	41.02	10.71	24.90	74.30
Christian	98	0.59	0.49	0	1.00
Moslem	98	0.28	0.45	0	1.00
Hindu	98	0.01	0.10	0	1.00
Buddhist	98	0.07	0.26	0	1.00
Shamanic	98	0.04	0.20	0	1.00
Jewish	98	0.01	0.10	0	1.00
White	98	0.54	0.50	0	1.00
Black	98	0.27	0.44	0	1.00
Asian/Pacific Islander	98	0.09	0.29	0	1.00
Indigenous	98	0.02	0.14	0	1.00
Mixed Race	98	0.08	0.28	0	1.00

Source: Author

Model

A two-stage nested model was used to perform the OLS regression analysis testing the effects of religious homogeneity upon life expectancy. The first stage included per capita GDP, illiteracy rate, the Gini index of inequality, controls for population size and racial homogeneity, as well as the dummy variables to control for the racial and religious composition of the majority population. The second stage added the variable of religious

homogeneity to the analysis. For the hypothesis to be accepted, religious homogeneity had to be both significant, and its inclusion in the full model had to indicate improved model fit. The full model is shown in Equation one below.

Equation 1: OLS Regression Equation

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + e.$$

In this equation, Y is the dependent variable of mean life expectancy and β_0 is the intercept. Predictor variables included β_1 for the log of per-capita GDP, β_2 for illiteracy and β_3 for the Gini Index. The control variables are represented by β_4 through β_{12}. In order, these are total population size, racial/ethnic homogeneity, Black, Indigenous (Aboriginal), Mixed Race, Moselm, Hindu, Shamanistic, and Jewish. In the full model, β_{13} is added for the explanatory variable of Religious Homogeneity. Finally, e serves as the error term. White serves as the omitted variable for the set of dummies relating to race, while Christian serves as the omitted category for the religion dummies. Tests of the assumptions of OLS were conducted on the model, and no significant violations were noted, other then potential omitted variable bias in Model One.

RESULTS

The results of the OLS regression are shown in Table Five below. Discussion of results from Models One and Two follow.

Table Six: OLS Regression Results

	Test of GDP	Model One	Model Two
Intercept	17.64*** (4.65)	48.53*** (6.49)	44.61*** (6.48)
Log of Per Capita GDP	6.20*** (0.61)	3.17*** (0.58)	3.39*** (0.57)
Illiteracy Rate	----------	-0.13** (0.05)	-0.12** (0.05)
Population (in 000's)	----------	0.000005 (0.000005)	0.000003 (0.000005)
Gini Index	----------	-0.24** (0.08)	-0.30*** (0.08)
Ethnic Homogeneity	----------	0.08* (0.03)	0.04 (0.04)
Black	----------	-10.72*** (2.26)	-8.63*** (2.34)
Indigenous	----------	7.86 (5.28)	5.65 (5.19)
Mixed Race	----------	6.63‡ (2.82)	5.35* (2.78)
Moslem	----------	1.60 (2.04)	0.41 (2.03)
Hindu	----------	-1.74 (8.60)	-2.24 (8.33)
Shamanistic	----------	-3.9 (3.89)	-3.4 (3.77)
Jewish	----------	3.47 (6.74)	2.48 (6.54)
Religious Homogeneity	----------	----------	0.10** (0.04)
Adjusted R_SQR	0.52	0.78	0.79

Significance levels on one-tailed tests are: p>t ‡ 0.10 * 0.05 ** 0.10 *** 0.001

Model One Results

As the table illustrates, the expectation that each of the predictors for the wealth equals health, inequality and literacy hypotheses were met with each presenting significant and strong effects, all else being equal. The log of per capita GDP was significant at the <0.0001 level, with mean life expectancy improved by 0.03 years for every one percent increase. Likewise, for each 1% increase in the Gini index, mean life expectancy increased by 0.30 years, at a significance level of 0.009. Finally, every percentage increase in the illiteracy rate of a nation decreased mean life expectancy by 0.12, with a significance level of 0.004.

In addition to the significant predictors, two control variables were found to be significant as well. First, each percentage increase in racial/ethnic homogeneity increased mean life expectancy by 0.08 years with a significance level of 0.03. Second, nations with a black racial majority experienced a reduction of 10.72 years in their mean life expectancy compared to nations with a white majority.

None of these results are surprising given the previous literature. As others have succinctly stated, wealthier nations have higher mean life expectancies then their impoverished counterparts, greater levels of inequality lead to reduced life expectancies, and nations that experience higher levels of illiteracy (and by proxy, education) also suffer lower mean life expectancies. Furthermore, given the well publicized plight of the African nations in terms of health and stability, the dramatic finding that born and living one's life in a black majority nation equates to a reduction in over 10 years of life was not unexpected, though it remains disturbing.

It is important to note that these statistics do not imply any direct racial beneficial or detrimental effect on health, so much as they denote the variations captured in nations whose majority populations tend to fall within a specific category. These are variables that describe characteristics of a population in very broad terms as controls only, and do not attempt to explore mechanisms operating at the social, physical or epidemiological levels. The fact that racial/ethnic homogeneity was significant presents the first evidence that solidarity may be important in terms of overall population health.

Model Two Results

As previously stated, Model Two served as the Full Model in the nested regression analysis. As such, the addition of religious homogeneity was included to test the hypothesis presented in this study. The inclusion of religious homogeneity in the analysis did not significantly alter the findings regarding the original three predictors. Per capita GDP, illiteracy and the Gini index all remained significant with strong effects. Religious homogeneity did not mediate or moderate the effects, nor was it expected to. These three primary predictors are shown in the literature to have strong and significant effects, and combine to explain a large portion of the variation in life expectancy between nations. As this analysis shows, however, the addition of religious homogeneity explains part of the remaining variation.

The results of Model Two indicate that for every 1% increase in the log of per capita GDP, mean life expectancy increases by 0.03 years with a significance level of <0.0001. Furthermore, for each 1% increase in the Gini index of inequality, mean life expectancy declines by 0.30 years with a significance level of 0.0006. For each 1% increase in the rate of illiteracy, mean life expectancy decreases by 0.12 years with a significance of

0.009. Each of these results are comparable to those from Model One, with only slight variations. The addition of religious homogeneity improved the significance of the Gini index, but had only a minute influence on wealth and education. Of the two control variables that were significant in Model One, only the dummy variable for black race remained significant in Model Two. Black nations experienced a mean life expectancy decrease of 8.63 years compared to their white counterparts, which is slightly mediated form the 10 years in Model One but still very strong, with a significance level of 0.004.

Religious homogeneity itself had a strong effect and was highly significant. Each 1% increase in religious homogeneity within a nation equated to a 0.10 improvement in that nation's mean life expectancy with a significance level of 0.01. While this finding seems to confirm the hypothesis that the degree of religious homogeneity significantly influences mean life expectancy at the national level, two further results strengthen the association. First, racial/ethnic homogeneity was fully mediated by the presence of religious homogeneity. Clearly, the control for solidarity based upon race and ethnicity in Model One was capturing the effect of the missing variable of religious homogeneity, and there is something operant within religion in terms of solidarity that operates in a way that is distinct from any similarity based upon race or ethnicity. Second, specification tests on Model Two indicated a fully specified model, with no omitted variable bias.

The final result of this analysis is the simple comparison of the R-Squared values, as a test of model fit. Model Two indicates a slightly better model fit then Model One, with an adjusted R-Squared of 0.79 compared to 0.78. While this is not a large increase and could be associated with the inclusion of any variable, the elimination of any omitted

variable bias, which can result in inflated values in the adjusted R-Squared, supports the conclusion that Model Two has the better model fit.

Because religious homogeneity had a strong effect, was highly significantly and its inclusion established a better model fit, the null hypothesis that religious homogeneity does not influence mean life expectancy can be rejected, and the hypothesis that the greater the degree of religious homogeneity within a nation, the higher that nation's life expectancy will be, all else being equal, is accepted.

Discussion

The results of this analysis indicate a relationship exists between religious homogeneity and life expectancy. Perhaps the most appropriate way of discussing this finding is to place it in context in real world dynamics. For instance, as of 2004 Zambia had a mean life expectancy of 32.4 years and religious homogeneity of 62.5%. If Zambia had greater levels of social cohesion as defined in terms of religious homogeneity, its mean life expectancy would rise at a rate of 0.10 years per one percentage point increase. Therefore, if Zambia were 100% homogenous, its mean life expectancy would be 3.75 years longer, all else being equal. Conversely, any decrease in Algeria's 99% religious homogeneity would result in reductions to its mean life expectancy of 69.7, which was higher then the global mean despite a per capita GDP of only $2,049.

Durkheim suggested that religion was used a mechanism for the creation and reproduction of society in such a way that society itself was kept coherent and understandable by its constituent groups (1995 [1912]). For Durkheim, sustaining collective understandings of and interactions with the realm of the sacred was essential to

sustaining communal health. Failing to abide by social strictures or expectations had dramatic, and often fatal, negative repercussions on health (Durkheim 1995 [1912]). Durkheim proposed that even in the emerging modern societies where the definition of religion may be increasingly negotiable, the cultural reproduction elements would remain vital and active (Durkheim 1995 [1912]).

Several scholars have determined the paths that social cohesion can take in enhancing health and well-being, for both society and for the individuals of which they are comprised. Through the reproduction of a coherent society, common understanding of reality, a common worldview, is formed that serves society by providing a shared sense of meaning (Kaltko-Rivera 2004). Furthermore, Aaron Antonovsky, in his groundbreaking work on resilience and coping, suggested that the dynamic of a sense of coherence is strongly supportive of positive coping, positive resilience, and positive mental health (1979). Using empirical methods, Antonovsky illustrated that experiencing a sense of coherence was strongly related to positive health outcomes (1979). The Theory of Homophily also stresses the importance of social cohesion in terms of increased correspondence, with the resultant activation of social support, as a primary result of collective similarities (Lazarsfeld and Merton 1982 [1954]).

Since the conceptualization of sense of coherence as a theoretical explanation for understanding health, it has been empirically shown to advance positive health outcomes through hundreds of empirical studies. A few of the areas in which sense of coherence has been applied include its roles in supporting resilience from chronic disease (Surtees et al. 2003), protecting against the onset of Type II Diabetes (Agardh et al. 2004), and improved immune system functioning among older adults experiencing relocation to care

facilities (Lutgendorf et al. 1999). Furthermore, the protective influence of sense of coherence appears to be consistent outside of western cultural contexts, a finding that is also supported by this analysis. In a sample of adults in northern Thailand, sense of coherence was shown to have a protective influence upon health that was similar in magnitude and scale to that evidenced by western studies (Cederblad et al. 2003). The empirical support for sense of coherence as a protective factor in both physical and mental health is extraordinary.

According to Durkheim, "Religion is in a word a system of symbols by means of which society becomes conscious of itself; it is a characteristic way of looking at the world,"(1996 [1951]). Society uses concepts of the sacred to establish common reference points and to create collective recognition. Religion, at least at the national level, seems to engage protective factors inherent in social cohesion theory, and help to mitigate the damage that lack of cohesion can do through such challenges as illiteracy and inequality. Furthermore, these reference points appear to remain active for nations that view religion as more of a symbol of heritage then an active part of their everyday lives. Even in nations where actual participation in religion is low, identification with or support of religious institutions remains strong (Davie 2000), and the expectation that the shared worldview provided by religious contexts should also remain viable.

Equally inconsequential in terms of social cohesion is the actual brand of religion in question, either in terms of faith or practice (Schwarz and Huisman 1995). This analysis has shown that religion is not irrelevant in more developed nations, but rather has continued in a process of renewal and reinvention that is needed to meet the needs of society (Bellah 1964; Gorski 2000), at least in terms of religious solidarity. Ultimately,

religious concepts serve to reinforce collective and social cohesion, which according to this analysis, is supportive of health at the national level as well as for individuals and communities.

Religion has meaningful effects upon human populations that directly, and indirectly, influence health outcomes. By supporting common understandings of reality, generating a communal sense of coherence, increasing social support and sustaining structures of meaning in people's lives, religion operates as an active social force that supports health, and influences life expectancy. This has been shown to be true at the individual and community level by previous scholars. Through this study, the importance of religion as protective of health at the national level has also been confirmed.

Limitations and Next Steps

The primary limitation of this study rests with the original sources for the construction of the data set. While both the United Nations and the CIA have established infrastructures that should support adequate data collection, utilizing two sources does open the possibility that differences in measurement and data collection practices could create some bias in the data. This has been mitigated to the degree possible by garnering distinct data for this analysis from specific sources. For example, life expectancy, per-capita GDP, illiteracy rates, the Gini index and population size were taken only from the United Nations, while the variables on religion and race were drawn only from the 2004 CIA World Factbook. In addition, the use of listwise deletion ensured that only those nations with complete data across all variables were included within the study, further limiting the potential for bias in the sample. Half of the missing variables were found in

the Gini index alone, but its inclusion was made necessary by the need to address previous literature. While perhaps hampering the degrees of freedom available for the regression, this reduction in sample size sustains a conservative approach to understanding the data. The significance levels of the findings indicate that the reduced sample size did not compromise the final results, supporting the decision not to impute additional data at the risk of impugning the results.

Next steps in this research fall along two paths. First, while a general relationship has been presented, the nation-specific dynamics underlying the specific question of how religious effects on social cohesion play out in a nation's health transition is best determined through a detailed, comparative historical approach of a small number of cases. This level of detail, following Riley's lead in his study on the Jamaican transition (2005) will provide the type of window through which the dynamics at play between religion and nation-level health can be most clearly understood. Additional steps may include increasing the level of sophistication in the analysis to include the potential for embedded random effects based upon region of influence (e.g., Africa, former Soviet republics, the Carribean), or to test for gradient relationships suggested in previous literature. This analysis is simply a portal study from which further advances in understanding the continuing role of religion at the broadest social level may be achieved.

Conclusion

There is always a danger to an analysis of this type, that it will be seen as supporting some type of forced homogenization. This is most certainly not the case. This paper has shown that it is religion in the abstract that has an effect, not any specific type or brand of

religion. More precisely, one can state that it is the dynamics operant within religion's ability to mobilize common perspectives and engender social cohesion at the national level that lead to improved health and longer life expectancies. This paper is not suggesting that homogeneity in religious structure should be enforced in order to improve mean life expectancies. However, the results are significant and strong, and indicate a positive, and heretofore ignored, relationship that warrants further study and understanding.

These findings do not present a plan for change, but they do open a space for dialogue. Previous work has shown that at the individual level, religion matters in terms of health and wellbeing. While the mechanisms may be different, this paper has shown that the same can be said at the national level as well. Durkheim believed that these dynamics would one day be co-opted by science, and the possibility exists that it may be replicated through other means. Until the mechanisms through which religion specifically affects nation-level health are more clearly understood, the ability to use them to advance the health transition throughout the under-developed nations of the world will remain untapped and unexplored.

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APPENDIX A: List of Nations in Sample

Albania	Côte d'Ivoire	Jordan	Romania
Algeria	Croatia	Kazakhstan	Rwanda
Argentina	Czech Rep.	Kenya	Senegal
Armenia	Ecuador	South Korea	Sierra Leone
Australia	Egypt	Kyrgyzstan	Singapore
Austria	El Salvador	Lesotho	South Africa
Azerbaijan	Ethiopia	Mali	Sri Lanka
Bangladesh	Finland	Mauritania	Swaziland
Belarus	Gambia	Mexico	Switzerland
Belgium	Georgia	Mongolia	Tajikistan
Benin	Germany	Morocco	Thailand
Bolivia	Ghana	Mozambique	Trinidad and Tobago
Botswana	Greece	Namibia	Tunisia
Brazil	Guinea	Netherlands	Turkey
Bulgaria	Guinea-Bissau	New Zealand	Turkmenistan
Burkina Faso	Haiti	Nicaragua	Uganda
Burundi	Honduras	Niger	Ukraine
Cambodia	Hungary	Norway	Tanzania
Cameroon	India	Pakistan	United States of America
Canada	Indonesia	Paraguay	Uruguay
Central African Republic	Iran	Peru	Uzbekistan
Chile	Ireland	Philippines	Zambia
China	Israel	Poland	Zimbabwe
Colombia	Jamaica	Portugal	
Costa Rica	Japan	Moldova	