

Religion and Child Health: Religious Affiliation, Importance, and Attendance and Health Status among American Youth

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Abstract This study examines the relationship between religious affiliation, importance of religion, and frequency of church attendance and the reported overall health status and psychological health of children and adolescents by age group (6–11, 12–15, and 16–19 years old), using national data from the Child Development Supplement to the Panel Study of Income Dynamics. Controlling for child's initial health, individual and family demographic characteristics, and socio-economic status, differences were found by age and measures of religion and health. Probit analysis revealed a generally positive and statistically significant association between religion and health, especially for the psychological health of children ages 12–15. Mitigating the issue of selection bias on observable characteristics, the Propensity Score Matching analysis generated similar positive associations between religion and child health. These findings are consistent with the corresponding literature on adults.

Keywords Health · Religion · Religiosity · Children · Adolescents · US

Introduction

The health literature has shown that religious adults are generally healthier than their non-religious counterparts, although the issue of endogeneity has not been addressed (see for example Koenig et al. 2001; Lee and Newberg 2005). Even less is known about the religion-health relationship for children and adolescents. The question then arises: Is there a beneficial relation between religion and the health of children, as has been found for adults?

This paper examines the relation between religion and the overall health and psychological health of children and adolescents in the United States, which has received relatively little attention in the literature. The general finding was that religious beliefs and participation among American youth were associated with better health status, suggesting that religion may foster a healthy environment for the child's development.

This research contributes to the extant literature in several important ways. Previous related studies have tended to employ relatively small samples of homogeneous youth (e.g., Abbotts et al. 2004; Holder et al. 2010; Non-nemaker et al. 2003), while this research used a large nationally representative sample of American children and adolescents ($N = 2,604$) across a wide age range (6–19 years old). The analysis was done both for the full sample (ages 6–19) and by age groups (6–11, 12–15, and 16–19) to account for the differential relationship between religion and health over the spiritual developmental life stages of childhood and adolescence. Several measures were used to capture the varied aspects of religious behavior: affiliation and denomination, frequency of attending religious services (intensity of attendance), and importance of religion (intensity of belief). In addition, the relevant literature has largely focused on risky health

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behavior (substance abuse and adolescent sex) or single mental/emotional health outcomes (suicide, depression, happiness), whereas this paper examined overall health (reported overall health status) and a comprehensive measure of psychological health. Furthermore, the theoretical framework modified the Grossman (1972) model of the demand for health to apply it to children and adolescents and incorporated religious capital as one of the inputs in the production of health. Another contribution of this paper was the attempt to address causality (i.e., health status affecting religious belief and practice) using the Instrumental Variables (IV) technique. The Propensity Score Matching (PSM) technique was also employed.

Background and Literature Review

Americans tend to have a strong attachment to religion. According to recent surveys, about 92 % of Americans professed belief in the existence of God or a universal spirit, 82 % reported religion to be very important or somewhat important in their lives, 88 % attended church regularly,¹ and 42 % attended church in the previous 7 days (Gallup 2009; The Pew Forum 2008). High levels of religious belief and participation are also characteristic of children and adolescents. Among American teenagers, 95 % believed in God, and 45 % belonged to a religion-sponsored youth group or attended worship services weekly (Gallup and Bezilla 1992). Fifty-four percent of middle and high school students reported that religion or spirituality was quite or extremely important to them, whereas 27 % of American teens considered religious faith more important to them than it was to their parents and reported being slightly more likely to attend worship services than adults (Benson et al. 2003; Gallup and Bezilla 1992).

A body of literature has developed that relates religious affiliation, denomination, and religiosity (religious beliefs and practices), here broadly defined as “religion,” to the physical and psychological health of adults. Most studies suggested that religious involvement among adults was associated with lower mortality rates, fewer or less severe morbidities (e.g., cardiovascular disease, hypertension, stroke, and cancer), less frequent unhealthy behavior (e.g., drug and alcohol use and abuse), and a lower prevalence of anxiety, depression and suicide, among other health outcomes (e.g., Johnson et al. 2002; Koenig et al. 2001; Lee and Newberg 2005; McCullough and Smith 2003; Miller and Thoresen 2003).

Not all studies found a positive significant relationship between religion and health. A meta analysis of 850 articles did find that 80 % of the studies reported a positive association between religious beliefs and practices and life satisfaction (Koenig and Larson 2001). A recent study, however, found that greater religiosity was not associated with lower risk of cardiovascular disease prevalence and incidence in a 4-year period (Feinstein et al. 2010). Studies produced mixed results on the link between religion and adult obesity, depending on the dimension of religious life and gender (Cline and Ferraro 2006).

Even though the religion-health relationship received considerable attention with regard to adult health, little is known about the relation of religion and religiosity to child and adolescent health. The relevant literature on youth tended to focus on unhealthy behavior (smoking and alcohol and drug use) and risky sexual behavior, and a few studies analyzed the association with exercise, diet, sufficient sleep, and seat belt use, generally finding a beneficial relationship (e.g., Abbotts et al. 2004; Donahue and Benson 1995; Miller and Gur 2002; Regnerus 2003; Sinha et al. 2007). Risky behaviors were associated with numerous detrimental health outcomes. However, what is missing in the literature is exploring the relationship between religion and health (as opposed to healthy behavior) among children and adolescents.

In terms of psychological health, several studies of youth found that involvement in religion was associated with lower rates of suicide, attempted suicide, and contemplation of suicide, lower occurrence or less severe depression, and higher levels of happiness and overall well-being (e.g., Borowsky et al. 2001; Donahue and Benson 1995; Harker 2001; Watt and Sharp 2001; Wright et al. 1993). The relationship might vary by the specific measures of religion and health outcomes, although few studies found no or negative association. Research on adolescents in grades 7–12 found that frequency of attendance of religious services and religious youth group activities were associated with lower emotional distress, but frequency of prayer and importance of religion were not statistically significant (Nonnemaker et al. 2003). Another recent study reported that among 8–12 year olds religiosity (frequency of attendance and prayer/meditation) was not significantly associated with happiness (Holder et al. 2010). Studies have examined the association between religion and health behavior or mental health, but not the causal relationship.

Few studies of the relationship between religion and socio-economic outcomes attempted to address the issue of causation, typically by using PSM analysis or IV approach. For example, utilizing PSM to control for endogeneity of school choice, Mocan and Tekin (2006) found that teenage Catholic school attendance reduced the propensity to use cocaine and to have sex for female students, but increased

¹ For simplicity, this paper refers to any house of worship as “church.”

the propensity to use and sell drugs for male students. Scheve and Stasavage (2006) showed that countries with higher levels of religiosity had lower levels of welfare state spending, estimating the effect of religion on welfare spending.² Using ancestral group as an instrument for religious density, Gruber (2005) concluded that higher levels of religious market density (share of the population of an individual's religion in the area), significantly increased religious participation leading to higher levels of education and income, lower levels of welfare receipt and disability, and higher marriage and lower divorce levels. No paper we are aware of has attempted to examine causal relationships between religion and health. If potential endogeneity problems exist, it is not clear whether the link identified is causal. In this paper attempts to use the IV technique were not successful because of the lack of relevant identifying instruments. The PSM method is presented in the Empirical Framework section.

Theoretical Framework

Mechanisms

Religion could have positive effects on youth health status directly through influencing the children and indirectly through influencing their parents' behavior by means of regulative, integrative, and spiritual mechanisms (Waite and Lehrer 2003). First, as a regulative mechanism, religions tend to discourage unhealthy behavior (e.g., smoking, drug use, risky sexual behavior) and excessive behavior that in moderate form may not be unhealthy or in some cases may even be beneficial (e.g., drinking red wine). Some religious denominations do not allow the consumption of potentially harmful substances (e.g., Mormons disallow alcohol and tobacco consumption). On the other hand, some religions or religious denominations prohibit their members from using some services of doctors and hospitals (e.g., Christian Scientists) or discourage blood transfusions and vaccinations, which may adversely affect health. While the avoidance of medical care may not have had negative health consequences in the past, it may do so today.

Second, the integrative or social mechanism may be another way to explain the religion-health relationship, since religious participation usually takes place in a group context and thus involves social relationships and the formation of networks, i.e., social capital (Hawe and Shiell 2000). Such groups may moderate unhealthy behavior, enhance one's business and marital prospects, and provide friendship and social support in times of emotional or

medical need. Family participation is typical in religious activities, as distinct from other group activities (e.g., junior soccer leagues, bowling leagues, and book clubs) that tend to separate or segregate people by gender or age. Thus, if the whole family practices the same religion, religious activities can serve to strengthen ties among family members (Pearce and Axinn 1998).

Third, a spiritual or psychological mechanism could explain the relationship between religion and health. Religion can improve psychological health since it may serve as a coping mechanism in times of adversity, improve self-esteem, provide deliverance from anxiety about life after death, and give meaning in life. Some denominations, however, can also increase feelings of guilt and fear (e.g., Azzi and Ehrenberg 1975; Ellison et al. 2001) or the child may feel peer-rejection or embarrassment (Abbotts et al. 2004), resulting in lower levels of psychological health.

As these various mechanisms suggest, the religion-health relationship is a complex one, making it difficult to establish a direction of causation. There could be three possible explanations for the correlation between religion and health: religion affects health, health influences religion, or a third, unobserved variable (e.g., individual's time preference) impacts both health and religion. Most of the religion-health literature has focused on the first relationship with little regard or explicit recognition of the difficulty in establishing causality. This study first modeled religion as an independent variable in the health regressions and then attempted to examine whether the relationship found was causal.

Theoretical Model

The theoretical framework of this paper was built on the Grossman model of the demand for health (Grossman 1972) by adding religion/religiosity to the production of health and applying the model to children and adolescents. In Grossman's framework, adults inherit an initial stock of health, which depreciates over time, and can be increased by investment. Consumers produce gross investments in health capital using as inputs market goods (e.g., medical care) and their own time. The health production function depends on one's initial health status; age; investments in health; and efficiency in the use of health inputs, which is measured by the individual's level of education.

We made several adjustments to Grossman's health production function. First, health depreciation with age from the Grossman model does not apply in the case of children and adolescents, who are physically much healthier than adults. Here instead of atrophy of the human body, age reflects the maturation of the child, both physically and mentally. With age, otherwise undetected health conditions may be revealed. Second, the relevant efficiency

² State religious support, religious regulation measures, and religious pluralism were used as instruments.

parameter is not child's own education, but rather parental education. Since the population of interest in this study was children and adolescents, who had not yet completed their education, age and education (years of schooling) were essentially collinear. Presumably parents' knowledge of health production (their education) is more relevant than that of the child. Studies have long established that mother's education is about twice as important for the child's health as that of the father because mothers tend to be the primary caregiver of children (e.g., Case and Paxson 2001). Thus, this study used mother's education to measure the family's efficiency in converting resources into child health. It is expected to positively affect the health of the child. In the dataset used in this paper, there was a positive association between mother's education and the probability of being affiliated with a religion.

In addition to education, several control variables were considered in the analysis. Better initial health was predicted to enhance health during childhood. We expected poorer health at birth (or as an infant) to be linked to poorer health later on, but probably less so as the child grew into adolescence. Initial child health was measured by birthweight and whether the child had been breastfed. Family income was hypothesized to be associated with better child health. Controlling for family income, marital status, and education, a working mother implied less time available for maternal child care, which would tend to have a negative effect on child health.

Age plays an important role in the spiritual development of children. A child's religious denomination and age-appropriate level of religious participation are most likely determined primarily by the parent for very young children. As the youth matures from childhood through the teenage years, one can expect opportunities to emerge for the child to diverge religiously from the parents. This divergence is more likely to start with the extent of religious practice, such as church attendance, and could continue with divergent patterns in denomination (Iannaccone 1990, referencing Clark 1929 and Pressey and Kuhlen 1957, p. 301). In other words, younger children ages 6–11 do not have a choice with regard to religion, older children ages 16–19 can choose their religion, whereas the options for the middle group, ages 12–15, are less clear. Therefore, it is important to do the analysis by age group.

An important question in examining the relationship between religion and health is whether those with greater propensities to be religious are also apt to engage in healthy behavior or invest in their health independently of religion. We cast light on this issue by employing a PSM approach, which allowed us to model the propensity of being religious and then to assess the religion-health relationship for children and adolescents with equal propensities of being religious.

Methods

Data

The main data used for this study came from the 2002 Child Development Supplement (CDS) to the Panel Study of Income Dynamics (PSID). Additional data on child and family demographics were drawn from the 1997 CDS and the 2003 PSID. The PSID is a nationally representative longitudinal dataset collected since 1968, which includes a rich array of socio-economic, behavioral, health, and numerous other variables, whereas CDS provides a wealth of information on the child's physical health, emotional well-being, social relationships, and academic achievement.

The 1997 CDS interviewed PSID families with children ages 0–12 (3,563 children; 88 % response rate) and the 2002 CDS re-interviewed them in 2002/2003 (2,907 children; 91 % response rate), when the children were ages 5–19. Most of the responses were given by the child's primary caregiver (PCG), who in over 90 % of the cases was the child's mother, or else biological father or grandmother. Fitzgerald et al. (1998) provided a detailed discussion of CDS and PSID sampling procedures.

The 2002 CDS was chosen for the analysis because it included children of the age range of interest, whereas the previous wave (1997) or subsequent wave (2007), the children were either too young, or many were beyond adolescence. Furthermore, in the 1997 CDS there were no data on the child's religion and only limited information on the child's health. Some psychological health responses and child characteristics that did not vary with age (gender, race, birthweight, and breastfeeding as a baby) were drawn from the 1997 CDS. Using household identifiers, the 2003 PSID was linked to CDS to obtain data on family characteristics, including family income, household head's marital status, and mother's education and hours worked. Five-year-old children were excluded from the analysis because of a high rate of missing values for some of the religion questions. The final sample consisted of 2,604 children of the household head (whether biological, step, adoptive, or foster), ages 6–19, who lived in the family at the time of the interview and had no missing values for the variables analyzed.³

³ Because of missing values for one or more of the variables included in the analysis, only 4.9 % (135 records) of the original CDS/PSID sample of biological/step/adoptive/foster children ages 6–19 had to be dropped. Since a larger number of observations of the mother's education were missing, a missing mother's education variable was included in the analysis. The children in the sample used in this study ($N = 2,604$) were statistically not different from the children in the comparable CDS/PSID sample (before dropping records for missing variable values) (maximum $N = 2,739$), except for mother's education (a difference of 0.23 years of education in favor of the regression sample). A summary statistics table is available from the authors on request.

Measures of Health

To obtain a better understanding of the complex relationship between religion and health, two health outcomes were analyzed. Child overall health (presumably a proxy for physical health) was classified as healthy (=1) if the PCG reported excellent or very good health for the child, and less healthy (=0) if the PCG reported good, fair, or poor health. Few children were in fair or poor health (2.8 %), so the comparison was really between children in “excellent” (53.0 %) or “very good” (31.6 %) health versus “good” health (12.6 %). The categorical health variable does not lend itself to being treated as a continuous variable, since it is less clear what a unit increase represents in objective health terms. Its treatment as a dichotomous variable is consistent with much of the literature.

Using a rich array of questions from the PCG survey, dichotomous variables were created for each child’s psychological health, which was defined as less healthy (=0) if the child’s last hospitalization was for mental health problems or a suicide attempt, the last doctor visit was for a mental health reason, if a doctor had ever diagnosed the child with serious emotional disturbance or emotional/mental/behavioral problems, or if the PCG reported that the child was often unhappy, sad, or depressed. If none of these conditions applied, the psychological health variable was coded as psychologically healthy (=1).

Religion Variables

The primary variables of interest in our study were the practice of religion and degree of religiosity of the child. Three dimensions of religion were examined: religious affiliation (and denomination), frequency of attending religious services, and importance of religion. Children ages 12 and older were asked questions on religion, but not younger children. In addition to investing in their children’s health, parents also care about sharing their lifestyle with their children, which in this case included religion (Ponthiere 2011). Thus, the child religion variables were constructed based on self-reports for children ages 12 and older, and if not available, first the PCG’s report on religion, second the mother’s religion or third the father’s religion were used as proxies.⁴ The religious affiliation variable was defined as unity for those reporting a specific religion and defined as zero for those who had no religion or were atheist or agnostic. Church attendance categories included: weekly or more frequently, sometimes or

⁴ Among children ages 12–19, parental report was used for 16.9 % of children to construct the variables on religious affiliation and denomination, 9.8 % for church attendance, and 9.2 % for importance of religion.

monthly, and none or yearly. Similarly, religious importance was also divided in three categories: very important, somewhat important, and not important.

We also wished to test whether religious denominations differ in their relationship with child health. Are some denominations more successful in the production of health than others? Building on Smith (1990) and Steensland et al. (2000), children were classified into five groups according to their religious affiliation: Catholic, Mainline Protestant, Conservative Protestant, other religion, and no religion/atheist/agnostic.⁵

Control Variables

Since health outcomes vary significantly across demographic groups, a number of individual-level demographic variables were used as controls in the empirical models. These include the following child demographics: gender (dichotomous variable = 1 if male), race/ethnicity (dichotomous variables for white, black, Hispanic, and other race), and age group (dichotomous variables for ages 6–11, 12–15, and 16–19).⁶ Following Grossman’s model (1972), where initial health accounted for part of the current health status, the analysis included two measures of child’s initial health stock: breastfed as a baby (dichotomous variable = 1 if breastfed), and child’s birthweight (dichotomous variable = 1 if birthweight >5.5 pounds (WHO 2004), i.e., absence of low birthweight). Birthweight was based on a 1997 CDS survey question, where the PCG recalled the weight at birth of children ages 0–12. Due to the potential time lapse, there might be a recollection response error in the child’s birthweight. If there are systematic reporting errors, the coefficient estimates are inconsistent; if purely random, reporting errors in the explanatory variable bias the coefficient estimates toward zero (Wooldridge 2000).

As the literature has found, family structure and socioeconomic status were other important determinants of improved health. Thus, we also included in our analysis marital status of the household head (dichotomous variable = 1 if married), mother’s education (years of schooling, years of schooling squared, and missing schooling), and family income as a percentage of the poverty level adjusted for the size of the family (a

⁵ The literature refers to Mainline Protestants also as “Liberal Protestants,” and Conservative Protestants also as “Fundamentalist Protestants” or “Evangelical Protestants.” Due to small sample sizes, Jews, Orthodox, and Mormons, were included under the category “other religion.” The Appendix includes a detailed description of the denominational groups.

⁶ Due to concerns on how to define other race categories given small sample size (Thornton and White-Means 2000), other races included Asian/Pacific Islander, American Indian or Alaskan Native, and Multi-racial.

continuous variable and its square term).⁷ Furthermore, a variable for mother's work hours (number of hours worked per week) was also included as a proxy for the amount of time available for the mother to invest in the child's health, the total of active and passive time spent with the child (Moro-Egido 2011). Miller (2011) found that the effect of maternal work on child health varied by the child's age group. Such differences were captured in this paper, as the analysis used a breakdown by age categories.

Child health could also depend on access to medical care. Health insurance affects access to medical care, although it may be endogenous with respect to health status. Namely, children with health insurance have greater access to medical services and may enjoy better health, yet at the same time parents of a sickly child would be expected to have a higher demand for health insurance. The inclusion of the health insurance variable had no material effect on the results reported in this paper.⁸

In order to obtain improved statistical matching, in addition to the variables discussed above (child demographics, initial health, and family characteristics), the estimation of the propensity of being religious included a behavior problem index; two indices we created for traditional family (a 19-item index, Chronbach's alpha = 0.76⁹) and child independence (a 5-item index, Chronbach's alpha = 0.75); and the presence of health insurance (health insurance, health insurance missing).¹⁰

Empirical Framework

The empirical analysis utilized probit and PSM estimation methods. The relationship between religion and overall and psychological health was examined separately by the

different measures of religion (affiliation and denominational category, church attendance, and importance of religion), both for the full sample (ages 6–19) and by age groups (6–11, 12–15, and 16–19). Since the data are a single cross-section, we could not exclude the possibility of reverse causality or unobserved variables both affecting religion and health. The statistical analysis was performed in STATA 10.1.

Probit Analysis

Because of the dichotomous nature of the two outcome variables, the models for child overall health and psychological health were estimated using maximum likelihood probit regression models. The estimated marginal effects from the probit regressions provided useful information for the association between the different measures of religion and health outcomes by child age group.

If families who are religious differ substantially from those who are not religious in ways that also affect their investments in child health, biased estimates would be obtained for the relationship between religion and child health. For example, if families with characteristics that benefit child health are also more likely to be religious, compared to those who are non-religious, the benefits of religion may be overstated (e.g., individuals who place a high value on future outcomes, may be more likely to be religious and at the same time more healthy as they make greater health investments). Conversely, if families with poorer health traits are more likely to be religious, a negative association between religion and child health may arise (e.g., families with a family member in poor health may choose to turn to religion as last resort). Given the limited understanding of the determinants of religion, the direction and magnitude of the potential selection biases in the estimates of the religion effect remain unclear.

Propensity Score Matching (PSM)

The PSM econometric technique, developed by Rosenbaum and Rubin (1983), mitigates selection bias (in this case selection into religion), but cannot eliminate the possibility of omitted variable bias. In the paper, PSM assessed the treatment effect (religion) on the outcome variable (child health).¹¹

¹¹ The IV technique also attempts to provide an alternative to account for selection into religion. However, finding a suitable instrument for religion proved difficult. State prevalence of religion (both from external data and based on the PSID), namely belief in God or religious affiliation, importance of religion, and weekly church attendance as well as indices for parental child-rearing attitudes and family values were tested as instruments, but the first stage results showed very low explanatory power of the model introducing extra noise in the estimation. Bound et al. (1995) provided a detailed discussion of problems with IV estimation.

⁷ The square terms for maternal education and family income were included to capture the potential non-linear relationship between these variables and child health, expecting diminishing returns of education with each year of schooling, as the general health production function suggests.

⁸ The regressions including health insurance are available from the authors upon request.

⁹ A Cronbach's alpha, the statistic typically used for measuring the internal consistency or index reliability, of 0.70 or higher is considered reliable (Streiner and Norman 1989).

¹⁰ The traditional family index was based on questions, such as "If a husband and a wife both work full-time, they should share household tasks equally"; "Women are much happier if they stay at home and take care of their children"; "It is more important for a wife to help her husband's career than to have one herself" (1 = strongly disagree to 4 = strongly agree), whereas the index indicating the degree of child's independence comprised 5 questions on the frequency, in the last 6 months, that the child made his/her own bed, cleaned his/her own room, helped manage his/her own time, etc. (1 = never/almost never to 5 = almost always). Detailed information of the construction of the health, religion, and control variables is available on request from the authors.

The PSM models first utilized the child's propensity of being religious, utilizing a rich array of background variables and then assessed the effect of religion on the health of religious children who were matched to their non-religious counterparts based on those propensity scores. Thus, the main idea of using the PSM technique was to replicate conditions of a random experiment by adjusting for observable differences such that the treated group (religious children) and the control group (non-religious children) were homogeneous on all other factors except religion, which was randomly assigned.¹²

In particular, the relationship between religion, R , and health, H , for individual i in the PSM framework can be presented as follows:

$$H_i = \beta R_i + \gamma X_i + \varepsilon_i$$

$$R_i = \delta X_i + v_i$$

where X_i stands for characteristics of the child which affect his/her health and religious involvement. ε_i and v_i capture unobservable characteristics affecting H_i and R_i , whereas β measures the religion–health relationship. Estimating H_i directly may yield a biased estimate of β if R_i and ε_i are statistically dependent. The literature has given two explanations for the correlation between R_i and ε_i (Rosenbaum and Rubin 1983; Heckman and Robb 1985): selection on observables (dependence between X_i and ε_i), and selection on unobservables (dependence between ε_i and v_i). If either source of bias was present, then religious children would have different outcomes compared to their non-religious counterparts, independent of any causal effect of religion. In other words, by matching religious and non-religious children who were similar in terms of an expanded list of observable independent variables, except for the receipt of the treatment (religion), the PSM method mitigated the issue of selection bias on observable variables.

The inclusion of a wide array of variables in the estimation of the propensity score (X_i from the health equation plus additional variables) may have also helped limit the extent of selection on unobservables to the extent that this wide array of variables served as proxies for unmeasured factors. The expanded list of variables helped improve the quality of the match between the treated and control groups, in order to reduce potential biases generated by unobservables.

In particular, the PSM method uses the conditional probability of selection into treatment (propensity score) to stratify the sample (Rosenbaum and Rubin 1983). If the treated and the non-treated with the same propensity score have the same distribution of X , then the balancing property of the propensity score is satisfied. Matching the

religious and non-religious children using their estimated propensity score and placing them into one block meant that selection into religion within each block was random and the probability of being religious within this block equaled the propensity score. However, since the propensity score itself is a continuous variable, the probability of finding an exact match will rarely be achieved, and a certain distance between individuals belonging to the two groups has to be allowed (Becker and Ichino 2002). We chose Uniform (radius) Kernel matching algorithm to estimate the average treatment effect for the treated. Kernel matching weighs the distance of the difference in propensity scores between treated cases and their matched controls. The contribution of individuals in the control group to the overall estimation of the treatment effect of religion is dependent on their distance, measured through differences in propensity scores from their matched treated case. The estimate of the religion effect was therefore weighted so that control group members (non-religious) who were closest to treated individuals (religious) contributed more to the estimation of the overall treatment effect than those with greater differences in the propensity score. In other words, better matches have greater impact on the parameter estimate. As the match decreases in quality, so too does the contribution of the control individual in calculating the treatment effect (Becker and Ichino 2002).

In order to compute the propensity score, we ran a separate logit regression of the binary treatment variable of religion. We used three binary variables of religion in the PSM analysis: religious affiliation, church weekly attendance, and considering religion very important. Then based on the new sample resulting from the statistical matching, probit models were estimated for the overall health and psychological health outcomes for each religion variable for the full sample and by age group.

Results

Table 1 reports the means and standard deviations of the dependent and explanatory variables used in the analysis for the full sample, and for those affiliated with a religion, and the unaffiliated (reporting no religion, atheist or agnostic). Given the definitions of being healthy used in this study, 85 % of the children were reported as healthy overall, and 78 % were psychologically healthy. Nearly 90 % of the children were affiliated with a religion, with only about 10 % reporting as having no religion or being atheist or agnostic. Those who were affiliated with a religion were healthier overall by 6 % points than the unaffiliated (85 % compared to 79 % in good overall health, respectively). For psychological health, there was also a 6 % point spread with those affiliated reporting better

¹² Ali and Ajilore (2011) provided an excellent discussion of the PSM technique.

Table 1 Means and standard deviations by presence of religious affiliation

	Full sample		Non-affiliated		Affiliated		Diff
	Mean	SD	Mean	SD	Mean	SD	
<i>Dependent variables</i>							
Overall health	0.85	(0.36)	0.79	(0.41)	0.85	(0.35)	**
Psychological health	0.78	(0.41)	0.73	(0.44)	0.79	(0.41)	*
<i>Religion</i>							
No religion, atheist, agnostic	0.10	(0.31)	1	(0)	0	(0)	—
Affiliated with religion	0.90	(0.31)	0	(0)	1	(0)	—
Catholic	0.21	(0.40)	0	(0)	0.23	(0.42)	***
Mainline Protestant	0.19	(0.39)	0	(0)	0.21	(0.41)	***
Conservative Protestant	0.44	(0.50)	0	(0)	0.49	(0.50)	***
Other Religion	0.07	(0.25)	0	(0)	0.07	(0.26)	***
Importance of religion: not important	0.13	(0.33)	0.61	(0.49)	0.07	(0.25)	***
Importance of religion: somewhat	0.26	(0.44)	0.17	(0.38)	0.27	(0.44)	***
Importance of religion: very important	0.62	(0.49)	0.22	(0.41)	0.67	(0.47)	***
Church attendance: none or seldom	0.33	(0.47)	0.65	(0.48)	0.30	(0.46)	***
Church attendance: monthly/sometimes	0.23	(0.42)	0.16	(0.37)	0.24	(0.43)	**
Church attendance: weekly or more	0.43	(0.50)	0.19	(0.39)	0.46	(0.50)	***
<i>Child Demographics</i>							
Male	0.51	(0.50)	0.57	(0.50)	0.50	(0.50)	*
White	0.48	(0.50)	0.55	(0.50)	0.47	(0.50)	**
Black	0.41	(0.49)	0.36	(0.48)	0.41	(0.49)	
Hispanic	0.08	(0.27)	0.04	(0.19)	0.08	(0.27)	**
Other race	0.04	(0.20)	0.06	(0.23)	0.04	(0.20)	
Child age: 6–11 years	0.48	(0.50)	0.39	(0.49)	0.50	(0.50)	**
Child age: 12–15 years	0.31	(0.46)	0.32	(0.47)	0.31	(0.46)	
Child age: 16–19 years	0.21	(0.40)	0.29	(0.45)	0.20	(0.40)	***
<i>Child Initial Health</i>							
Child breastfed as a baby	0.45	(0.50)	0.50	(0.50)	0.45	(0.50)	†
Child normal/high birthweight	0.89	(0.31)	0.88	(0.33)	0.89	(0.31)	
<i>Family Characteristics</i>							
Married head	0.62	(0.48)	0.52	(0.50)	0.63	(0.48)	***
Years of schooling mother	12.06	(3.91)	11.38	(4.33)	12.14	(3.85)	**
Years of schooling mother missing	0.06	(0.24)	0.10	(0.29)	0.06	(0.23)	**
Work hours mother	26.26	(18.55)	28.94	(18.56)	25.95	(18.52)	**
Family income (as a % of poverty level)	3.39	(4.46)	3.40	(2.99)	3.39	(4.60)	
<i>N</i>	2,604		272		2,332		

Source Child Development Supplement (CDS) 2002 supplemented with data from CDS 1997 and Panel Study of Income Dynamics 2003

SD stands for standard deviation

The Diff Column reports the statistical significant differences between the non-affiliated and affiliated columns (*t*-test for the continuous and test of proportions for the dichotomous variables), where ***, **, *, † represent statistical significance at $p < 0.001$, $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively

psychological health (79 vs 73 %). Similar to the rates of adult church attendance in the United States, one-third (33 %) of the sample did not attend or attended only a few days a year, close to a quarter (23 %) attended sometimes, and nearly half (43 %) attended at least weekly. In spite of patterns of affiliation and frequency of church attendance,

for only about two-thirds of children (62 %) religion was reported to be very important. For about a quarter (26 %) religion was only somewhat important, and for about one-in-eight (13 %) religion was not important.

It is useful to study separately the three dimensions of religion/religiosity. There is not a perfect relation among

these variables.¹³ While one might expect the affiliated to attend church often and to view religion as very important, this was not always the case. As shown in Table 1, among those reporting an affiliation, for example, 30 % never or very seldom attended church and for 7 % religion was not important. On the other hand, the absence of an affiliation does not necessarily mean that the person does not attend church or that religion is not important. Among those with no affiliation, 35 % attended church sometimes or weekly or more, and for 22 % religion was very important. Findings of no religious involvement among the affiliated may introduce an upward bias in the estimates of religious affiliation, as the benefits from affiliation may not be fully utilized. Similarly, findings of religious involvement among the unaffiliated group may introduce a downward bias in the estimates of religious attendance and importance, as an unaffiliated child may be attending church or perceive religion as important and hence their behavior may differ compared to the behavior of other non-affiliates. As Table 1 shows, since the relationships between the different measures of religion were not perfect, it was important to utilize several measures of religion to more fully capture the multifaceted impact of religion. In addition, the religiously affiliated children were more likely to come from married families and their mothers worked, on average, fewer hours, perhaps due to a more traditional family structure in a religiously affiliated household with a stay at home or part-time working mother.

As shown in Table 1, religion was associated with better health status. There were, however, sharp differences in health status by religion and religiosity. Table 2 reports the means and standard deviations for the overall health and psychological health for the full sample of children by religious affiliation, specific denominational group, importance of religion to them, and frequency of church attendance.

In addition to affiliation, as demonstrated in Table 1, the importance of religion in one's life and church attendance were also related to overall and psychological health. As Table 2 shows, for those for whom religion was very important, 85 % were healthy overall, whereas this was so for only 81 % if religion was not important. The gap was even greater for psychological health. About 81 % of those for whom religion was very important were psychologically healthy, in contrast to only 65 % among those for whom it was not important.

¹³ A correlation matrix not shown here indicated that even though the religious measures of affiliation, attendance and importance were statistically significantly correlated, the correlations were not strong, the highest correlation coefficient being (−0.5) between religion not important and affiliated. As expected, a negative correlation was found between having an affiliation and religion not important and a positive correlation was found between having an affiliation and frequency of church attendance.

Furthermore, both measures of health were higher for those who attended more frequently. For example, in terms of overall health, 85 % were healthy among those attending at least weekly, in contrast to 82 % for those who never or hardly ever attended. The gap was more pronounced for psychological health, 82 % compared to 74 %, respectively.

Table 3 reports the marginal effects from the probit regression analysis for the determinants of overall health, whereas Table 4 does the same for psychological health. Both tables report the analyses for the full sample (ages 6–19), and separately by age group (6–11, 12–15, and 16–19).¹⁴ The sample sizes were, of course, reduced when the analyses were done within age groups.

Overall health (Table 3) for 6–19 year olds and for 6–11 year olds was improved when the child had better initial health (breastfed as a baby and normal or high birthweight), when the mother had more schooling, and when the family's income was higher. Especially for those 6–11 year olds, overall health was lower for males, as well as for blacks and Hispanics as compared to whites.

Psychological health (Table 4) appeared unrelated to initial health status, to mother's education, and to family income, but it was better in a two parent household (married family head). Good psychological health was less frequent among males, but it was greater for blacks and Hispanics in reference to whites. Less favorable access to medical care among blacks and Hispanics as compared to whites might result in less reporting to the parents of psychological problems that might otherwise be reported by physicians.

Affiliation with a religion as distinct from having no religion or being atheist or agnostic, had a strong positive relationship with overall health, both for the full sample and for children ages 6–15 (Table 3). Among older teens (age 16–19), the association was positive, but not statistically significant, possibly partly due to relatively small sample size ($N = 536$). Affiliation with a religion for 6–19-year-old youths was associated with a 6.7 % point higher probability of being in better overall health than if unaffiliated. It had a slightly greater positive relationship with health than having been breastfed as a baby and the same strength of the association as having a mother with 2.2 additional years of schooling. For children ages 12–15, the marginal effect of affiliation was double the size of that for

¹⁴ Consistent with the proposed theory for differences in the religion-health relationship by age, a Wald test indicated that separating the analysis by age group was the preferred approach as compared to a pooled sample using interaction terms by age. In particular, the Wald test for psychological health indicated that separate models should be run by age groups, whereas the results of Wald test for overall health were just shy of the conventional level of significance. For consistency purposes, for both health outcomes the results were presented for the full sample and by age group.

Table 2 Means and standard deviations of overall and psychological health by religion

	Overall health		Psychological health		Sample size
	Mean	SD	Mean	SD	N
<i>Religious affiliation</i>					
Not affiliated	0.79	(0.41)	0.73	(0.44)	272
Affiliated	0.85	(0.35)	0.79	(0.41)	2,332
Catholic	0.84	(0.37)	0.82	(0.39)	538
Mainline protestant	0.89	(0.31)	0.79	(0.41)	488
Conservative protestant	0.84	(0.37)	0.77	(0.42)	1,135
Other religion	0.88	(0.33)	0.79	(0.41)	171
<i>Importance of religion</i>					
Not important	0.81	(0.40)	0.65	(0.48)	327
Somewhat important	0.86	(0.35)	0.79	(0.41)	666
Very important	0.85	(0.36)	0.81	(0.40)	1,611
<i>Church attendance</i>					
None or seldom	0.82	(0.38)	0.74	(0.44)	869
Sometimes or monthly	0.86	(0.34)	0.78	(0.42)	611
Weekly or more	0.85	(0.35)	0.82	(0.39)	1,124
Total Sample	2,604		2,604		2,604

Source Child Development Supplement (CDS) 2002 supplemented with data from CDS 1997 and Panel Study of Income Dynamics 2003
SD Standard Deviation

Table 3 Probit analysis of overall health: affiliation, by age group

Overall health	Ages 6–19 (full sample)	Ages 6–11	Ages 12–15	Ages 16–19
Affiliated with religion	0.0668** (0.0261)	0.0607† (0.0416)	0.1238** (0.0481)	0.0306 (0.0431)
Male	−0.0057 (0.0133)	−0.0395* (0.0188)	0.0201 (0.0231)	0.0388 (0.0282)
Black	−0.0086 (0.0173)	−0.0624* (0.0266)	0.0239 (0.0281)	0.0356 (0.0355)
Hispanic	−0.0648* (0.0343)	−0.0748† (0.0462)	−0.0738 (0.0681)	−0.0235 (0.0716)
Other race	−0.0452 (0.0395)	−0.0254 (0.0533)	−0.0511 (0.0768)	−0.0924 (0.0870)
Child breastfed as a baby	0.0592*** (0.0146)	0.0687*** (0.0201)	0.0436 (0.0268)	0.0545† (0.0310)
Child normal/high birthweight	0.0879*** (0.0255)	0.1161*** (0.0379)	0.0366 (0.0396)	0.0811† (0.0562)
Married head	0.0063 (0.0163)	−0.0194 (0.0234)	0.0318 (0.0278)	0.0084 (0.0304)
Years of schooling mother	0.0295† (0.0158)	0.0603** (0.0248)	0.0167 (0.0290)	0.0051 (0.0261)
Years of schooling mother squared	−0.0008 (0.0007)	−0.0021* (0.0010)	−0.0003 (0.0012)	0.0003 (0.0012)
Years of schooling mother missing	0.1308* (0.0249)	0.1424* (0.0179)	0.1103 (0.0600)	0.0917 (0.0768)
Work hours mother	0.0006 (0.0004)	0.0013* (0.0006)	0.0003 (0.0007)	−0.0004 (0.0008)
Family income (as a % of poverty level)	0.0165* (0.0089)	0.0143 (0.0091)	0.0232** (0.0080)	0.0090 (0.0223)
Family income squared (as a % of poverty level)	0.00005 (0.0006)	−0.0002 (0.0004)	−0.0002† (0.0001)	0.0012 (0.0016)
Child age: 12–15 years	−0.00002 (0.0155)			
Child age: 16–19 years	−0.0333† (0.0192)			
Pseudo R ²	0.077	0.097	0.092	0.078
N	2,604	1,262	806	536

Source Child Development Supplement (CDS) 2002 supplemented with data from CDS 1997 and Panel Study of Income Dynamics 2003

***, **, *, and † Statistical significance at $p < 0.001$, $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively

Marginal effects reported from PROBIT regressions; robust standard errors shown in parentheses

Religion reference group: not affiliated with religion, atheist or agnostic

Table 4 Probit analysis of psychological health: affiliation, by age group

Psychological health	Ages 6–19 (full sample)	Ages 6–11	Ages 12–15	Ages 16–19
Affiliated with religion	0.0095 (0.0259)	−0.0398 (0.0305)	0.0923† (0.0549)	−0.0034 (0.0562)
Male	−0.0559*** (0.0159)	−0.0673*** (0.0193)	−0.0476 (0.0319)	−0.0254 (0.0395)
Black	0.1195*** (0.0196)	0.1056*** (0.0238)	0.1439*** (0.0383)	0.1216* (0.0512)
Hispanic	0.1085** (0.0280)	0.0573 (0.0311)	0.1895** (0.0522)	0.1658† (0.0777)
Other race	0.0581 (0.0341)	0.0673 (0.0350)	−0.0792 (0.0910)	0.1765† (0.0693)
Child breastfed as a baby	0.0199 (0.0185)	0.0157 (0.0218)	0.0247 (0.0378)	0.0105 (0.0478)
Child normal/high birthweight	0.0074 (0.0268)	0.0185 (0.0343)	−0.0124 (0.0489)	0.0085 (0.0681)
Married head	0.1367*** (0.0210)	0.1001*** (0.0291)	0.1754*** (0.0388)	0.1301** (0.0475)
Years of schooling mother	−0.0306 (0.0215)	−0.0418 (0.0281)	0.0121 (0.0442)	−0.0316 (0.0483)
Years of schooling mother squared	0.0014 (0.0009)	0.0018 (0.0011)	−0.0001 (0.0018)	0.0011 (0.0020)
Years of schooling mother missing	−0.1748 (0.1807)	−0.3419 (0.3130)	0.1326 (0.2032)	−0.2293 (0.3633)
Work hours mother	0.0007 (0.0005)	0.0004 (0.0006)	0.0003 (0.0009)	0.0016 (0.0011)
Family income (as a % of poverty level)	−0.0004 (0.0038)	0.0115 (0.0073)	−0.0050 (0.0063)	−0.0015 (0.0109)
Family income squared (as a % of poverty level)	−0.00001 (0.00004)	−0.0002 (0.0003)	0.00001 (0.0001)	0.0001 (0.0001)
Child age: 12–15 years	−0.1334*** (0.0205)			
Child age: 16–19 years	−0.1660*** (0.0253)			
Pseudo R^2	0.059	0.046	0.051	0.036
N	2,604	1,262	806	536

Source Child Development Supplement (CDS) 2002 supplemented with data from CDS 1997 and Panel Study of Income Dynamics 2003

Marginal effects reported from PROBIT regressions; robust standard errors shown in parentheses

Religion reference group: not affiliated with religion, atheist or agnostic

***, **, *, † Statistical significance at $p < 0.001$, $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively

children ages 6–11 (12.4 vs 6.1 percentage points, respectively). For psychological health, the estimated marginal effect of religious affiliation was statistically significant and positive only for youths ages 12–15 (Table 4). The magnitude of that marginal effect was about half that of the favorable effect of living with both parents (married household head).

The full probit equations for religious denomination, importance, and church attendance were computed next, but rather than reporting the full regression equations as in the previous two tables, only the religion variables are shown in Table 5.¹⁵ The top panel of Table 5 reports the marginal effects of the denominational groups on the overall health and psychological health of the child for the full sample and by age categories, with the unaffiliated (no religion, atheist or agnostic) serving as the reference group. The association between overall health and all denominational groups, as compared to the unaffiliated, was not only positive, but also significant for the full sample, ages 6–19. By separate age groups, the estimated marginal effect of religion was always positive, and in a number of cases it was also significant. In the case of psychological health, compared to the unaffiliated, the estimates for the separate

religion groups were in most cases positive (except in the 6–11 age group), but generally not statistically significant.

The middle and bottom panels of Table 5 show the marginal effects of the importance of religion and church attendance, respectively. The estimates for the importance of religion, where the reference group was that it was not important, were positive and highly significant for overall health for ages 6–19 and ages 12–15. The same pattern held for psychological health. The reference group for the church attendance variable was never or seldom attending church. Church attendance apparently consistently had a positive association with overall health, but it was not statistically significant even at the 15 % level of significance. Church attendance generally had a positive relationship with psychological health and was highly statistically significant for those who attended weekly or more frequently, compared to those who never or seldom attended for all age groups combined and those ages 16–19.¹⁶

¹⁶ The probit equations presented in Tables 3, 4 5 were also estimated in two stepwise manners: (1). First-order regressions where a health outcome was regressed on a religious variable (without the control variables); and (2). Regressions of the health variable on the control variables (without the religion variables). The results were not sensitive to the order in which the religion and control variables were entered in the equations. Those regressions are available from the authors upon request.

¹⁵ The full regression equations are available on request from the authors.

Table 5 Probit analysis of child overall and psychological health, by various dimensions of religion and age group

	Overall health					Psychological health						
	Ages 6–19 (full sample)	Ages 6–11	Ages 12–15	Ages 16–19	Ages 6–19 (full sample)	Ages 6–11	Ages 12–15	Ages 16–19	Ages 6–19 (full sample)	Ages 6–11	Ages 12–15	Ages 16–19
Catholic	0.0466* (0.0218)	0.0287 (0.0358)	0.0579 (0.0333)	0.0805* (0.0393)	0.0318 (0.0293)	0.0031 (0.0424)	0.0468 (0.0586)	0.0205 (0.0697)	0.0318 (0.0293)	0.0031 (0.0424)	0.0468 (0.0586)	0.0205 (0.0697)
Mainline protestant	0.0600** (0.0207)	0.0509 (0.0320)	0.1064** (0.0246)	0.0166 (0.0450)	0.0157 (0.0297)	-0.0440 (0.0462)	0.1146* (0.0511)	-0.0299 (0.0719)	0.0157 (0.0297)	-0.0440 (0.0462)	0.1146* (0.0511)	-0.0299 (0.0719)
Conservative protestant	0.0568** (0.0214)	0.0613† (0.0329)	0.1015** (0.0338)	0.0010 (0.0405)	-0.0020 (0.0272)	-0.0587 (0.0412)	0.0859† (0.0511)	-0.0118 (0.0620)	-0.0020 (0.0272)	-0.0587 (0.0412)	0.0859† (0.0511)	-0.0118 (0.0620)
Other religion	0.0613* (0.0232)	0.0488 (0.0356)	0.0615 (0.0351)	0.0881† (0.0427)	0.0060 (0.0393)	-0.0789 (0.0628)	0.0860 (0.065)	0.0751 (0.0984)	0.0060 (0.0393)	-0.0789 (0.0628)	0.0860 (0.065)	0.0751 (0.0984)
Pseudo R ²	0.077	0.098	0.096	0.091	0.059	0.050	0.053	0.038	0.059	0.050	0.053	0.038
N	2,604	1,262	806	536	2,604	1,262	806	536	2,604	1,262	806	536
Importance of religion: somewhat important	0.0516* (0.0198)	-0.0104 (0.0496)	0.1041*** (0.0249)	0.0200 (0.0357)	0.0654** (0.0237)	-0.0111 (0.0552)	0.1255** (0.0410)	0.0106 (0.054)	0.0654** (0.0237)	-0.0111 (0.0552)	0.1255** (0.0410)	0.0106 (0.054)
Importance of religion: very important	0.0579** (0.0228)	0.0351 (0.0497)	0.0657* (0.0297)	0.0286 (0.0356)	0.0551* (0.0252)	-0.0533 (0.0439)	0.1266** (0.0429)	0.0890† (0.0515)	0.0551* (0.0252)	-0.0533 (0.0439)	0.1266** (0.0429)	0.0890† (0.0515)
Pseudo R ²	0.077	0.098	0.098	0.078	0.061	0.049	0.058	0.042	0.061	0.049	0.058	0.042
N	2,604	1,262	806	536	2,604	1,262	806	536	2,604	1,262	806	536
Church attendance: sometimes or monthly	0.0214 (0.0174)	0.0244 (0.0246)	0.0103 (0.0307)	0.0055 (0.0351)	0.0079 (0.0212)	-0.0323 (0.028)	0.0487 (0.0405)	0.0484 (0.0509)	0.0079 (0.0212)	-0.0323 (0.028)	0.0487 (0.0405)	0.0484 (0.0509)
Church attendance: weekly or more	0.0204 (0.0151)	0.0155 (0.0215)	0.0156 (0.0261)	0.0320 (0.0291)	0.0397* (0.0185)	0.0157 (0.0233)	0.0926** (0.0363)	0.0219 (0.0453)	0.0397* (0.0185)	0.0157 (0.0233)	0.0926** (0.0363)	0.0219 (0.0453)
Pseudo R ²	0.074	0.095	0.080	0.079	0.060	0.048	0.054	0.038	0.060	0.048	0.054	0.038
N	2,604	1,262	806	536	2,604	1,262	806	536	2,604	1,262	806	536

Source Child Development Supplement (CDS) 2002 supplemented with data from CDS 1997 and Panel Study of Income Dynamics 2003

***, **, *, † Statistical significance at $p < 0.001$, $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively

Marginal effects reported from PROBIT regressions; robust standard errors are shown in parentheses

Religion reference groups: denomination: no affiliation, atheist or agnostic (top panel); importance of religion: not important (middle panel); and church attendance: none or seldom (bottom panel)

The regressions control also for gender, race, breastfed, birthweight, married head, mother's education and work status, family income, and child's age

Table 6 Propensity score matching: child overall and psychological health, by various dimensions of religion and age group

	Overall health				Psychological health			
	Ages 6–19 (full sample)	Ages 6–11	Ages 12–15	Ages 16–19	Ages 6–19 (full sample)	Ages 6–11	Ages 12–15	Ages 16–19
Affiliated with religion	0.0520* (0.0268)	0.0269 (0.0409)	0.1127** (0.0504)	0.0215 (0.0331)	0.0191 (0.0278)	-0.0173 (0.0347)	0.0845 (0.0578)	-0.0043 (0.0590)
Pseudo R^2	0.075	0.0933	0.0907	0.104	0.0543	0.041	0.0441	0.0325
N	2,317	1,145	710	462	2,317	1,145	710	462
Importance of religion: very important	0.0167 (0.0159)	0.0420† (0.0252)	-0.0045 (0.0257)	0.0132 (0.0337)	0.0161 (0.0179)	-0.0413† (0.0221)	0.0512 (0.0341)	0.1028* (0.0439)
R^2	0.0726	0.0959	0.0791	0.1013	0.0557	0.0442	0.0472	0.0468
N	2,315	1,145	707	463	2,315	1,145	707	463
Church attendance: weekly or more	0.0105 (0.0146)	0.0009 (0.0203)	0.0092 (0.0258)	0.0386 (0.0328)	0.0523** (0.0169)	0.0395† (0.0207)	0.0977** (0.0331)	0.0190 (0.0437)
R^2	0.071	0.0923	0.0779	0.1015	0.0573	0.0476	0.0545	0.0354
N	2,304	1,140	704	460	2,304	1,140	704	460

Source Child Development Supplement (CDS) 2002 supplemented with data from CDS 1997 and Panel Study of Income Dynamics 2003

***, **, *, † Statistical significance at $p < 0.001$, $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively

Marginal effects reported from PROBIT regressions; robust standard errors are shown in parentheses

The regressions control also for gender, race, breastfed, birthweight, married head, mother's education and work status, family income, and child's age group

Table 6 reports the PSM results.¹⁷ The coefficient estimates imply better overall and psychological health of the children affiliated with religion. The effect was stronger for those 12–15 years of age, and among the children ages 6–11 for whom religion was very important. Better psychological health was found for children ages 16–19 for whom religion was very important, and for those attending church weekly or more frequently, especially 6–15 year olds. Unexpectedly, worse psychological health was found for those ages 6–11 for whom religion was very important.

More specifically, compared to the children unaffiliated with religion, the affiliated children ages 6–19 were on average 5.2 % points more likely to be in better overall health, which, as the analysis by age group indicated, was primarily attributable to children ages 12–15, who had 11.3 % points higher probability of being in good overall health. Children ages 6–11 for whom religion was very important were 4.1 % points less likely to be in good psychological health but the coefficient estimate was at the margin of statistical significance. This was in contrast to the positive effect on their overall health (4.2 % points). By the late teenage years, placing a high importance on religion made adolescents 10.3 % points more likely to be in good psychological health.

Whereas frequent church attendance was not statistically significant in the overall health regression, it was associated with a 5.2 % point higher probability of being in good psychological health for children ages 6–19. The analysis by age group indicated that this positive effect was observed for children ages 6–11 (4 % points more likely to be in better psychological health) and children ages 12–15 (9.8 % points). The PSM results were generally consistent with the probit results presented previously, and with the idea that various dimensions of religion might have beneficial effects on the overall or psychological health of children.

Summary, Discussion, and Conclusions

This paper is concerned with the relation of religious affiliation and religiosity (measured by frequency of church

attendance and importance of religion) to the overall health and psychological health of children and adolescents ages 6–19. The main dataset used was the 2002 Child Development Supplement (CDS) and additional data on child and family characteristics were merged in from the 1997 CDS and the 2003 Panel Study of Income Dynamics. The hypothesis that religious affiliation and religiosity are positively associated with the overall health status and the psychological health of children and adolescents, as the literature has found to be the case for adults, was generally supported by the data, although the relationship varied by the specific aspect of religion and child age considered. The strongest positive religion-health relationship was found for children ages 12–15. The descriptive statistics indicated that health status (overall and psychological health) increased significantly with having a religious affiliation (e.g., 85 % of children affiliated with religion were reported as being in good overall health as compared to 79 % of the unaffiliated), perceiving religion as somewhat/very important, and attending church on a monthly or weekly basis. Furthermore, psychological health also improved with the degree of religiosity.

This analysis built on the Grossman (1972) model of the demand for health by including religious human capital in the production of health and modifying the model for children and adolescents. The statistical control variables revealed interesting patterns. Other variables the same, black and Hispanic youth were in poorer overall health but in better psychological health than whites, perhaps because their limited access to health care resulted in less reporting of mental health problems to care-givers. Consistent with the literature, favorable family characteristics, such as mother's education and family income in the child's overall health regressions and two-parent households in child's psychological health regressions, were associated with better health (e.g., Amato and Keith 1991; Eldar-Avidan et al. 2008; Hong and White-Means 1993). Girls ages 6–11 were in better health status than boys, but these gender differences disappeared for older age groups. Initial health (breastfed as a baby, had normal or high birth-weight) was more important for the overall health of the younger group (ages 6–11) than for the older group (16–19), suggesting a dissipation in these initial beneficial health associations as children get older. While mother's education was associated with better overall health for the young children (ages 6–11), family income became important for the young adolescents (ages 12–15).

Controlling for initial health and child and family demographic characteristics, the probit results showed a positive relationship between religion and health. While specific denominations did not matter, any religious affiliation for children and adolescents ages 6–19 was linked to better overall health, especially in the early teen years

¹⁷ In the first step in implementing the matching method the propensity score for the treatment group (dichotomous variables for affiliation, religion being very important, and weekly/more frequent church attendance) was estimated as a function of all of the variables included in the health equation, as well as the presence of health insurance and indices for the degree of traditional family, child independence, and behavioral problems. Following the algorithm proposed by Becker and Ichino (2002), we found that in each of the blocks (8 blocks for affiliation, 7 blocks for importance, and 6 blocks for attendance) the propensity score for the treatment group satisfied the balancing property, i.e., the score was balanced across the treated units and controls.

(6.7 % points, $p < 0.01$, for 6–19-year-old children and 12.4 % points, $p < 0.01$, for 12–15-year olds), and those ages 12–15 were also in better psychological health (9.2 % points, $p < 0.10$). Children ages 6–19 who viewed religion as very important, and the subset ages 12–15, had better overall and psychological health than those who viewed it as not important (e.g., 5.5 % points, $p < 0.05$, and 12.7 % points, $p < 0.01$, in the psychological health regressions for children ages 6–19 and 12–15, respectively). Frequency of church attendance did not seem to matter for overall health, but did matter for the psychological health of 6–19 year olds and the subgroup ages 12–15. Those who attended church weekly or more frequently had better psychological health than less frequent attendees (4.0 % points, $p < 0.05$ for 6–19-year-old children and 9.3 % points, $p < 0.01$, for 12–15-year-old children, and statistically nonsignificant and much smaller in magnitude marginal effects for “sometimes or monthly” frequency of attendance). In other words, there appears to be a non-monotonic effect of age on the relationship between religiosity and health, with religion having the strongest association with health in the early teen years (ages 12–15), and a nonsignificant relationship for younger children (ages 6–1), and late teens (ages 16–19). It could be that the effect of religion accumulates, that is, religion is important as a religious stock and not merely as a flow variable. For the older group, however, due to small sample size the results were mostly not statistically significant.

The PSM analysis, which helped to correct for selection into religion, also showed generally a positive effect of religion on health, with the biggest impact for those 12–15 year olds, confirming the probit results. Religious affiliation improved overall health, whereas weekly church attendance improved psychological health, with the strongest effect in both cases found in the early teen years (e.g., the estimated marginal effects for religious affiliation were 5.2 percentage points, $p < 0.50$, for 6–19 year olds and 11.3 % points, $p < 0.01$, for 12–15 year-old children in the overall health regressions). Viewing religion as very important resulted in better overall health for children ages 6–11, poorer psychological health in the pre-teen school years (ages 6–11), and improved psychological health in the late teen years. The PSM estimates were similar though slightly smaller than the probit results (e.g., the estimated marginal effect of religious affiliation for 12–15-year-old children was 11.3 % points, $p < 0.01$, in the PSM regressions vs 12.4 % points, $p < 0.01$, in the probit regressions). However, compared to the probit regressions, in the PSM analysis information on the degree of religiosity was lost, due to the dichotomy requirement for the treatment variable (religion).

This work indicates a generally positive association between religion and health among youths. Even though

the PSM analysis helps mitigate the issue of selection bias on observable characteristics, there could still be selection into religion based on unobservables. Because of the cross-sectional nature of the data used, we could not exclude the possibility of reverse causality or an unobserved variable affecting both religion and health.¹⁸ If religion does in fact improve child/adolescent health, as suggested by this analysis, then parents should take into account these benefits when they weigh the costs and benefits of religious activity. Namely, religious capital—“familiarity with a religion’s doctrines, rituals, traditions, and members [that] enhances the satisfaction one receives from participation in that religion” (Iannaccone 1990, p. 299)—which accumulates with family time investments and out-of-pocket expenditures may improve the child’s health status.

The beneficial relationship between religion and child health may partially arise from discouraging unhealthy behavior on the part of children and their parents (i.e., what the literature has described as the regulative effect of religion), which is probably captured by all three measures of religion used here. Church attendance, on the other hand, “mainly measures the conventional observance and social aspects of religiosity” (Schwartz and Huismans 1995), and hence is linked to psychological rather than overall health. The data did not allow for more specific testing of the actual mechanism relating religion and health. Moreover, the parent-reported measure of health might be a further limitation of the study, since more religious parents might be more optimistic about their children’s health.

In addition to improved social behaviors (such as decreased smoking, alcohol and drug use, crime, teenage pregnancies, and unsafe sexual practices) and better educational outcomes as previous studies have found, improved health may be yet another benefit from religion (Donahue and Benson 1995; Koenig et al. 2001; Regnerus 2003). Since healthier children become healthier adults, starting a child on the path of religious belief and involvement can be beneficial for the child’s health in the short-run and in the long-run. Thus, policies by governmental or non-governmental groups that are supportive of religious institutions, even without favoring any particular denomination, are likely to be positively associated with children’s health status, and thereby may help reduce health care expenditures. In addition, if religious participation does improve child health, then promoting church-based children programs, such as youth groups, summer camps, parochial schools, and even subsidizing the cost of Sunday school to increase child attendance, may raise

¹⁸ We tried using the IV technique to address the endogeneity of religion, but the technique was not successful because of the absence of appropriate identifying instruments.

social welfare. Such changes could be implemented by individual families, religious denominations, and private philanthropies, if not by the government.

In summary, this study adds to the literature by showing some beneficial relationships between child overall and psychological health and religion, measured by religious affiliation, church attendance, and the importance of religion to the family. The most important religion-health relationships appeared at early adolescence, at the stage when youths begin to adopt religion on their own rather than it being chosen for them. These findings have implications for families, religious communities and denominations, and society overall. The involvement of children in religious practices and the opportunity to obtain religious human capital, may not only increase their religious involvement as they become adults, but may also have

benefits, even if not intended, for the children’s overall and psychological health as well as for health care costs. This study also raises the question as to whether other types of youth organizations (e.g., Boy Scouts, Girl Scouts, 4-H Clubs, etc.) may have similar beneficial health effects.

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Appendix

See Table 7.

Table 7 Variable definition

Overall and psychological health	
Variable	Definition
Overall health	= 0 if the child is less healthy (i.e., in good, fair, or poor health) = 1 if the child is healthy (i.e., in excellent or very good health) “In general, would you say Child’s health is excellent, very good, good, fair, or poor?” (2002 CDS: Q21A11)
Psychological health	= 0 if psychologically unhealthy child (i.e., any of the conditions below apply) = 1 if psychologically healthy child (i.e., none of the conditions below apply) “What was the reason for (last) hospitalization?—1st, 2nd, 3rd: mental health, suicide attempt” (2002 CDS: Q21A3B1, Q21A3B2, Q21A3B3) “For what illness did (CHILD) see the doctor, nurse or other health care professional?—1st, 2nd, 3rd: mental health” (2002 CDS: Q21A5B1, Q21A5B2, Q21A5B3) “Has child’s doctor or health professional ever said that CHILD had-A serious emotional disturbance: yes” (1997 CDS: Q1A21J; 2002 CDS: Q21A4I) “Has child ever seen a psychiatrist, psychologist, doctor, or counselor about an emotional, mental, or behavioral problem?: yes” (1997 CDS: Q1A24; 2002 CDS: Q21A8) “For the next set of statements, decide whether they are not true, sometimes true, or often true of CHILD’s behavior ... (He/She) is unhappy, sad or depressed: often true” (1997 CDS: Q1G23T; 2002 CDS: Q21B29T)
Religious affiliation	
Age group	Variable construction
Ages 6–11	“What is your religious preference? [If answer is generic, such as “christian” or “protestant,” probe: What denomination is that?—Head” (PSID 2003: ER23474, ER23475) “What is your religious preference? [If answer is generic, such as “christian” or “protestant,” probe: What denomination is that?—Wife” (PSID 2003: ER23382, ER23383) Head and wife responses were converted into mother’s and father’s responses Use mother’s religion/religious denomination; if mother’s religion was missing, then use father’s religion/religious denomination.
Ages 12–19	Child’s religion or religious denomination, Child-reported (2002 CDS) “What is your present religion? [for children 12 and older]” (2002 CDS: Q23J2)

Table 7 continued

Category	Parental religion (ages 6–11)	Child own religion (ages 12–19)
Catholic	Catholic	Catholic
Mainline Protestant	Disciples of Christ; United Christian ... First Christian; Christian Holiness Episcopalian Lutheran Methodist/African Methodist Presbyterian Protestant, Protestant unspecified, ... Other Protestant Quaker; Friends Reformed, Christian reformed Unitarian; Universalist United Church of Christ ... Congregational Church	Episcopalian Lutheran Methodist Presbyterian Protestant Congregational/United Church of ... Christ/Evangelical Covenant Church
Conservative Protestant	Amish; Mennonite Baptist Christian Christian Science Churches of Christ Church of God Pentecostal Assembly of God Seventh Day Adventist	Baptist Christian Christian, Non-denominational Pentecostal/Holiness Seventh Day Adventist
Other	Greek/Russian/Eastern Orthodox Hindu/Buddhist Jehovah's Witness Jewish Latter Day Saints; Mormon Other non-Christian: Muslim Rastafarian, etc. Other	Hindu/Buddhist Jehovah's Witness Jewish Mormon/Church of Jesus Christ of Latter Day Saints Multiple Muslim Other
None/ atheist/agnostic	None/atheist/agnostic	None/atheist/agnostic
Importance of religion		
Age group	Variable construction	
Ages 6–11	Importance of religion to PCG (PCG-reported) "Apart from attending religious services, how important would you say religion is to you?"—Not important; somewhat important; very important; Don't know; Not answered/refused" (2002 CDS: Q22J7)	
Ages 12–19	Importance of religion to child (Child-reported) "How important is religion to you?"—Not at all important; not very important; somewhat important; very important; Don't know; Not answered/refused; inapplicable" (2002 CDS: Q23J3)	
Variable	Definition	
Not important	not important not at all important, not very important	
Somewhat important	somewhat important	
Very important	very important	

Table 7 continued

Church attendance	
Age group	Variable construction
Ages 6–11	PCG-reported: “During the last 12 months, how often did CHILD attend religious services?—Not at all; a few times a year; about once a month; two or three times a month; about once a week; more than once a week; don’t know; Not answered/refused; inapplicable” (2002 CDS: Q21G6B for 6–9 year olds; 2002 CDS: Q21H9B for 10–11 year olds)
Ages 12–19	Child-reported: “In the past 12 months, about how often did you attend religious services?—Not at all; a few times a year; about once a month; two or three times a month; about once a week; more than once a week; don’t know; not answered/refused; inapplicable” (2002 CDS: Q23J3B) if child-reported attendance missing, then PCG-reported child attendance of religious services during the past 12 months was used (2002 CDS)
Attendance of religious services was divided into three categories	
Category	Definition
None/yearly	not at all, a few times a year
Monthly	about once a month; two or three times a month
Weekly or more	about once a week; more than once a week
Control variables	
Variable	Definition
<i>Child demographics</i>	
Gender	=1 if male, =0 otherwise (1997 CDS and II)
Race	Four dichotomized variables taking values of =1 if given race (White, Black, Hispanic, Other race), =0 otherwise. White is the benchmark race (1997 CDS and II)
Child breastfed as a baby	=1 if child was breastfed as a baby, =0 otherwise (1997 CDS)
Child normal/high birthweight	=1 if child’s weight at birth was normal or high, i.e., greater than 5.5 pounds, =0 otherwise, i.e., if low birthweight (1997 CDS)
Child age	Three dichotomized variables taking values of =1 if given age (6–11, 12–15, 16–19 years old), =0 otherwise. The youngest group is the benchmark age category (2002 CDS)
<i>Family demographics</i>	
Married head	=1 if the head of the household is married, spouse present, =0 otherwise (head single, divorced, separated, widowed) (PSID 2003)
Years of schooling mother	Number of years of schooling of mother; if graduate school, years of schooling =17. The regressions also include Years of schooling mother squared and a dummy variable for Years of schooling mother missing (PSID 2003)
Work hours mother	Hours mother worked per week (PSID 2003)
Family income (as a % of poverty level)	Family income divided by the census poverty level for the family, adjusted for family size. The regressions also include the square of family income (as a % of poverty level) (PSID 2003).
<i>Additional variables used in Propensity score matching</i>	
Traditional family index	=1 strongly disagree to =4 strongly agree (2002 CDS) Please tell me your level of agreement with the following statements: A If a husband and a wife both work full-time, they should share household tasks equally B Women are much happier if they stay at home and take care of their children C It is much better for everyone if the man earns the main living and the woman takes care of the home and family D It is more important for a wife to help her husband’s career than to have one herself E An employed mother can establish as warm and secure a relationship with her children as a mother who is not employed F Parents should encourage just as much independence in their daughters as in their sons.

Table 7 continued

Control variables

Variable	Definition
	G Preschool children are likely to suffer if their mother is employed.
	H Being a father and raising children is one of the most fulfilling experiences a man can have
	I Mothers should not work full time if their child is younger than 5 years old
	J It is fine for children under 3 years of age to be cared for all day in a daycare center or daycare home
	K If children are seriously misbehaving it is best to spank them.
	L Being a mother and raising children is one of the most fulfilling experiences a woman can have
	M It is essential for the child's well-being that a father spend time interacting and playing with their children
	N A father should be as heavily involved in the care of his child as the mother
	O Fathers play a central role in the child's personality development
	P Fathers are able to enjoy children more when the children are older
	Q The way a parent treats a child in the first four years has important life-long effects
	R If it keeps him from getting ahead in his job, a father is being too involved with his children
	S In general, fathers and mothers are equally good at meeting their children's needs
Child independence Index	=1 never/almost never to =5 almost always (2002 CDS) In the last 6 months, how often did CHILDA Make (his/her) own bed? B Clean (his/her) own room? C Help keep shared living areas clean and straight? D Do routine chores such as mow the lawn, help with dinner, wash dishes, etc.? E Help manage (his/her) own time (get up on time, be ready for school, etc.)?
Behavioral problem index	=0–32, based on a number of questions with responses, 1 = Not true, 2 = Sometimes true, 3 = Often true (2002 CDS) For the next set of statements, decide whether they are not true, sometimes true, or often true of child's behavior: has sudden changes in mood or feeling, feels or complains that no one loves (him/her), feels no love, high strung, cheats, fearful, argues too much, difficulty concentrating, easily confused, mean to others, disobedient, feels no regret, trouble getting along, impulsive, feels worthless, not liked, has obsessions, restless, stubborn, strong tempered, unhappy, withdrawn, destructive, clings to adults, cries too much, demands attention, dependent, paranoid, hangs around trouble, secretive, worries too much, disobedient at school, trouble w/ teachers
Health insurance	=1 if child has health insurance; =0 otherwise (2002 CDS)
Health insurance missing	=1 if missing information on child's health insurance; =0 otherwise (2002 CDS)

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