Religion and Risky Health Behaviors among U.S. Adolescents and Adults[1]

Jason Fletcher and Sanjeev Kumar

Department of Health Policy and Management

School of Public Health

Yale University

Prepared for NBER Conference on Economics of Religion and Culture

March 8 and 9, 2013

THIS IS A PRELIMINARY DRAFT, PLEASE DON'T CITE OR CIRCULATE

[1]This research uses data from Add Health, a program project directed by Kathleen Mullan Harris and designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill, and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Information on how to obtain the Add Health data files is available on the Add Health website (http://www.cpc.unc.edu/addhealth). No direct support was received from grant P01-HD31921 for this analysis.

Abstract: Recent studies analyzing the effects of religion on various economic, social, health and political outcomes have been largely associational. Although some attempt to establish causation using the instrument variable (IV) method, the instrument used in these studies---a county level measure of religious market density---may be problematic. Moreover, the focus of most of the studies has been on religious rites and rituals i.e., religious participation or on the intensity of participation. During the adolescent years, religious participation might be a matter of limited choice for many individuals, as it is often heavily reliant on parents and family background more generally. Using the National Longitudinal Study of Adolescent Health, this paper analyses the effects of a broad set of measures of religiosity on substance use at different stages of the life course. In contrast to previous studies, we find positive effects of religion on all addictive substance during adolescence, but not in a consistent fashion during the later years for any other illicit drugs except for crystal meth and marijuana.

JEL Codes: I1, Z12

Keywords: Substance Abuse, Religion, Illicit Drug, Adolescence, Young Adult

Introduction

There is an urgent need to understand the determinants and correlates of risky health behaviors among U.S. adolescents. In light of an increasing proportion of single parent and dysfunctional families in the U.S. (Conti and Heckman, 2012), one needs to look at all other existing institutions, including religion, to ameliorate the worsening mental and physical health of children and youth. Risky health behaviors among adolescents, especially the persistently high-level of tobacco and other addictive substance use, especially among more vulnerable and poor populations, have been an active research area looking for causal explanations (Fletcher 2012; Clark and Loheac 2007).

Various explanations, from genes to environment, have been provided for the continued high rate of substance use among people of all age groups—some of these are causal and some are associational studies This paper is an attempt to re-evaluate the roles that one particularly crucial institution—religion--plays in influencing risky health behaviors among U.S. adolescents. To best of our knowledge, there is no study discussing the effects of religiosity and religious participation on medium- and long-term risky health behaviors and other health related outcomes using sibling fixed effects.

There is hardly an aspect of a society's life that is not affected by religion (Guiso et al. 2003, p. 226).[2] However, it is not clear if religious belief is an ex post narrative or if it really has a causal role in the ways an individual or a society function.[3] It would be appropriate to put, as Ulmer et al. (2011) did, that our understanding of the ways religion and its institutions affect our behaviors, in particular, risky health behaviors, is quite insufficient.

If religion indeed protects people from self-harm (Desmond et al. 2013; Mellor and Freeborn, 2011; McCullough and Willoughby 2009) , then one needs to understand not only what aspects of religion provide such protection, but also of the effects of religiosity, broadly defined to include all aspects of religion. Given the multidimensional nature of religiosity, we expand on

[2] Americans are strikingly different from other First World nations in their attitudes to religion (Dannett 2006). It also comes out very distinctly in the data that we use for this paper: 81.6% respondents in Wave 3 report that they believe in God and always have.

[3] What sets human beings apart from animals is not the pursuit of happiness, which occurs all across the natural world, but the pursuit of meaning, which is unique to humans (Baumeister 2013). Religion, by virtue of being a sense-making institution, potentially assists people to have a frame of reference for routine evaluation (i.e., endowing them with a sense of purpose) of the world around them (McCullough et al. 2009; Diamond, 2012). It is the ability for such routine evaluation that endows an individual with the capability to regulate their selves. Thus, we posit that one way religion, potentially, would protect individuals regarding substance use is to equip them with the requisite psychological tools to control their urge to indulge in risky health behaviors.[3] We are able to do this by controlling for religious affiliation of the respondents.

the existing measures of religiosity—frequency of religious attendance and prayers--to include a measure which captures the self-reported importance of religion (Iannaccone 1998; Kendler et al. 1997). We suggest that an individual can choose to participate under social and peer pressures; can choose to pray under unavoidable exigencies; yet not consider religion an important aspect of her life.

Only a handful of studies evaluating the role of religion in risky health behaviors are causal analyses. A recent example, by Mellor and Freeborn (2011), uses the instrument variable (IV) method; however, the instrument used in their study---a population based county level measure of religious market density---may not satisfy the conditions for exclusion restriction, especially with specifications excluding variables capturing state, county, parental, and other individual level sources of unobserved heterogeneity. Some studies have taken the route of exploiting policy variations across time and space to glean causal effects using changes in the prices of secular activities (Gruber and Hungerman, 2008; Hungerman 2010). Furthermore, the focus of most of the studies has been the role of rites and rituals (i.e., religious participation or the intensity of such participation) in their analyses. However, it may also be important to account for the role of religious belief in influencing the usage of addictive substance. For instance, an individual may not participate in religious activities but still can have strong religious beliefs, or there can be those who participate but are not sincere in their religious belief.

During the adolescent years, religion might not be a matter of choice for many individuals. Most children grow up believing in some form or another of religion depending on their parental, social networks, and their neighborhoods' characteristics (Iannaccone, 1998). Using the National Longitudinal Study of Adolescent Health, this paper analyses the effects not just of participation and the intensity of participation, but also of religiosity and religious beliefs on risky health behaviors for adolescents. In contrast to previous studies, using a sample of siblings, we show that parsing out the effects of family level unobserved heterogeneity allows for an alternative view of the effects that religious belief and behaviors have on adolescents' risky health behaviors, such as tobacco use, alcohol, and illicit drugs use. In contrast to some of the previous studies, positive effects of religion are found for all three variables used to capture the risky health behaviors.

We contribute in the literature along the following dimensions: We evaluate the use of a county level measure of religious density as a good instrument for religious participation to understand its role in the contemporaneous effect of religion on risky health behaviors. In light of the problems we highlight with the instrument, we use a sample of siblings and extend the existing analyses to medium- as well as the long-term outcomes. We also examine the effects of religion on illicit drugs besides marijuana both in the medium and in the long terms.

Literature Review

Iannaccone (1998) introduced the framework of rational choice model to explain religious institutions and adherence of beliefs, and since then there has been a sustained interest in building a better understanding of the economics and impact of religious institutions. Still the infancy of research analyzing the effects of religion on risky healthy behaviors in economics can be gleaned from the fact that none of the two recent handbooks of health economics (Pauly et al. 2012; Glied and Smith, 2011) even contain the word 'religion' in their index-sections. However, lately there has been more interest in evaluating the causal effects of religion on risky health behaviors (Mellor and Freeborn, 2011; Gruber and Hungerman, 2008; Lillard and Price, 2007; Gruber, 2005; Chatters, 2000).

A study closest in spirit to our paper is Mellor and Freeborn (2011), in which following Gruber (2005), they use the proportion of the county population belonging to the same denomination as the respondent as an instrument for religious participation variables. They report that religious participation in terms of both religious attendance and prayers to have a significant negative effect on marijuana use; however, estimated effects for smoking and binge drinking though negative were found to be statistically imprecise.

Lillard and Price (2007) apply various estimation techniques using several nationally representative surveys namely, the Panel Survey of Income Dynamics (PSID), the National Longitudinal Surveys of Youth 1979 (NSLY79), the Children of the National Longitudinal Surveys of Youth 1979 (CNLSY79), and Monitoring the Future (MTF) show that youth who attend church more often less likely to show socially deviant behaviors and indulge in risky health behaviors.

Gruber (2005) discusses many channels to explain the positive effects of a higher density of one's own religion in one's area on various outcomes of interests viz. religious participation, education, income, marital status, and also substance use. Given the difficulty in finding variables satisfying the exclusion restriction, Gruber and Hungerman (2008) and Hungerman (2010) have taken an innovative approach in their analyses by studying the response of individuals to the change in the price of secular goods due to changes in the policy regimes. Gurber and Hungerman (2008) show that the repeal of 'blue laws' across the US states in 70s and 80s led to significant increases in marijuana and cocaine consumption. Their findings about an increase consumption of the illicit drugs are explained by suggesting that lowering the price of secular activities would chip away at the religious participation because of higher opportunity cost; and consequently, if religion provides protection against the risky behaviors then it would lead to more indulgences in these behaviors. However, findings for respondent between 5 and 30 by Lillard and Price (2007) to some extent challenges such explanation; as they find that the respondents living in the states that repealed blue laws were less likely to initiate smoking. However, those living in states without blue laws conditional on belonging to a religion in which Sunday is treated as the day of obligation were somewhat more likely to initiate smoking.

The exogenous variations alleged to be isolated by these studies in the absence of control for parental religiosity, spatial sorting of people on the basis of policy-framework (Tiebout, 1956) cast doubt about the robust of these findings.

One limitation with recent studies is that they often do not account for family and individual level sources of unobserved heterogeneity on the adolescents' propensity to have religious inclinations and also their indulgence in risky health behaviors, namely cigarettes smoking, binge drinking, and illicit drug usages. In this paper, we expand the outcomes variables of interests to include: cocaine, meth, and any other drugs. We also investigate the near- and medium-term effects of religion on risky health behaviors. Moreover, Findings from behavioral genetics indicate the potential role of genes in predisposing a person to religion and religiosity (Sapolsky, 2011[4]) as well as to the usage of additive substance (Fletcher, 2012). If this indeed is the case that the propensity to have faith is innate i.e. genetically determined (Mohr and Huguelet, 2004) then doing family fixed effects, to some extent, would control for genetic endowments shared among the family members. Also, a more religious household may be more likely to adhere to religious proscription regarding addictive substance, have a higher discount rate, bigger family size, working mother etc., all of which have been shown to affect the demand for substance use (Iannaccone, 1998). The presence of these characteristics also affects the incentives for the suppliers and the state agency to regulate the supply and demand of these commodities. Thus, we keep such a model in the background, which helps in deriving predictions about the propensity for substance use. Controlling for family level unobservables through family fixed effects takes care of such confounders.

Empirical Strategy

There are clear reasons that much of the literature linking religion and risky outcomes is descriptive. It is quite difficult to find adequate quasi-experimental variation in individuals' religious beliefs and practices in observational data, and this is particularly true for adolescents because of their reliance on parental religious beliefs and practices. Indeed, we suggest that a critical source of heterogeneity that is often unable to be controlled in research is the effect of parents and family background on both religious and health outcomes (Chiswick 1988; Lehrer 1999). Thus, our primary strategy is to use a novel sample of siblings to employ family fixed effects to capture this specific set of potentially confounding influences.

Since the goal of this paper is to account for family unobservables to examine the robustness of the findings in the existing literature, we use the most recent paper on this topic by Mellor and Freeborn (2011; henceforth, MF) as our benchmark. We implement the following steps:

[4] Based on Sapolsky's lecture made available on the Internet: http://www.youtube.com/watch?v=4WwAQqWUkpI

The empirical specification used by MF had several limitations. First, they chose not to include many denominations and the respondents reporting 'no religion' owing to the limitation posed by data: county level data available in the Add Health dataset, in the absence of geographical identifiers, does not have information on the proportion of county level adherents belonging to other religions. If our goal is to explore the potential protective effect of religion and its practices for an average person, it is useful to make broader comparisons. Second, we evaluate and replicate the findings reported in MF. We use a measure similar to the one used by MF as an IV (see below for more elaborate discussion on the creation of this variable) and show the MF results are fragile to the choice of instrument.

We also extend the IV analysis by defining new groups namely, Other Christian group (Christian Science, Jehovah's Witness, Other Protestant, Eastern Orthodox), Other Religions (Baha'ism, Islam, Hinduism, other Religions), those with no religion group, and also to a group where members don't know their religion.[5] We accordingly redefine the instruments: The Other Christian group is instrumented by the proportion of people adhering to Christianity; and all other groups are instrumented by the proportion of people not adhering to Christianity.[6]

After evaluating the appropriateness[7] of the IV used in the existing literature, we focus primarily on the information on siblings, which enables us to include family fixed effects. This approach is taken after failing to find robust results through the existing IV approach. Additionally, given the difficulty in satisfying the exclusion restriction in the case of a variable like religion, which can potentially impact many institutions and behaviors we felt a more suitable approach is to control for as many confounding variables as we can in order to estimate the effect of religion on risky health behaviors. Although the family fixed effects approach has certain limitations, this approach is an advance over the current literature. In all of our specifications using the family fixed effects approach, we include all religious denominations, which include those with no religion, as well as those who report not knowing their religious denominations.[8]

[5] The idea behind including those who don't know their religion is the age of the respondents. Adolescence is the age of a number of changes; one of the siblings may report not knowing her religion when she does not participate in any religious activities, while her other siblings might. Although when we restrict the sample to siblings cluster, there remains just one family which reports not knowing its religion.

[6] If the degree of participation in religious activities is associated with the proportion of people of the same religious denomination, then for the adolescents subscribing to no religion or to non-Christian denominations, the proportion of those not adhering to Christian beliefs might be associated with their religious practices and participation.

[7] One can also potentially raise concerns about the issue of an error-laden IV. Iannaccone (1998, p. 1467) points toward such possibility when he draws attention to the possibility that most religious organizations are found to keep sloppy financial records, and they are also overly inclusive in their membership lists.

[8] Dull and Skokan (1995, p. 51) put forward more nuanced views regarding religious behaviors: "People may identify themselves as Baptists on a questionnaire because they have been raised in that faith, but not adhere to its tenets for daily living nor attend many of the group's religious functions. In contrast, another person may not identify with any religious group but may still adopt a particular religious or spiritual belief system."

Additionally, we repeat the above analytical framework to understand the medium- and long-terms effects of religion. Going beyond the contemporaneous effect gives us the latitude to include other measures of risky health behaviors: Cocaine use, Meth use, and use of other illicit drugs.[9] We briefly discuss the results about the effect of religion on other type of health related behaviors and outcomes in the medium- and long-term; for instance, depression, preference for risk, likelihood of not being in excellent health etc.

Data and Estimation

We use the restricted version of the National longitudinal Study of Adolescent Health (Add Health), a nationally representative study of 7^{th}-12^{th} grade students, their parents (or guardians), and school administration surveyed in 1994-1995 (Wave 1; N=20,745); with longitudinal follow up surveys of only students and administration in 1996 (Wave 2), in 2001-2002 (Wave 3; N=15,701), and in 2007-2008 (Wave 4; N>14,000). We use data from Wave 1, 3 and 4 to understand both the short run as well as long run effects of religion on risky health behaviors. However, after limiting the sample to those who in Wave 1, 3, and 4 leaves us with around 12,000 individuals. There are over 5000 individuals who have a sibling or twin who also had been surveyed. However, we are left with around 3,000 siblings who are found in all three waves used for this study. We chose to impute missing values with county level mean values (while controlling for corresponding dummy variable) for many of the variables to maximize available sample size for the analysis. The Add Health sample follows a stratified sampling design based on region, urbanization, school type, ethnic mix, and size. Moreover, the benefit in using Add Health to analyze risky health behaviors comes with its careful approach to elicit information on these behaviors, which makes it a more reliable source of data (Clark and Loheac, 2007; Mellor and Freeborn, 2011).

Table (1) compares the summary statistics of the full Add Health sample and the siblings cluster within it (respondents identified as twin pairs, full-siblings, half-siblings, or unrelated siblings raised together). The siblings' sample is demographically similar to the full sample.

We use three contemporaneous measures of risky health behaviors from Wave 1—cigarettes smoking, binge drinking, and marijuana use. To bring focus on the medium- and long-term effects on these measures, along with usages of other illicit drugs, we create various measures from Wave 3 and Wave 4. Past research could not use information on other drugs in Wave 1 as a very low percentage of the respondents reported using drugs other than marijuana (MF, 2011). As Table 1 displays, 6% respondents report to have taken Meth, and 16% report using other illicit drugs in Wave 3; while the figure for the use of any illicit drugs is 10% in Wave 4. In

[9] Given the age-cohorts (12-18) interviewed, there were only 1-2% users of illicit drugs besides marijuana in 1994-1995

particular, in Wave 3--for cocaine, we use the question: "Since June 1995, have you used any kind of cocaine—including crack, freebase, or powder?"; for meth, we use "Since June 1995, have you used crystal meth?"; for the measure of other drugs use, we use the question: "Since June 1995, have you used any other types of illegal drugs, such as LSD, PCP, ecstasy, mushrooms, inhalants, ice, heroin, or prescription medicines not prescribed for you?"

To measure the long term effects of religion, we use information on the usage of other drugs provided in Wave IV, besides the three measures used to measure contemporaneous risky health behaviors: During the past 12 months, on how many days did you use {favorite drug}? The list of favorite drugs includes: Ecstasy, Inhalants, LSD, Heroin, PCP, and Other illegal drugs. This survey question provides us with a composite measure of any illicit drug usage in past year to capture the long term effects of religiosity & participation in religious rites and rituals during the adolescence years.

To implement the IV method, we also use an alternative measure of religious market density, which is defined for each Christian and Jews respondent as the proportion of the county level population of adherents belonging to the same denomination as the respondent. The measure used by MF defines religious market density for each respondent out of the total population of a county rather than out of the total population of adherents in a county. The correlation between the religious density measure used by MF and the one created by us is found to be very high (0.85, p-value 0.0).

We control for the level of urbanization, which we define as the proportion of the population of a county living in the urban areas. We also control for some neighborhood level characteristics: proportion of individuals of same race, age groups, religion living in the respondents' area. It has been consistently shown that living in a close proximity to those who share the similar background has many health benefits (Egolf et al. 1992; Bruhn and Wolf, 1979).

The other additional set confounding variables[10]—parental religiosity, birth-weight, PVT scores for associational intelligence--which we use in this paper all comes from the survey instruments used in Wave 1. Retrospective information on birth-weight of adolescents and their parents' religiosity is collected from parents interviewed in Wave 1. The reason for the inclusion of these additional variables is not only to control for the unobserved heterogeneity in the parental investment across different offspring, but also to factor in individual specific differences owing to complex interaction between genes and environment in influencing both religiosity and substance use. Datar, Kilburn, and Loughran (2010) report about differential parental investment based on birth weight of babies, which becomes a matter for concerns as the family level fixed effects can't control for such heterogeneity. A series of research has shown the deleterious

[10] We also ran a separate set of regressions controlling for adherent based religious market density measure; we find similar results.

effects of adverse birth-weight on long-term adult outcomes (Almond et al. 2005; Fletcher 2011 and references therein). We circumvent this issue by directly controlling for the birth-weight of respondents retrospectively reported by their parents. Also, Burdette et al. (2012) suggests that parental religiosity affects the birth-weight of their babies. Thus, controlling for parental religiosity controls for the parental characteristics that may have an impact on both religiosity as well as the propensity for substance use; doing this also allows us to focus on the role of the family level unobservables invariant across siblings in biasing the OLS estimates. The inclusion of Picture Vocabulary Test (PVT) score allows us to control the heritable dimension of religiosity that is reflected in higher propensity to seek our loose associations (Mohr and Huguelet, 2004; Sapolsky, 2011)--seeing patterns where there might none; thus, potentially leading to a more responsivity to stress (Smith, 2010) and higher propensity for substance use Sinha, 2000).

Other variables in the control set are following: religious affiliation dummies (Catholic, Mod. Protestants etc.), age, gender, race, household size, family income, parental education, parental age, presence of biological mother and father, Cigarette tax at the county level, median income, density measure of county, own race density measure, same age density measures, regional dummies, school size and type dummies, school level measure of proportional of smokers, and drug and alcohol expulsion policies.

We use a series of OLS and IV specifications that control for environmental (school, county, and state level) as well as family level confounding variables, including the source of family level unobserved heterogeneity.

We first run the base-line regressions where the main explanatory variables of interest are religious involvement (frequency of participation and prayer) and religiosity. A separate set of regressions were run with two alternative measures of religious density measures that is used as the IV for the all three measures of religion separately. Then, we do regressions where we control for family fixed effects. Finally, we conduct falsification tests with variable which could not be taken to be influenced by religion.

Results

Our findings are striking. Table 2 displays the estimates from Mellor and Freeborn (2011) in Panel I. Since there was not much difference between the OLS estimates that include only the covariates reported in MF specifications from our preferred specifications, which includes parental religiosity, birth-weight, PVT score, and urbanization; we include them in all the specifications that we report. The estimates for the frequency of prayers variables are quite close to the MF estimates.. Interestingly, while we are able to match the estimates for the association with marijuana consumption, our other estimates are very different from the estimates reported by MF. While our estimates are imprecisely estimated, they are reversing the sign for binge

drinking for both measures of religion contrary to the estimates reported by MF. Last three columns display the estimates of the strength of association between self-reported degree of religiosity and three measures of risky health behaviors. Once again it follows the same pattern that was observed in the case of religious attendance and prayers. The OLS estimates provide a similar protective feature of religion for the risky health behaviors, while the IV estimates suggest not only an increase in the likelihood of being current smoker and high alcohol consumption, but the association with marijuana use can longer be found.

Panel III (Table 2) report the estimates when an alternative but similar measure of religious density is used. Once again the estimates of the association with smoking and binge drinking are not only positive; the associations with marijuana consumption though negative are no longer significant for all three measures of religion. These estimates suggest that the most important estimates of MF—IV estimates of the effect of religion on marijuana usage--are extremely sensitive to the definition used to create the IV.

If it is the case that the unobservables that drive people to religion also protect them from substance use (Iannaccone, 1998), we should get the estimates that are smaller than the OLS estimates once we take care of such source of unobserved heterogeneity, and as we do get that in contrast to the estimates reported by MF (p. 1234). Surprisingly, we find that the association with smoking and binge drinking that we estimate, when we use adherent-based measures of religious density as an instrument, we are unable to match the estimates reported by MF; and none of the estimated coefficients are significant at the conventional level of significance (See Panel III, Table 2). This is further corroborated by extremely low F-statistics in all of the first stage regressions with the new measure of religious density. We find similar patterns when we restrict our sample to only non-religious schools (results are not reported).

Table 3 displays the estimates with full set of covariates when we include all religious denominations in our sample. The OLS estimates [range: (-0.022, -0.054)] are quite close to the estimates [range: (-0.021, -0.058)] reported with the sample with just five denominations in Table 2. The first stage regressions give an acceptable F-statistics (~12.85) for the religious attendance; however, it is very low for degree of religiosity regressions, F-statistics (~5.11). However, F-statistics in the first stage regression are below 10 (~5.29) for the frequency of prayers variable. Only the association of religious attendance with marijuana use is statistically significant at the conventionally acceptable level of significance. For prayer frequency and importance of religion variables, we find negative estimates with large standard errors (See Panel II, Table 3) when we use population based IV. The estimates though continue to be negative in proximity to those reported by MF in the case of marijuana consumption, but none of them are statistically significance (see Panel III in Table 3). In fact, once again for binge drinking, the estimates are positive (though not significant).

Family Fixed Effects

Given the instability of the findings from the IV estimates, we move our focus to siblings to introduce family fixed effects. Given the latitude provided by the nature of siblings, our focus for the remaining of the paper will be on this sample. Additionally, in contrast to the earlier part of our analyses, we extend our analyses to medium (6 years later) and long term (13 years later) outcomes.

Table 4 displays the associations of all three measures of religion on risky health behaviors. The extrinsic religiosity (religious service attendance) becomes more pronounced during late adolescence and young adulthood period, then goes down again during the mid-20s and early 30s'. However, once we account for the family level unobserved heterogeneity in our fixed effects specifications, the association of religious attendance on cigarette smoking over the six years periods, from the time when the religion variables were measured, went down from -0.034 to -0.017, and it further went down to -0.005, when the respondents were in mid-20s to early 30s. This suggests that if the family level unobservables invariant across siblings make respondents more likely to smoke, they also are more likely to be less religious in terms of number of times that they attend their respective religious institutions.

An intriguing trend was discovered for binge drinking: the contemporaneous effect of religious attendance becomes more pronounced after controlling for family fixed effects, in contrast to its contemporaneous effect in the case of cigarette smoking (see Table 4). In consonance with the observations made by Conti and Heckman (2012) about the weakening of family, it might be the weakening of family as an institution that is accentuating the problem of binge drinking. Families with a higher opportunity cost of time for extrinsic religiosity (rites and rituals), also, are the families much to lose from their children opting for binge drinking; hence, those unobservables induce positive bias, and vice versa.

Once again, after controlling for family fixed effects, the associations of all three measures of religion with marijuana use become significantly smaller. This once again illustrates the important role that family play in influencing both religiosity and the usage of additive substance. However, controlling for family level unobservables is not able to overturn the effects of prayers on marijuana use. Also, a similar trend is observed in the case of importance of religion variable for the medium term outcome (Wave 3) (see Panel II & III in Table 4). The effects of prayers and religiosity both go up and then come down in the case of marijuana use: (-0.013, -0.022, -0.010) for prayers & (-0.009, -0.023, -0.011) for the degree of religiosity. Though estimates are not statistically significant, they are still economically meaningful and in expected directions. The estimates hint towards the fact that religion does provide some kind of protective psychological support at times when adolescents are most vulnerable to the external influences: during their late teen and early adulthood, when they venture on their own.

The most encouraging aspect of our findings concerns the strong and persistent associations that we find of the variables importance of religion with smoking; especially in light of the recent findings that demand for cigarettes is very price inelastic, and quite impervious to the regulatory arms of the government because of the environmentally modulated genetic propensity for nicotine dependence (Fletcher, 2012). Not only does the contemporaneous association get bigger, after we control for family level unobservables, the long term associations continue to remain economically meaningful and statistically significant at the conventional level. This captures the rebellious attitude of adolescents trying to go against the familial environment (Finkel et al. 2009[11]): family unobservables which make adolescents become more religious also drive them to smoking, which seems to fit the observation that during their teen years adolescents try to build their own independent identity. Or, as pointed by Mellor and Freeborn (2011), religion becomes more important as it allows them to deal with the same pressures and problems that lead them to engage in drug use.

Other Illicit Drugs

We also conducted analyses of the effects of different measures of religion on Cocaine, Meth, and other illicit drugs (which include, LCD, Ecstasy etc.). The OLS estimates, without siblings fixed effects, suggest that all three measures of religion reduce the propensity to use the illicit drugs both in the medium as well as in the long term (see Cols. 1-5, Table 5). However, once we control for the family level unobservables, the effect remains only for Meth usages in the six years from the interview date, when respondents were in their late teen and early 20s for all three measures of religion. We find no statistically significant associations for any other others. The positive and statistically significant associations of the degree of religiosity with reporting to be in excellent health and risk preference suggesting that religion continue to play an important role in young adults' lives (see Cols. 6 & 7 in Table 5).

It is quite interesting to find that religious attendance and activities during adolescence years cease their association in long term, when adolescents' brains' executive control area (PFC) becomes fully mature. This time period also coincides with adolescents' becoming financially more independent and also more integrated in the labor market.

Falsification Tests

To further explore the nature of relationship between religion and risky health behaviors, we conduct a series of falsification tests. We use self-reported incidence of headache and cold sweat

[11] During adolescence we are primed to commit ourselves to belonging to certain groups and not belonging to others (Finkel et al. 2009)

in Wave 1 as well as respondents' adult height measured in Wave 4 as the outcome variables. We conclude that all three measures of religion are not statistically related to these outcome variables. Table 6 displays results from the falsification tests. In all the family fixed effects specifications, none of the variables measuring religion has any statistically significant impact on the any of the outcomes variables. This assures us that the correlations that we report between various measures of religion and different measures of risky health behaviors are not spurious.

In parallel with that, given that we are not able to provide full control for genes and their interactions with environment, we ran a separate set of regression with many personality factors that are used to measure neuroticism and conscientiousness (Young et al. 2011). We use 10 different factors reported in Wave 1 to check if our measures of religion, after controlling for family fixed effects, predict any of these factors. All four factors that go in defining conscientiousness measures showed positive and significant associations with the broad measures of religiosity, and also to some extent with the frequency of prayers. This to some extent casts doubt at our results; however, it is hard to tell if it is not the religiosity that is influencing these personality measures. Keeping that in mind, we ran all our specification with two of the factors which show that strongest association ('You feel wanted and loved' & 'Propensity for more deliberate thinking'), and we find no substantive change in our estimates.

Conclusions

While providing methodological critiques in previous work between religious participation and illicit drug use, this paper makes some substantive and some methodological contributions. The structure of the data allows us to control for sibling fixed effects, thus help us account for many potential source of omitted variable bias—family level covariates, which includes a significant part of genetic endowment. As pointed by De Neve and Oswald (2012), it is the sibling fixed effects that allowed us to make inferences about lagged effects of religious rites and rituals on risky health behaviors (which could not have been possible with individual fixed effects).

In particular, we estimate the contemporaneous as well as the longer term effects of religion on risky healthy behaviors. Our measures of the risky behaviors include usage of both licit and illicit substance—Cigarette, Binge Drinking, Marijuana, Cocaine, Meth, Ecstasy, Inhalants, LSD, Heroin, PCP, and Other illegal drugs.

When we study religion, we usually tend to ignore ontological aspects (rites and rituals) of it. However, the findings from a number of studies suggest that it is the rites and rituals which hold the key to understand the positive effects that religion has consistently been shown to have. Our findings corroborate the importance of extrinsic aspects of religion, but points to more important role for the beliefs and intrinsic aspect of religion (capture by both prayers and importance of religion measures). It seems religion provides the focal point for societies and families where secular focal points have not been created to coordinate the activities of the members, or would

take long time to establish and find wide acceptance. Our findings suggest that the positive effects of religion is driven both by the extrinsic (in the form of frequency of religious attendance and public prayer) as well as by intrinsic or the belief system that goes with being religious. Furthermore, we find that family as an institution plays a very significant role in moderating the effects of religion on risky health behaviors. [When controlling for family effects] The intrinsic aspect becomes more salient as the extrinsic aspect loses its effect in the longer term.

Given how critical adolescence is for determining long-term health and well-being of the individual and for society as a whole (Call et al. 2003), our study suggests that we need to build a more nuanced understanding of the ways religion brings about the positive health outcomes.

If it indeed is the case, as we report it is, that religion provides protection against indulgence in risky health behavior, then it indeed is a very striking finding. In light of the research showing positive effects of education on health and risky health behaviors (Grossman and Kaestner, 1997), and given the high cost of education in the US, brining in a familiar non-market institution as a prevention strategy seems promising. More specifically, Cutler and Lleras-Muney (2010), using the National Health Interview Survey data, report that an additional year of education is associated with 3% lower probability of being a current smoker, 1.4% lower probability of being a heavy drinker, and 0.1% probability of using marijuana in the past month (Cawley and Ruhm, 2011). In comparison, in our family fixed effects specification, we show a stronger association for smoking and drinking (-5.8%, -4.8%). It is these two substance that pose greater risk than the marijuana and other illicit drug use (Cawley and Ruhm, 2011).

Additionally, given the usually low price elasticity of addictive substance (Kenkel and Sindelar, 2011), the risk of the emergence of underground illegal market owing to regulation (especially the failed policy of quantity/supply regulation of the illicit drugs), high deadweight loss involved in price based regulation of alcohol (Glied and Smith, 2011), religion could potentially complement the existing prevention efforts to rein in persistently high level of smoking, high alcohol consumption, and illicit drug usages.

Limitation

The sample we use for this study is conditional on being in school during 1994-1995. The extent to which genetic endowment in association with environment creates predilection for religious matters and propensity for substance use, the family fixed effects specification can only partially control for it. Although we have controlled for the variables that potentially could capture the heterogeneous treatment of children within a family, we are unable to control for many more that could be confounding our estimate, for example, differences due to age or cohort, social networks effects etc. Although, not reported here, but we did ran a set of separate regressions with the county level adherents based religion density measure, which control for the effects of being in close proximity of people of the same faith and denominations. We did not find any

substantial changes in the results reported above. Furthermore, given the recent study on the linked genes and phenotypic manifestations, incorporation of some of the variables capturing individual heterogeneity should be able to control for some of the genetic sources of such phenotypic variation. As we get a better and more nuanced understanding of the biological pathways, it would become clear gradually how environment interacts with biological pathways to differentially impact individuals in their religiosity and their propensity for substance use. Until then, one would not know what one might not be controlling for that could potentially be inducing the relationship between religion and risky health behaviors.

References

Adamczyk, Amy, and Jacob Felson. "The Effect of Religion-Supported Programs on Health-Related Behaviors in Adolescence." *Review of Religious Research: The Official Journal of the Religious Research Association* (2012): 1-29.

Barnes, K., & Gibson, N. J. (2013). Supernatural Agency: Individual Difference Predictors and Situational Correlates. *International Journal for the Psychology of Religion*, *23*(1), 42-62.

Benjamin, D. J., Choi, J. J., & Fisher, G. W. (2010). *Religious identity and economic behavior* (No. w15925). National Bureau of Economic Research

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological science*, *19*(12), 1207-1212.

Bonelli, R. M., & Koenig, H. G. (2013). Mental Disorders, Religion and Spirituality 1990 to 2010: A Systematic Evidence-Based Review. *Journal of religion and health*.

Borders, Tyrone F., Geoffrey M. Curran, Rhonda Mattox, and Brenda M. Booth. "Religiousness among at-risk drinkers: is it prospectively associated with the development or maintenance of an alcohol-use disorder?" *Journal of studies on alcohol and drugs* 71, no. 1 (2010): 136.

Bruhn, J. G. (1988). Life-style and health behavior. Health behavior: Emerging research perspectives, 71-86.

Bruhn J.G. and Wolf S., (1979, “The Roseto Story: An Anatomy of Health. Norman, Oklahoma; University of Oklahoma Press.

Burdette, A. M., Weeks, J., Hill, T. D., & Eberstein, I. W. (2012). Maternal religious attendance and low birth weight. *Social Science & Medicine*

Call, K. T., Riedel, A. A., Hein, K., McLoyd, V., Petersen, A., & Kipke, M. (2003). Adolescent health and well-being in the twenty-first century: a global perspective. *Journal of Research on Adolescence*, *12*(1), 69-98

Cawley, J., & Ruhm, C. J. (2011). The Economics of Risky Health Behaviors1. *Handbook of Health Economics*, *2*, 95.

Chatters, L. M. (2000). Religion and health: public health research and practice. *Annual review of public health*, *21*(1), 335-367.

Conti, G., & Heckman, J. J. (2012). *The Developmental Approach to Child and Adult Health* (No. w18664). National Bureau of Economic Research.

Cutler, David M, and Lleras-Muney, Adriana. 2010. Understanding Differences in Health Behavior by Education. Journal of Health Economics 29, no. 1: 1-28.

De Neve, J. E., & Oswald, A. J. (2012). Estimating the influence of life satisfaction and positive effect on later income using sibling fixed effects. *Proceedings of the National Academy of Sciences*, *109*(49), 19953-19958.

Diamond, J. (2013). The World Until Yesterday: What Can We Learn from Traditional Societies?, Penguin Books Limited.

Dohmen, Thomas, et al. "The intergenerational transmission of risk and trust attitudes." *The Review of Economic Studies* 79.2 (2012): 645-677.

Duhigg, C. (2012). *The Power of Habit: Why we do What we do in Life and Business*. Doubleday Canada.

Dull, V. T., & Skokan, L. A. (1995). A cognitive model of religion's influence on health. *Journal of Social Issues*, *51*(2), 49-64.

Egolf, B., Lasker, J., Wolf, S., & Potvin, L. (1992). The Roseto effect: a 50-year comparison of mortality rates. *American Journal of Public Health*, *82*(8), 1089-1092.

Finkel, D. N., Swartwout, P., & Sosis, R. (2010). 14 The Socio-religious Brain: A Developmental Model. In *Proceedings of the British Academy* (Vol. 158, p. 283).

Finke, Roger, and Rodney Stark. "The Churching of America, 1776-2005." *Winners and Losers in Our Religious Economy* (2005).

Fletcher, J. M. (2011). The medium term schooling and health effects of low birth weight: Evidence from siblings. *Economics of Education Review*, *30*(3), 517-527.

Fletcher, J. M. (2012). Why Have Tobacco Control Policies Stalled? Using Genetic Moderation to Examine Policy Impacts. *PloS one*, *7*(12), e50576.

Foer, J. Safran (2009), "*Eating Animals,"* New York: Back Bay Books.

Freeman, R. B. (1985). Who Escapes? The Relation of Church-Going & Other Background Factors to the Socio-Economic Performance of Blk. Male Yths. from Inner-City Pvrty Tracts, National Bureau of Economic Research Cambridge, Mass., USA.

Glied, S. & Smith P. C. (Eds.). (2011). The Oxford Handbook of Health Economics. OUP Oxford.

Gladwell, M. (2008). *Outliers: The story of success*. Little, Brown.

Grossman, M., & Kaestner, R. (1997). EIfects oI Education on Health. *The Social Benefits of Education*, *12*, 69.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales. "People's opium? Religion and economic attitudes." *Journal of Monetary Economics* 50.1 (2003): 225-282.

Gruber, J. (2005). *Religious market structure, religious participation, and outcomes: Is religion good for you?* (No. w11377). National Bureau of Economic Research.

Gruber, J. and D. M. Hungerman (2006). The Church vs the Mall: What Happens When Religion Faces Increased Secular Competition? National Bureau of Economic Research.

Harris S, Kaplan JT, Curiel A, Bookheimer SY, Iacoboni M, et al. (2009) The Neural Correlates of Religious and Nonreligious Belief. PLoS ONE 4(10): e7272. doi:10.1371/journal.pone.0007272.

Iannaccone, L. R. (1998). Introduction to the Economics of Religion. *Journal of economic literature*, *36*(3), 1465-1495.

Hungerman, Daniel (2010), "Does Religious Proscription Cause People to Act Differently? Evidence from a Theory-Based Test." *NBER Working paper* 16973.

Kendler, K. S., Gardner, C. O., & Prescott, C. A. (1997). Religion, psychopathology, and substance use and abuse: A multimeasure, genetic-epidemiologic study. *American Journal of Psychiatry*, *154*(3), 322-329.

Lechner, Frank J. *Rational choice and religious economies*. Sage, 2007

Lillard D. & Price J. (2007), "The impact of religion on youth in disadvantaged families," Manuscript, Cornell University Department of Economics.

McCullough, M. E., & Willoughby, B. L. (2009). Religion, self-regulation, and self-control: Associations, explanations, and implications. *Psychological bulletin*, *135*(1), 69.

Mellor, Jennifer M., and Beth A. Freeborn. "Religious participation and risky health behaviors among adolescents." *Health Economics* 20, no. 10 (2011): 1226-1240.

Moghaddam, B., Bolinao, M. L., Stein-Behrens, B., & Sapolsky, R. (1994). Glucocortcoids mediate the stress-induced extracellular accumulation of glutamate. *Brain research*, *655*(1), 251-254.

Mohr, S., & Huguelet, P. (2004). The relationship between schizophrenia and religion and its implications for care. *Swiss Medical Weekly*, *134*, 369-376.

Owen AD, Hayward RD, Koenig HG, Steffens DC, Payne ME (2011) Religious Factors and Hippocampal Atrophy in Late Life. PLoS ONE 6(3): e17006. doi:10.1371/journal.pone.0017006

Pauly, M. V., McGuire, T. G., & Barros, P. P. (Eds.). (2011). *Handbook of Health Economics* (Vol. 2). North Holland.

Sinha, R. (2001), "How does stress increase risk of drug abuse and relapse?" *Psychopharmacology*, *158*(4), 343-359.

Smith, N. T. (2010). *Increased stress responsivity in schizotypy leads to diminished spatial working memory performance*. STATE UNIVERSITY OF NEW YORK AT BINGHAMTON.

Tiebout, C. (1956), "A Pure Theory of Local Expenditures", *Journal of Political Economy* **64** (5): 416–424, doi:10.1086/257839

Ulmer, J. T., Desmond, S. A., Jang, S. J., & Johnson, B. R. (2012). Religious Involvement and Dynamics of Marijuana Use: Initiation, Persistence, and Desistence. *Deviant Behavior*, *33*(6), 448-468.

Young, J. K., & Beaujean, A. A. (2011). Measuring personality in wave I of the national longitudinal study of adolescent health. *Frontiers in Psychology*, *2*.

Table 1: Descriptive Statistics

	Full Sample			Siblings Sample		
Variable	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Adolescent Risk Behaviors						
Smoking (W1)	15258	0.24	0.43	3651	0.25	0.44
Binge Drinking (W1)	15320	0.25	0.43	3663	0.25	0.43
Marijuana Use (W1)	15354	0.15	0.35	3669	0.14	0.34
Smoking (W3)	11236	0.30	0.46	2968	0.31	0.46
Binge Drinking (W3)	11225	0.47	0.50	2956	0.44	0.50
Marijuana Use (W3)	11263	0.30	0.46	2973	0.29	0.45
Cocaine (W3)	11124	0.10	0.29	2938	0.09	0.28
Meth (W3)	11121	0.06	0.23	2936	0.05	0.22
Other Illicit Drugs (W3)	11112	0.16	0.36	2933	0.13	0.34
Smoking (W4)	11592	0.34	0.47	3018	0.36	0.48
Binge Drinking (W4)	11634	0.46	0.50	3031	0.44	0.50
Marijuana Use (W4)	11669	0.21	0.41	3041	0.21	0.41
Any Illicit Drugs (W4)	11673	0.10	0.30	3042	0.09	0.30
Depression (W3)	11258	0.10	0.30	2971	0.10	0.30
Propensity to like risk (W3)	11275	0.32	0.47	2975	0.34	0.47
Propensity to seek novel Experience (W3)	11275	0.25	0.43	2975	0.24	0.43
Not in Excellent Health (W4)	11680	0.80	0.40	3044	0.80	0.40
Depression (W4)	11678	0.15	0.36	3043	0.15	0.35
Panic Attack (W4)	11679	0.11	0.32	3044	0.11	0.32
Propensity to get angry (W4)	11664	0.20	0.40	3039	0.20	0.40
Propensity to like risk (W4)	11661	0.35	0.48	3036	0.36	0.48
Adolescent-level Explanatory Variables						
Religious Attendance (W1)	13337	3.01	1.07	3159	3.04	1.07
Some Attendance (W1)	15354	0.76	0.43	3669	0.76	0.43
Weekly Attendance (W1)	15354	0.39	0.49	3669	0.40	0.49
Freq. of Prayers (W1)	13339	2.98	1.28	3161	3.00	1.27
Urbanization	15283	0.64	0.40	3669	0.60	0.40
PVT Score	14631	100.44	14.84	3669	99.20	14.27
Birth Weight (kg)	11661	3.32	0.57	3669	3.21	0.54
No Religion	15354	0.11	0.32	3669	0.12	0.33
Other Christians	15354	0.05	0.22	3669	0.05	0.21
Other Religions	15354	0.04	0.19	3669	0.04	0.20
Don't Know My Religion	15354	0.01	0.11	3669	0.01	0.12
Catholic	15354	0.25	0.44	3669	0.23	0.42
Moderate Protestant (W1)	15354	0.14	0.34	3669	0.15	0.35
Lib. Protestant	15354	0.09	0.28	3669	0.09	0.28
Con. Protestant	15354	0.30	0.46	3669	0.31	0.46
Jewish	15091	0.01	0.08	3603	0.01	0.08
Age	15345	16.12	1.68	3668	16.14	1.64
Female	15354	0.51	0.50	3669	0.50	0.50
Hispanic	15311	0.16	0.37	3660	0.13	0.34

Black	15331	0.24	0.43	3666	0.25	0.43
Asian	15331	0.08	0.27	3666	0.08	0.27
Other Race	15331	0.09	0.29	3666	0.08	0.27
Parent and Household level Explanatory Variables						
Parent Age	15354	42.54	6.36	3669	42.02	6.08
High School	15354	0.25	0.43	3669	0.27	0.44
Some College	15354	0.25	0.43	3669	0.26	0.44
College Grad	15354	0.12	0.33	3669	0.13	0.33
Graduate degree	15354	0.08	0.27	3669	0.07	0.25
Income refused	15354	0.09	0.29	3669	0.08	0.28
Income 2	15354	0.12	0.33	3669	0.13	0.33
Income 3	15354	0.18	0.38	3669	0.19	0.39
Income 4	15354	0.36	0.48	3669	0.35	0.48
Income 5	15354	0.10	0.30	3669	0.10	0.30
Income 6	15354	0.09	0.28	3669	0.08	0.27
Household size	15354	4.39	1.14	3669	4.85	0.99
Mother present	15354	0.76	0.43	3669	0.76	0.43
Father present	15354	0.45	0.50	3669	0.45	0.50
Mother works	15354	0.74	0.45	3669	0.74	0.46
Mother work missing	15354	0.06	0.23	3669	0.05	0.22
Area-level Explanatory Variables						
Cigarette tax	15354	32.09	16.26	3669	31.05	16.50
Median income ('000)	15354	30.24	8.00	3669	29.73	7.82
Age-sex density	15283	0.07	0.01	3651	0.07	0.01
Religious density	15022	0.19	0.17	3586	0.19	0.17
Area density	15354	0.59	1.56	3669	0.45	1.16
Race density	15224	0.64	0.35	3640	0.65	0.34
Pr (Hispanic)	15283	0.10	0.14	3651	0.09	0.13
South	15354	0.40	0.49	3669	0.39	0.49
Midwest	15354	0.22	0.42	3669	0.27	0.44
West	15354	0.22	0.41	3669	0.21	0.41
Northeast	15354	0.16	0.36	3669	0.12	0.33
School-level Explanatory Variables						
Religious school	15303	0.05	0.21	3662	0.04	0.21
Small School	15354	0.14	0.34	3669	0.16	0.36
Medium school	15354	0.38	0.49	3669	0.37	0.48
Large school	15354	0.48	0.50	3669	0.47	0.50
Pr (Smokers)	15354	0.33	0.10	3669	0.34	0.11
Drug Expulsion	14908	0.30	0.46	3603	0.31	0.46
Alcohol Expulsion	15042	0.16	0.37	3624	0.18	0.39
Drug abuse program	15354	0.47	0.50	3669	0.51	0.50

Notes: Descriptive statistics are not weighted by the survey provided sampling weights as weights are not available for the siblings sub-sample.

Table 2: Mellor and Freeborn's sample excluding Other Christians & non-Christian Religions in Wave 1

	Religious Attendance			Freq. of Prayers			Importance of Religion		
	Smoking	**Binge**	**Marijuana**	**Smoking**	**Binge**	**Marijuana**	**Smoking**	**Binge**	**Marijuana**
I. Mellor & Freeborn's (2011) estimates									
MFOLS	-0.049‡	-0.031‡	-0.033‡	-0.036‡	-0.028‡	-0.025‡			
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)			
MFIV	-0.064	-0.036	-0.114*	-0.072	-0.042	-0.139*			
	(0.081)	(0.084)	(0.066)	(0.099)	(0.098)	(0.072)			
MFR-OLS	-0.043‡	-0.041‡	-0.022‡	-0.037‡	-0.024‡	-0.022‡	-0.058‡	-0.045‡	-0.037‡
	(0.006)	(0.006)	(0.005)	(0.004)	(0.005)	(0.003)	(0.007)	(0.006)	(0.007)
II. All Schools (Population-based IV)									
b(mf-x)	-0.003	0.004	-0.125*	0.003	0.012	-0.140*	0.003	0.016	-0.249
se	(0.097)	(0.087)	(0.066)	(0.110)	(0.100)	(0.083)	(0.199)	(0.179)	(0.159)
III. All Schools (Adherent-based IV)									
b(mf-x)	0.005	0.034	-0.252	0.011	0.035	-0.172	0.017	0.045	-0.224
se	(0.371)	(0.312)	(0.285)	(0.229)	(0.201)	(0.168)	(0.321)	(0.270)	(0.216)
N	10,802	10,844	10,866	10,805	10,848	10,870	10,813	10,856	10,878

Note: MF indicates the sample and covariates used in Mellor and Freeborn (2011) paper. MFR/mf-x indicates for extra covariates: birth-weight, parental religiosity, county level urbanization, and PVT score. Robust standard errors clustered at the county level are in parentheses. Linear probability regression models are used with the sampling weights provided in the survey. All models include the full set of adolescent, parent, household, area, and school level explanatory variables. ‡1%, †5%, *10%. Xs: religious affiliation dummies (Catholic, Mod. Protestants etc.), age, gender, race, household size, family income, parental education, parental age, presence of biological mother and father, Cigarette tax at the county level, median income, density measure of county, own race density measure, same age density measures, regional dummies, school size and type dummies, school level measure of proportional of smokers, and drug and alcohol expulsion policies. Panel III uses an alternative measure of religious density based on proportion of total church-adherents. The last three columns provide results with Importance of religiosity, a self-reported measure of degree of religiosity.

Table 3: All Religion & those with no religion in Wave 1

	Religious Attendance			Freq. of Prayers			Importance of Religion		
	Smoking	**Binge**	**Marijuana**	**Smoking**	**Binge**	**Marijuana**	**Smoking**	**Binge**	**Marijuana**
I. MFX	-0.039‡	-0.042‡	-0.024‡	-0.033‡	-0.023‡	-0.022‡	-0.054‡	-0.048‡	-0.036‡
	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)	(-0.178)	(-0.154)	(-0.145)
II. All Schools (Population-based IV)									
b(mf-x)	-0.018	0.035	-0.104*	-0.019	0.070	-0.165	-0.043	0.038	-0.229
se	(0.089)	(0.087)	(0.061)	(0.141)	(0.140)	(0.122)	(-0.139)	(0.124)	(-0.922)
III. All Schools (Adherent-based IV)									
b(mf-x)	-0.038	0.083	-0.162	-0.029	0.118	-0.188	-0.057	0.071	-0.185
se	(0.259)	(0.286)	(0.169)	(0.281)	(0.316)	(0.244)	(-0.188)	(0.228)	(-0.742)
N	12,005	12,049	12,075	12,005	12,050	12,076	13,562	13,612	13,641

Note: This table includes all religious denominations, in contrast to only Christians and Jews included in Mellor and Freeborn (2011) paper. mf-x indicates for extra covariates: birth-weight, parental religiosity, county level urbanization, and PVT score. Robust standard errors clustered at the county level are in parentheses. Linear probability regression models are used with the sampling weights provided in the survey. All models include the full set of adolescent, parent, household, area, and school level explanatory variables. ‡1%, †5%, *10%. Xs: religious affiliation dummies (Catholic, Mod. Protestants etc.), age, gender, race, household size, family income, parental education, parental age, presence of biological mother and father, Cigarette tax at the county level, median income, density measure of county, own race density measure, same age density measures, regional dummies, school size and type dummies, school level measure of proportional of smokers, and drug and alcohol expulsion policies. Panel III uses an alternative measure of religious density based on proportion of total church-adherents. The last three columns provide results with Importance of religiosity, a self-reported measure of degree of religiosity

Table 4: OLS and Family Fixed Effects Estimates of the Effects of Religion on Risky Health Behaviors at Different Stages of Young Adults since their Adolescence

	Smoking			Binge Drinking			Marijuana Use		
Variable	**W1**	**W2**	**W3**	**W1**	**W2**	**W3**	**W1**	**W2**	**W3**
I. Religious Attendance									
OLS	-0.039‡	-0.044‡	-0.030‡	-0.034‡	-0.016	-0.024†	-0.021‡	-0.036‡	-0.026‡
	(0.008)	(0.010)	(0.010)	(0.008)	(0.010)	(0.010)	(0.006)	(0.010)	(0.008)
FFE	-0.034*	-0.017	-0.005	-0.053‡	0.038*	-0.011	-0.013	0.002	-0.009
	(0.017)	(0.021)	(0.024)	(0.018)	(0.021)	(0.026)	(0.014)	(0.021)	(0.019)
II. Frequency of Prayers									
OLS	-0.026‡	-0.037‡	-0.035‡	-0.029‡	-0.008	-0.021†	-0.014‡	-0.018†	-0.013*
	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)	(0.009)	(0.006)	(0.008)	(0.007)
FFE	-0.033‡	-0.043‡	-0.050‡	-0.040‡	-0.019	-0.034*	-0.013	-0.022	-0.010
	(0.012)	(0.016)	(0.019)	(0.013)	(0.017)	(0.018)	(0.011)	(0.016)	(0.015)
N	3,066	2,516	2,540	3,076	2,505	2,548	3,081	2,520	2,558
III. Importance of Religion									
OLS	-0.048‡	-0.053‡	-0.042‡	-0.048‡	-0.015	-0.033‡	-0.023‡	-0.023†	-0.035‡
	(0.009)	(0.011)	(0.011)	(0.009)	(0.010)	(0.010)	(0.007)	(0.010)	(0.009)
FFE	-0.058‡	-0.049†	-0.036*	-0.048‡	-0.026	-0.014	-0.009	-0.023	-0.011
	(0.015)	(0.020)	(0.021)	(0.015)	(0.020)	(0.021)	(0.013)	(0.021)	(0.019)
N	3,066	2,516	2,540	3,076	2,505	2,548	3,081	2,520	2,558

Note: All specifications include a set of extra covariates: birth-weight, parental religiosity, county level urbanization and own religion adherent-based density measures, and PVT score. Robust standard errors clustered at the family level are in parentheses. Linear probability regression models are used with the sampling weights provided in the survey. FFE stands for family fixed effects. All models include the full set of adolescent, parent, household, area, and school level explanatory variables. ‡1%, †5%, *10%. Xs: religious affiliation dummies (Catholic, Mod. Protestants etc.), age, gender, race, household size, family income, parental education, parental age, presence of biological mother and father, Cigarette tax at the county level, median income, density measure of county, own race density measure, same age density measures, regional dummies, school size and type dummies, school level measure of proportional of smokers, and drug and alcohol expulsion policies. The last panel provides results with Importance of religiosity, a self-reported measure of degree of religiosity.

Table 5: Illicit Drug Use in Wave 3 and Wave 4

	Wave 3				Wave 4		
variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
	Cocaine	**Meth**	**Other drugs**	**Risk pref.**	**Any illicit drugs**	**Not in excellent health**	**Risk pref.**
I. Religious Attendance							
OLS	-0.013†	-0.014‡	-0.023‡	-0.017*	-0.017‡	-0.006	-0.007
	(0.006)	(0.005)	(0.007)	(0.010)	(0.006)	(0.009)	(0.010)
FFE	0.008	-0.020†	-0.007	-0.038	-0.005	-0.012	-0.006
	(0.013)	(0.009)	(0.014)	(0.025)	(0.014)	(0.022)	(0.025)
II. Frequency of Prayers							
OLS	-0.003	-0.005	-0.009	-0.016†	-0.005	-0.014*	-0.001
	(0.005)	(0.004)	(0.006)	(0.008)	(0.005)	(0.007)	(0.008)
FFE	-0.001	-0.022‡	-0.003	-0.001	-0.005	-0.030*	0.022
	(0.010)	(0.007)	(0.013)	(0.017)	(0.012)	(0.016)	(0.019)
III. Importance of Religion							
OLS	-0.014†	-0.018‡	-0.025‡	-0.019*	-0.006	-0.013	0.002
	(0.007)	(0.006)	(0.009)	(0.010)	(0.006)	(0.009)	(0.010)
FFE	0.004	-0.014*	-0.010	-0.029	-0.000	-0.039†	0.048†
	(0.011)	(0.008)	(0.014)	(0.019)	(0.015)	(0.017)	(0.020)
N	2,825	2,823	2,820	2,860	2,917	2,919	2,911

Note: All specifications include a set of extra covariates: birth-weight, parental religiosity, county level urbanization and own religion adherent-based density measures, and PVT score. Robust standard errors clustered at the family level are in parentheses. Linear probability regression models are used with the sampling weights provided in the survey. FFE stands for family fixed effects. All models include the full set of adolescent, parent, household, area, and school level explanatory variables. ‡1%, †5%, *10%. Xs: religious affiliation dummies (Catholic, Mod. Protestants etc.), age, gender, race, household size, family income, parental education, parental age, presence of biological mother and father, Cigarette tax at the county level, median income, density measure of county, own race density measure, same age density measures, regional dummies, school size and type dummies, school level measure of proportional of smokers, and drug and alcohol expulsion policies. Cols. 1-4 belongs to measures from Wave 3; while 4-6 from Wave 4. The last panel provides results with Importance of religiosity, a self-reported measure of degree of religiosity.

Table 6: Falsification Tests I

Variable	Headache (W1)	Cold Sweat (W1)	Birth Weight (W1)	Height (W4)
I. Religious Attendance				
OLS	-0.012*	0.003	-14.461	0.045
	(0.007)	(0.008)	(10.851)	(0.168)
FFE	0.012	-0.019	-15.454	0.012
	(0.015)	(0.019)	(17.690)	(0.335)
II. Frequency of Prayers				
OLS	-0.003	0.007	-9.103	0.136
	(0.006)	(0.006)	(9.217)	(0.131)
FFE	0.015	0.005	-2.396	0.186
	(0.011)	(0.014)	(13.486)	(0.223)
III. Importance of Religion				
OLS	-0.010	0.000	-10.678	-0.116
	(0.007)	(0.008)	(11.239)	(0.172)
FFE	-0.001	-0.018	-4.909	0.283
	(0.012)	(0.016)	(13.889)	(0.343)
N	3,510	3,509	3,510	2,900

Note: All specifications include a set of extra covariates: birth-weight, parental religiosity, county level urbanization and own religion adherent-based density measures, and PVT score. Robust standard errors clustered at the family level are in parentheses. Linear probability regression models are used with the sampling weights provided in the survey. FFE stands for family fixed effects. All models include the full set of adolescent, parent, household, area, and school level explanatory variables. ‡1%, †5%, *10%. Xs: religious affiliation dummies (Catholic, Mod. Protestants etc.), age, gender, race, household size, family income, parental education, parental age, presence of biological mother and father, Cigarette tax at the county level, median income, density measure of county, own race density measure, same age density measures, regional dummies, school size and type dummies, school level measure of proportional of smokers, and drug and alcohol expulsion policies. The last panel provides results with Importance of religiosity, a self-reported measure of degree of religiosity.

Table 7: Falsification Tests II

	Neuroticism (Wave 1)					Conscientiousness (Wave 1)				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
I. Religious Attendance										
OLS	0.031†	0.032†	0.042†	0.021	0.046‡	0.039‡	0.025	0.014	0.042†	0.014
	(0.013)	(0.014)	(0.018)	(0.017)	(0.015)	(0.014)	(0.017)	(0.015)	(0.017)	(0.016)
FFE	0.013	0.009	0.029	0.047	0.087‡	0.023	0.058	0.059*	0.114‡	0.056*
	(0.030)	(0.030)	(0.043)	(0.039)	(0.031)	(0.028)	(0.037)	(0.032)	(0.038)	(0.032)
II. Frequency of Prayers										
OLS	0.044‡	0.056‡	0.026*	0.034†	0.039‡	0.051‡	0.066‡	0.049‡	0.042‡	0.053‡
	(0.010)	(0.012)	(0.015)	(0.014)	(0.012)	(0.012)	(0.014)	(0.013)	(0.014)	(0.013)
FFE	0.043†	0.047†	-0.052	0.025	-0.003	0.025	0.066†	0.032	0.036	0.044*
	(0.020)	(0.024)	(0.033)	(0.028)	(0.022)	(0.025)	(0.027)	(0.027)	(0.028)	(0.024)
III. Importance of Religion										
OLS	0.055‡	0.073‡	0.060‡	0.061‡	0.055‡	0.078‡	0.088‡	0.075‡	0.095‡	0.077‡
	(0.013)	(0.014)	(0.018)	(0.017)	(0.014)	(0.015)	(0.017)	(0.016)	(0.018)	(0.016)
FFE	0.056†	0.054†	0.028	0.051	0.045	0.051*	0.058*	0.091‡	0.086‡	0.080‡
	(0.022)	(0.026)	(0.036)	(0.031)	(0.028)	(0.029)	(0.032)	(0.030)	(0.032)	(0.027)
N	3,077	3,078	3,079	3,080	3,077	3,077	3,069	3,068	3,065	3,073

Note: All specifications include a set of extra covariates: birth-weight, parental religiosity, county level urbanization and own religion adherent-based density measures, and PVT score. Robust standard errors clustered at the family level are in parentheses. Linear probability regression models are used with the sampling weights provided in the survey. FFE stands for family fixed effects. All models include the full set of adolescent, parent, household, area, and school level explanatory variables. ‡1%, †5%, *10%. Xs: religious affiliation dummies (Catholic, Mod. Protestants etc.), age, gender, race, household size, family income, parental education, parental age, presence of biological mother and father, Cigarette tax at the county level, median income, density measure of county, own race density measure, same age density measures, regional dummies, school size and type dummies, school level measure of proportional of smokers, and drug and alcohol expulsion policies. Columns 1-6 include factors that go into measures of Neuroticism; Columns 7-10 include factors that go into measuring Conscientiousness. The last panel provides results with Importance of religiosity, a self-reported measure of degree of religiosity.