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Religiosity and Exposure to Users in Explaining Illicit Drug Use among Emerging Adults

Joseph J. Palamar · Mathew V. Kiang · Perry N. Halkitis

Abstract Religiosity is a protective factor against illicit drug use, but further investigation is needed to delineate which components of religiosity are protective against use. A racially diverse sample ($N = 962$) was surveyed about religiosity, exposure to users, and recent use of marijuana, powder cocaine, ecstasy, and nonmedical use of opioids and amphetamine. Results suggest that identifying as Agnostic increased odds of use for each of the five drugs; however, this effect disappeared when controlling for religious importance and attendance. High levels of religious attendance were protective against recent use of marijuana and cocaine, but protective effects diminished when controlling for exposure to users, which was a robust predictor of use of every drug. Religion is a protective mechanism against drug use, but this effect may diminish in light of exposure to users. Alternative preventative methods need to be directed toward individuals who are not religious or are highly exposed to users.

Keywords Religiosity · Drug use · Drug exposure · Drug use prevention · Emerging adults

Introduction

Illicit drug use is a leading public health issue in the United States. Use is often associated with adverse health consequences and the majority of adults in the United States feel that illicit drug use is morally wrong (Blendon and Young 1998); however, use remains prevalent with 67 % of adults having used an illicit drug by 25 years of age (Johnston et al. 2012).

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Religiosity, or level of religiousness, has been shown to protect individuals from illicit drug use (Bartkowski and Xu 2007; Crano et al. 2008), but results vary depending on how religiosity was measured. Likewise, much research is limited as it examines the effects of religiosity on general "drug use." Addressing these gaps, this investigation examines how different components of religiosity explain recent use of specific illicit drugs in a sample of urban emerging adults (age 18–25) in New York City (NYC).

In studies that suggest religiosity protects individuals from drug use, religiosity is often analyzed in a unidimensional fashion (e.g., church attendance as a crude indicator), which can lead to flawed results. Studies that examine the effects of religiosity in multidimensional fashion—which includes affiliation (or denomination), degree of integration (religious attendance), and salience (importance of religion in one's life)—yield stronger, more reliable results (Johnson et al. 2000). Such variables are often calculated into composite scores and measure multiple dimensions simultaneously. Further research is needed to examine more closely how separate elements of religiosity explain use. Religious affiliation, religious service attendance, and religious importance are the three main elements of this "tripartite" construct (Bartkowski and Xu 2007), so we examined how each separate element explains illicit drug use while considering an important, but understudied epidemiological concept—exposure to users.

Religious Affiliation

The majority of the US population affiliates themselves with an organized religion (The Pew Forum on Religion and Public Life [PFRPL] 2008). Religious affiliation is part of one's identity and is an indicator of exposure to and internalization of religious norms (Bartkowski and Xu 2007). Affiliation has been shown to be a protective factor against risky behaviors, such as illicit drug use among adolescents and emerging adults (Nonnemaker et al. 2003); however, more studies are needed to examine the influence of specific religious affiliations on the use of various illicit drugs.

The Pew Forum on Religion and Public Life (2008) is a leading source of national survey data on religiosity in the United States and considers Evangelicals, Mormons, Muslims, and members of Historically Black churches to be among the most conservative denominations as they tend to be the most politically conservative groups with respect to many social issues. Affiliation with such conservative denominations has been shown to protect individuals from substance use (Michalak et al. 2007; Miller et al. 2000). For example, Muslims tend to strongly condemn the use of psychoactive substances and are less likely to drink alcohol than their religious counterparts (Viner et al. 2006). More conservative sects of Christianity (e.g., Mormon and Baptist) tend to be less tolerant of substance use than other Christians and Roman Catholics (Bartkowski and Xu 2007; Francis 1997) and are more likely to proscribe substance use, and such attitudes strongly predict abstinence. Likewise Mormons, Muslims, and Pentecostals have been shown to be among the least likely to drink alcohol while Catholics and Lutherans are more likely to engage in use (Michalak et al. 2007).

Although some religions may strictly proscribe the use of psychoactive substances, other affiliations appear to express more tolerance. For example, some denominations such as Catholicism and Judaism incorporate alcohol into their rituals. Results from a national study also suggest that adolescents in Catholic schools are more likely to use marijuana than their counterparts in public school (O'Malley et al. 2006). Although Catholicism is not particularly tolerant of illicit drug use, certain sects of other belief systems may in fact express lower levels of condemnation (e.g., Tart 1991; Stolaroff 1999), and other cultures

have utilized psychoactive substances for centuries to enhance a feeling of religiosity or spirituality (Smith 1963). Finally, Atheists and Agnostics tend to report higher rates of use of substances such as marijuana and cocaine in comparison with their religious counterparts (Degenhardt et al. 2007; Ellis 2002). Therefore, it appears that individuals who do not identify with an affiliation may be at greater risk for illicit drug use. More research is needed to understand how specific religious affiliations predict illicit drug use since religious affiliation is only a crude indicator of beliefs or values (Miller 1998).

Religious Attendance

Attendance of religious services is an important aspect of religiosity because it suggests degree of integration with religious networks (Bartkowski and Xu 2007). While religious attendance represents amount of time exposed to houses of worship and associated teachings, it may also serve as a "time displacement" from outside activities (Chen et al. 2004). Therefore, if an individual attends church, temple, or mosque, he or she is more likely to be removed from potential illicit drug using individuals.

Religious attendance has been shown to be a strong protective factor against drug use. For example, higher attendance is associated with lower odds of marijuana use (Bartkowski and Xu 2007), and this association has been shown to have a stronger effect than affiliation (Piko and Fitzpatrick 2004). Findings, however, vary depending on other factors. For example, Harrell and Broman (2009) found that religious attendance was associated with lower prescription drug misuse among Black emerging adults, but not in those who were White or Hispanic. Another study found that occasional religious service attendance was associated with greater odds of drug use (Steinman et al. 2008); therefore, further research is needed to examine how attendance explains use of various drugs in light of affiliation and level of religious importance.

Religious Importance

Level of religious importance (in one's life) is an indicator of religious salience and is often examined in relation to risk behavior (Bartkowski and Xu 2007). Personal importance of religion has been found to be protective against marijuana use in adolescents (Sinha et al. 2007), and low importance has been found to be a risk factor for use of cocaine, ecstasy, and nonmedical use of prescription stimulants (Degenhardt et al. 2007; Herman-Stahl et al. 2006). Other studies have found that private religiosity, which includes level of religious importance, is more protective against substance use than public religiosity, such as attendance (Bartkowski and Xu 2007; Nonnemaker et al. 2003). However, recent findings from a national investigation suggest that importance is not protective against prescription drug misuse (Harrell and Broman 2009), and another study found that high religious importance was a risk factor for methamphetamine use (Herman-Stahl et al. 2006). This variation in findings suggests that more research is warranted in order to determine whether level of religious importance protects individuals from use of various illicit drugs when controlling for affiliation and attendance.

Demographic Determinants of Religiosity

Religiosity is often associated with specific demographic characteristics. Specifically, religion is most important to older Americans and those who are female (Newport 2006a), and men are less likely than women to be religious or proscriptive against substance use

(Michalak et al. 2007). Level of educational attainment is also related to religiosity. Specifically, those with lower levels of educational attainment are more likely to believe in God (Newport 2006b), and those who are less educated tend to be more religious, more proscriptive against substance use, and abstain at higher levels (Michalak et al. 2007). Race/ethnicity has also been shown to be a strong predictor of religiosity as Black adolescents report higher levels of religious importance, more frequent religious attendance, lower levels of nonaffiliation, and higher levels of abstinence in comparison with other racial groups (Newport 2006a, 2007; Michalak et al. 2007; Wallace et al. 2003).

Such demographic factors are also associated with exposure to drug users. Religious individuals tend to be less exposed to marijuana, powder cocaine, ecstasy, opioids, and amphetamine than their non-religious counterparts (Nonnemaker et al. 2003; Palamar et al. 2011), but protective effects may be dependent on level of religious socialization because religious individuals tend to associate with peers who do not use drugs and who may also be intolerant of use (Bahr et al. 1998). Likewise, evidence suggests that religious individuals may be protected from drug use because they are less exposed and thus tend to stigmatize or devalue illicit drug users (Palamar et al. 2011). Therefore, it is crucial to examine how level of exposure to drug users predicts use while controlling for religiosity.

This study seeks to delineate factors that explain recent use of five of the most prevalent drugs in the United States: marijuana, powder cocaine, ecstasy, and nonmedical use of opioids and amphetamine. Specifically, this study examines how different aspects of religiosity as well as level of exposure to users predict illicit drug use among urban emerging adults, who are at the highest risk for use and associated consequences.

Methods

Procedure

Participants were recruited on the street for two modes of survey administration: (1) paper surveys were administered to participants on the street, and (2) other potential respondents who were deemed eligible were given a recruitment card (with a unique ID number) to take an Internet version of the survey at a later time. Recruitment was conducted throughout Manhattan, New York, in city parks, at city college campuses, and near other venues frequented by emerging adults (e.g., coffee shops). For both survey modes, one out of every three individuals, or groups of individuals, who appeared to be emerging adults were approached in select recruitment areas. Respondents who filled out street surveys were compensated $3.00 for their time. With regard to street recruitment for the Internet version of the survey, potential respondents were asked whether they would be willing to complete a ten-minute anonymous survey via Internet Web site. It was explained that upon completing the survey, they could enter their email, which would not be attached to their survey, for a chance to win an iPod. The Internet survey program (SurveyMonkey®) used cookies to prevent multiple responses from the same participant, and basic demographics were collected at recruitment and later matched to the unique ID number they entered in the Internet survey that was listed on their recruitment card. This information collected at recruitment matched the Internet survey data for each respondent to a high level of accuracy (see Palamar et al. 2012). To meet inclusion criteria, respondents must have been (1) 18–25 years of age; (2) fluent in English; and, for the Internet survey, (3) must have had access to the Internet. Recruitment occurred from May through October of 2009. The study protocol was approved by the Institutional Review Board for New York University.

Measures

Demographics Respondents were asked to answer items that assessed age (in years), gender, level of educational attainment (by highest degree achieved), and race/ethnicity.

Illicit Drug Use Recent use, defined as use within the last 12 months, was assessed for five drugs: marijuana, powder cocaine, ecstasy, and the nonmedical use of select amphetamine and opioid prescription drugs. Amphetamine was defined as Adderall® and Dexedrine®, and opioids were defined as Oxycontin®, Vicodin®, and Percoset®. Nonmedical use was defined as using a drug without a prescription or using it to get "high" (Substance Abuse and Mental Health Services Administration [SAMHSA] 2010).

Religion Variables Religiosity was assessed through three separate items. Religious importance was measured though a 4-point Likert scale which asked, "How important is religion in your life?" Answer options ranged from (1) "Not important" to (4) "Very important." Level of religious service attendance was also assessed: "How often have you attended religious services (such as church or temple) within the last year?" Answer options were (1) "Never," (2) "Rarely," (3) "Once or twice a month," and (4) "About once a week or more." These measures have been used in numerous national investigations (e.g., Bartkowski and Xu 2007; Regnerus and Uecker 2006). In addition to these two Likert items, respondents were asked to select their religious affiliation. Answer options included Agnostic, Atheist, Catholic, Christian (other than Catholic), Jewish, Muslim, and other religion. Respondents also had the option to fill in their specific denomination (e.g., Pentecostal, Roman Catholic, and Shia) in addition to their affiliation.

Exposure to Illicit Drug Users Respondents were assessed via the *Exposure to Drug Users Index* in order to assess level of perceived exposure to illicit drug users (Palamar et al. 2011). This measure consists of seven statements that measure perceived exposure to users of each of the five drugs; for example, "I have worked with a person that uses *[drug name]*" and "I have a friend who uses *[drug name]*." The count of affirmative responses was recoded into mean scores for each drug (KR-20 reliability = 0.79–0.82).

Analytic Plan

We first examined associations between demographic and religious variables. Chi-square tests were calculated to determine whether there were differences with regard to religious affiliation and race/ethnicity, and a series of correlations were then calculated to determine bivariate associations between key factors. Specifically, we examined relationships between religious affiliation indicator variables and age, gender, and educational attainment, using point biserial, phi, and Spearman correlations, respectively. Religious importance and attendance were also examined in relation to key demographic variables using Spearman correlations.

Stepwise logistic regression models were built separately for each drug outcome (e.g., recent marijuana use, 0/1) and provided odds ratios for recent use of each drug. Age, gender, educational attainment, race/ethnicity, and affiliation were entered into Step 1. The referent group for each respective explanatory variable was identifying as male, having a high school diploma or less, identifying as White, and identifying as Christian (other than Catholic). We used Christianity as the reference both because it was the largest group and because it contains subgroups (i.e., Mainline and Evangelical), which are difficult to break down. Specifically, while Evangelical (more conservative) and Mainline (more liberal) groups consist of specific denominations, there are various sects of each denomination which are difficult to categorize, in part, because there are both Mainline and Evangelical

branches of many denominations (PFRPL 2008). Likewise, many participants did not provide a specific denomination, which prevented us from further categorizing Christianity for the full sample. Problems with such categorizations of Christian denominations have also been documented as limitations in previous work (Michalak et al. 2007). Level of religious importance and attendance was then entered into Step 2, with responses of "Not important" and "Never attends" serving as the comparisons, respectively. Level of exposure to users was entered into Step 3. Exposure in each model corresponds to use of the specific drug being analyzed in that model. For example, in the marijuana model, the exposure variable indicates level of exposure to marijuana users. Finally, for the fourth step, we tested interaction terms to assess whether exposure was related to specific levels of importance (exposure × each importance indicator) and attendance (exposure × each attendance indicator).

Results

Sample Characteristics

A total of 1,048 respondents were surveyed—769 respondents (73.4 %) were assessed on the street and 279 (26.6 %) were assessed online. Demographic characteristics differed by mode of survey administration. In comparison with respondents who were assessed on the street, Internet survey respondents tended to be older ($M = 20.52$ years old, $SD = 1.74$ vs. $M = 20.24$ years old, $SD = 2.00$, $t(559) = 2.24$, $p = 0.026$) and more educated ($M = 14.43$ years, $SD = 1.46$ vs. $M = 14.15$ years, $SD = 1.63$, $t(1,046) = 2.57$, $p = 0.010$). Internet respondents were also more likely to identify as White (57.3 vs. 42.7 % Non-White, $\chi^2(1) = 29.16$, $p < 0.001$) or female (58.8 vs. 41.2 % male, $\chi^2(1) = 4.76$, $p = 0.017$).

After data cleaning, casewise deletion of cases with missing demographic or religiosity data (2.0 %, $n = 21$) and removal of respondents who selected "choose not to answer" for the religious affiliation question (6.2 %, $n = 65$), the final analytic sample was 962. The age of respondents ranged from 18 to 25 ($Md = 20$), and the sample was racially and religiously diverse. Table 1 summarizes sample characteristics and rates of illicit drug use. Racial minorities and participants of religions other than Christianity were oversampled in comparison with NYC Census (US Census 2012) and national PFRPL (2008) rates, respectively; however, NYC has a more diverse spread of religious affiliations than the rest of the United States. Participants also reported slightly higher annual rates of marijuana, cocaine, and ecstasy in comparison with national rates (Johnston et al. 2012), but rates of use tend to be higher in NYC (Paone et al. 2010).

Respondents who did not check off a religious affiliation did not differ from the analytic sample with regard to age, educational attainment, religious importance, or exposure to users or recent use of any of the five drugs. However, these individuals were more likely to be male ($\chi^2(1) = 6.05$, $p = 0.010$), Black or Asian American ($\chi^2(4) = 19.52$, $p = 0.001$), and more likely to report higher levels of religious attendance (Wilcoxon W, $p = 0.040$).

Demographic and Religious Associations

Religious affiliation varied by participant race ($\chi^2(24) = 319.01$, $p < 0.001$). Specifically, the plurality of Agnostics (51.5 %), Atheists (59.8 %), Christians (30.5 %), Catholics (44.4 %), and Jewish respondents (87.6 %) identified as White. The majority identifying as

Table 1 Sample demographics and illicit drug use ($N = 962$)

Demographic variable	N	(%)
Age	$M = 20.33$	$SD = 1.94$
Gender		
Male	439	45.6
Female	523	54.4
Race/ethnicity		
White/Caucasian	430	44.7
Black/African American/Caribbean	123	12.8
Hispanic/Latino	164	17.0
Asian American/Pacific Islander	165	17.2
Other	80	8.3
Educational attainment		
High school/GED or less	331	34.4
Some college or Associate's Degree	435	45.2
College graduate or higher	196	20.4
Religious affiliation		
Christian (other than Catholic)	238	24.7
Catholic	225	23.4
Agnostic	134	13.9
Jewish	115	12.0
Other	99	10.3
Atheist	94	9.8
Muslim	57	5.9
Recent illicit drug use		
Marijuana	478	49.7
Powder Cocaine	99	10.3
Ecstasy	83	8.6
Opioids (nonmedical use)	93	9.7
Amphetamine (nonmedical use)	90	9.4

M mean, *SD* standard deviation

Muslim were Asian American (51.8 %) and those identifying with "other religion" tended to identify as White (27.5 %) or Asian American (27.5 %). Black (54.1 %) and Asian American (31 %) respondents were most likely to identify as Christian, Whites (23.2 %) and Hispanics (46.2 %) were most likely to identify as Catholic, and those of "other" race were most likely to identify as Muslim (20.5 %). Affiliation was not related to age, gender, or level of educational attainment.

With regard to religiosity, level of religious importance was highly related to level of religious attendance ($r_s = 0.67$, $p < 0.001$). Black respondents reported the highest levels of religious importance ($r_s = 0.21$, $p < 0.001$), and White respondents reported the lowest levels of both importance ($r_s = -0.21$, $p < 0.001$) and attendance ($r_s = -0.20$, $p < 0.001$). Level of religious importance and attendance was not related to gender or level of educational attainment; however, there were moderate associations with regard to affiliation. Identifying as Christian was positively related to level of religious importance ($r_s = 0.35$, $p < 0.001$) and attendance ($r_s = 0.31$, $p < 0.001$), and unaffiliated respondents reported lower levels of religious importance and attendance. Specifically, identifying as Agnostic was negatively related to level of religious importance ($r_s = -0.36$, $p < 0.001$)

and attendance ($r_s = -0.29$, $p < 0.001$) while identifying as Atheist was also negatively related to level of religious importance ($r_s = -0.36$, $p < 0.001$) and attendance ($r_s = -0.35$, $p < 0.001$). No other affiliations reported significant levels of religious importance or attendance.

With regard to exposure to users, level of religious importance was negatively related to level of exposure to marijuana ($r_s = -0.20$, $p < 0.001$) and ecstasy ($r_s = -0.22$, $p < 0.001$) users. Level of religious attendance was negatively related to level of exposure to users of marijuana ($r_s = -0.23$, $p < 0.001$), powder cocaine ($r_s = -0.22$, $p < 0.001$), and ecstasy ($r_s = -0.22$, $p < 0.001$). Numerous significant associations exist within the predictors; therefore, it is important to control for them in a stepwise manner when examining the effects of religiosity on recent illicit drug use.

Logistic Regression Models

Separate stepwise logistic regression models were built for each of the five drugs with recent use (yes/no) as the binary outcome variable. However, examining drug outcomes in separate models reduced the independence of the outcome variables because the use of some drugs (e.g., cocaine) tends to be highly associated with use of other drugs (e.g., marijuana) (Kandel and Yamaguchi 1993). Likewise, recent use was correlated for all drugs ($\varphi = 0.28$–0.47, $p < 0.001$). To reduce family-wise error resulting from multiple comparisons, we utilized a Bonferroni correction ($\alpha = 0.05/5$); therefore, the alpha level was set to 0.01. It should be noted that exposure data for 39 cases was missing due to omitted survey pages and we treated this as missing at random. Before building the logistic regression models, we first estimated these missing values through multiple data imputation using SAS 9.2® PROC MI.

The first model assessed recent marijuana use as the outcome variable. As shown in Table 2, in comparison with Christians, Agnostics ($OR = 3.30$, $p < 0.0001$) and those identifying with "other" religion ($OR = 2.03$, $p = 0.006$) were at increased odds for recent use in the first step, but this effect disappeared upon entering attendance and importance into the model. High religious attendance ($OR = 0.34$, $p = 0.001$) served as a protective factor upon entry, but this protective effect evanesced when exposure to marijuana users was entered into the model. Exposure was a robust predictor of use ($OR = 1.24$, $p < 0.0001$) and minority status was a consistent protective factor against use with all else equal. The second model assessed recent cocaine use as the outcome variable. As shown in Table 3, in Step 1, the risk of being Agnostic ($OR = 2.81$, $p = 0.004$) disappeared upon entering religious importance and attendance. Attending religious services once a week or more was protective upon entry ($OR = 0.10$, $p = 0.005$); however, this effect diminished upon entering exposure to cocaine users, which in the third step was a robust predictor of use ($OR = 1.35$, $p < 0.0001$). Recent ecstasy use was the criterion variable in the third model. As shown in Table 4, Agnostics ($OR = 4.37$, $p = 0.001$) and Atheists ($OR = 4.49$, $p = 0.001$) were at higher odds for use, but these effects were lost upon entry of religious importance and attendance, which were not protective against use. Exposure to ecstasy users was a robust predictor ($OR = 1.35$, $p < 0.0001$) upon entry.

In the fourth model, recent nonmedical use of opioids was the criterion variable. As shown in Table 5, Agnostics were at higher odds of use ($OR = 4.39$, $p < 0.0001$); however, upon entering attendance and importance, this effect disappeared. Neither religious importance nor attendance were protective factors in the second step. In the last step, exposure to users was a robust predictor ($OR = 1.24$, $p < 0.0001$). Finally, recent nonmedical use of amphetamine was the criterion variable in the last model. As shown in

Table 2 Results of multivariate logistic regressions predicting recent marijuana use

Variable	Step 1		Step 2		Step 3	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
Age	0.96	0.88–1.06	0.95	0.86–1.04	0.94	0.85–1.04
Female[a]	0.77	0.58–1.01	0.75	0.57–1.00	0.76	0.57–1.02
Education[b]						
Some college/AS	1.22	0.88–1.70	1.19	0.85–1.67	1.04	0.73–1.48
BA or higher	1.51	0.90–2.53	1.56	0.92–2.66	1.47	0.85–2.54
Race/ethnicity[c]						
Black	0.23***	0.14–0.37	0.27***	0.16–0.45	0.27***	0.16–0.45
Hispanic/Latino	0.48***	0.32–0.70	0.47***	0.32–0.71	0.51**	0.33–0.77
Asian	0.27***	0.18–0.41	0.34***	0.22–0.53	0.40***	0.25–0.64
Other	0.74	0.44–1.25	0.85	0.49–1.45	1.04	0.59–1.83
Religious affiliation[d]						
Agnostic	3.30***	2.05–5.32	1.81	1.04–3.14	1.78	1.00–3.15
Atheist	1.85	1.10–3.12	0.99	0.52–1.88	0.98	0.50–1.92
Catholic	1.45	0.97–2.17	1.30	0.85–1.98	1.28	0.83–1.98
Jewish	1.30	0.79–2.13	1.05	0.62–1.76	0.97	0.57–1.65
Muslim	0.78	0.39–1.56	0.68	0.33–1.36	0.70	0.34–1.46
Other	2.03*	1.23–3.36	1.34	0.78–2.30	1.28	0.74–2.24
Religious importance[e]						
A little important			1.01	0.63–1.62	1.08	0.66–1.76
Somewhat important			0.67	0.41–1.08	0.69	0.42–1.14
Very important			0.67	0.38–1.19	0.69	0.38–1.24
Religious attendance[f]						
Rarely			0.99	0.66–1.48	1.01	0.67–1.53
Once or twice a month			0.59	0.34–1.02	0.64	0.37–1.13
Once a week or more			0.34*	0.18–0.64	0.44	0.23–0.83
Exposure to users					1.24***	1.17–1.32
Pseudo R^2	0.17		0.22		0.28	

Comparison variables: [a] Male, [b] High School or less, [c] White, [d] Christian, [e] Not important, [f] Never

* $p < 0.01$; ** $p < 0.001$; *** $p < 0.0001$

Table 6, Agnostics were at higher odds for use ($OR = 2.77$, $p = 0.007$), but this effect disappeared upon entry of religious importance and attendance. Neither religious importance nor attendance were protective factors in the second step, and exposure to users was a robust predictor ($OR = 1.21$, $p < 0.0001$). There were no significant interaction effects in any model with respect to exposure and different levels of importance, or exposure and different levels of attendance (last step not included in tables).

Discussion

This study investigated how religiosity explains recent illicit drug use in a diverse sample of emerging adults in NYC. Specifically, this study examined how three components of

Table 3 Results of multivariate logistic regressions predicting recent powder cocaine use

Variable	Step 1		Step 2		Step 3	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
Age	1.24*	1.07–1.42	1.21*	1.05–1.40	1.20	1.03–1.39
Female[a]	0.76	0.49–1.17	0.73	0.46–1.13	0.82	0.51–1.31
Education[b]						
Some college/AS	1.27	0.72–2.24	1.24	0.70–2.21	1.13	0.61–2.10
BA or higher	0.96	0.44–2.12	1.00	0.45–2.24	0.92	0.39–2.18
Race/ethnicity[c]						
Black	0.21	0.06–0.71	0.27	0.08–0.91	0.35	0.10–1.22
Hispanic/Latino	1.08	0.60–1.94	1.13	0.62–2.07	1.27	0.68–2.40
Asian	0.32*	0.14–0.74	0.42	0.18–1.00	0.60	0.24–1.47
Other	0.71	0.31–1.62	0.77	0.34–0.77	0.76	0.32–1.81
Religious affiliation[d]						
Agnostic	2.81*	1.39–5.69	1.43	0.65–3.18	1.48	0.63–3.46
Atheist	1.62	0.70–3.71	0.72	0.27–1.91	0.78	0.28–2.19
Catholic	0.98	0.47–2.06	0.88	0.41–1.89	0.81	0.36–1.80
Jewish	1.80	0.84–3.87	1.46	0.67–3.21	1.36	0.59–3.11
Muslim	0.70	0.15–3.33	0.72	0.15–3.52	0.82	0.17–4.08
Other	1.23	0.49–3.08	0.72	0.28–1.88	0.60	0.22–1.67
Religious importance[e]						
A little important			1.03	0.55–1.94	1.18	0.60–2.31
Somewhat important			0.73	0.36–1.48	0.76	0.36–1.62
Very important			0.82	0.32–2.12	0.75	0.28–2.02
Religious attendance[f]						
Rarely			0.66	0.38–1.13	0.73	0.41–1.30
Once or twice a month			0.26	0.09–0.77	0.33	0.11–1.00
Once a week or more			0.10*	0.02–0.50	0.17	0.03–0.88
Exposure to users					1.35***	1.24–1.47
Pseudo R^2	0.12		0.16		0.27	

Comparison variables: [a] Male, [b] High School or less, [c] White, [d] Christian, [e] Not important, [f] Never

* $p < 0.01$; ** $p < 0.001$; *** $p < 0.0001$

religiosity—affiliation, attendance, and importance—each separately explain illicit drug use. Independent models were built to determine how these factors explain recent use of different illicit drugs while considering social proximity to users.

In comparison with Christians, Agnostics were at increased odds of recent use of all five drugs; however, when controlling for religious importance and attendance, this effect disappeared. Likewise, Atheists were at increased risk for ecstasy use, but this effect also disappeared when controlling for other components of religiosity. This suggests that the risk of being Agnostic or Atheist, in some respects, may serve as an indicator of low levels of religious attendance and importance. While controlling for demographic characteristics and religious affiliation, level of religious attendance was a protective factor against marijuana and cocaine use. Specifically, high levels of attendance (attending once per week or more) in comparison with no attendance were protective against use. Only high levels of

Table 4 Results of multivariate logistic regressions predicting recent ecstasy use

Variable	Step 1		Step 2		Step 3	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
Age	1.07	0.91–1.25	1.05	0.90–1.24	1.05	0.89–1.24
Female[a]	0.53*	0.33–0.85	0.49*	0.30–0.80	0.58	0.35–0.97
Education[b]						
Some college/AS	1.34	0.74–2.42	1.35	0.74–2.48	1.40	0.74–2.64
BA or higher	1.06	0.44–2.57	1.17	0.48–2.87	1.23	0.49–3.09
Race/ethnicity[c]						
Black	0.25	0.08–0.86	0.36	0.10–1.24	0.42	0.12–1.51
Hispanic/Latino	0.74	0.38–1.44	0.76	0.39–1.49	0.78	0.38–1.59
Asian	0.38	0.17–0.86	0.48	0.20–1.12	0.68	0.28–1.66
Other	0.54	0.21–1.38	0.62	0.24–1.58	0.63	0.24–1.66
Religious affiliation[d]						
Agnostic	4.37*	1.84–10.38	1.79	0.69–4.64	1.38	0.50–3.76
Atheist	4.49*	1.82–11.09	1.50	0.53–4.29	1.30	0.43–3.93
Catholic	1.69	0.69–4.16	1.47	0.59–3.67	1.28	0.49–3.34
Jewish	1.86	0.70–4.95	1.40	0.51–3.80	1.11	0.39–3.17
Muslim	1.97	0.47–8.18	2.13	0.50–9.10	1.83	0.41–8.11
Other	2.50	0.90–6.97	1.30	0.44–3.80	1.01	0.33–3.15
Religious importance[e]						
A little important			0.80	0.41–1.58	0.79	0.38–1.62
Somewhat important			0.41	0.18–0.93	0.45	0.19–1.03
Very important			0.36	0.11–1.15	0.33	0.10–1.09
Religious attendance[f]						
Rarely			0.66	0.37–1.18	0.74	0.40–1.35
Once or twice a month			0.37	0.11–1.20	0.40	0.12–1.35
Once a week or more			0.21	0.04–1.13	0.28	0.05–1.48
Exposure to users					1.35***	1.23–1.48
Pseudo R^2	0.11		0.16		0.26	

Comparison variables: [a] Male, [b] High School or less, [c] White, [d] Christian, [e] Not important, [f] Never

* $p < 0.01$; ** $p < 0.001$; *** $p < 0.0001$

attendance were protective, which suggests that less than weekly attendance (e.g., monthly) may not be preventative against use. However, any protective effects of religiosity diminished when controlling for exposure to users, and attendance had no effect on nonmedical use of opioids or amphetamine. Therefore, it is possible that potential protective effects of religious attendance apply less to pills that are only available legitimately through prescription. Religious importance was not protective against use of any drug while controlling for affiliation and attendance. It should be noted that attendance and importance approached significance in some models, but could not be deemed significant due to the Bonferroni correction. This correction is conservative so we explain the loss of significance across models as a diminished effect rather than a loss of effect.

Before controlling for exposure to users, various indicators of religiosity predicted recent use of each drug. Non-religious respondents, particularly Agnostics, were at risk for

Table 5 Results of multivariate logistic regressions predicting recent nonmedical opioid use

Variable	Step 1		Step 2		Step 3	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
Age	1.10	0.95–1.28	1.09	0.94–1.27	1.10	0.95–1.28
Female[a]	0.70	0.45–1.29	0.67	0.42–1.05	0.73	0.45–1.17
Education[b]						
Some college/AS	0.85	0.50–1.45	0.81	0.47–1.38	0.71	0.41–1.24
BA or higher	0.52	0.22–1.19	0.52	0.22–1.22	0.46	0.19–1.10
Race/ethnicity[c]						
Black	0.20*	0.06–0.68	0.27	0.08–0.92	0.32	0.09–1.11
Hispanic/Latino	0.57	0.30–1.09	0.58	0.30–1.12	0.63	0.32–1.24
Asian	0.30**	0.12–0.72	0.35	0.14–0.87	0.43	0.17–1.10
Other	1.03	0.48–2.22	1.14	0.53–2.46	1.16	0.53–2.56
Religious affiliation[d]						
Agnostic	4.39***	2.01–9.61	2.37	0.99–5.66	1.85	0.75–4.56
Atheist	2.21	0.88–5.53	1.09	0.38–3.12	0.92	0.31–2.73
Catholic	2.04	0.92–4.51	1.75	0.78–3.93	1.62	0.71–3.68
Jewish	2.19	0.93–5.18	1.77	0.74–4.24	1.37	0.55–3.39
Muslim	0.40	0.05–3.35	0.46	0.05–3.86	0.41	0.05–3.52
Other	1.68	0.61–4.64	1.03	0.36–2.94	0.89	0.30–2.60
Religious importance[e]						
A little important			1.01	0.53–1.92	0.92	0.47–1.81
Somewhat important			0.55	0.26–1.16	0.52	0.25–1.10
Very important			0.33	0.10–1.06	0.29	0.09–0.93
Religious attendance[f]						
Rarely			0.81	0.46–1.42	0.84	0.47–1.50
Once or twice a month			0.87	0.34–2.22	0.92	0.36–2.36
Once a week or more			0.25	0.05–1.28	0.31	0.06–1.59
Exposure to users					1.24***	1.15–1.34
Pseudo R^2	0.11		0.15		0.21	

Comparison variables: [a] Male, [b] High School or less, [c] White, [d] Christian, [e] Not important, [f] Never

* $p < 0.01$; ** $p < 0.001$; *** $p < 0.0001$

using all drugs until controlling for religiosity and exposure to users. This suggests that merely identifying with a religious denomination (in comparison with Christianity) is not associated with an increase or decrease in risk of use. Instead it appears that level of attendance and importance help drive the protective effects of religiosity, regardless of affiliation. However, protective effects of all religion variables diminished or disappeared when controlling for exposure.

The most consistent predictor across models was exposure to users. With all else equal, for every unit increase in exposure to users, respondents were at increased odds for use between 21 and 35 %, depending on the drug. Each religious variable had unique effects on use of each of the five drugs, but level of exposure to users was the most robust predictor, which appeared to diminish the effects of religiosity. The effect of exposure across all models was perhaps the most important finding in this study because our models

Table 6 Results of multivariate logistic regressions predicting recent nonmedical amphetamine use

Variable	Step 1		Step 2		Step 3	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
Age	0.97	0.83–1.14	0.97	0.83–1.14	0.99	0.84–1.16
Female[a]	0.64	0.41–1.01	0.64	0.40–1.02	0.70	0.43–1.12
Education[b]						
Some college/AS	1.86	1.05–3.29	1.85	1.04–3.31	1.75	0.97–3.17
BA or higher	1.19	0.48–2.94	1.22	0.49–3.03	1.06	0.42–2.68
Race/ethnicity[c]						
Black	0.25	0.09–0.74	0.28	0.09–0.84	0.31	0.10–0.93
Hispanic/Latino	0.58	0.29–1.15	0.60	0.30–1.12	0.64	0.31–1.29
Asian	0.30*	0.13–0.71	0.32	0.13–0.77	0.35	0.14–0.86
Other	0.35	0.13–0.93	0.35	0.13–0.96	0.32	0.12–0.89
Religious affiliation[d]						
Agnostic	2.77*	1.32–5.82	2.08	0.89–4.85	1.80	0.76–4.30
Atheist	1.61	0.68–3.78	1.20	0.43–3.33	1.09	0.38–3.14
Catholic	0.69	0.29–1.60	0.63	0.27–1.48	0.60	0.25–1.42
Jewish	1.97	0.89–4.37	1.77	0.79–3.97	1.49	0.65–3.39
Muslim	0.88	0.18–4.24	0.94	0.19–4.64	0.81	0.16–4.06
Other	1.98	0.82–4.78	1.61	0.64–4.09	1.49	0.58–3.84
Religious importance[e]						
A little important			1.06	0.53–2.10	0.99	0.49–2.02
Somewhat important			0.91	0.43–1.90	0.94	0.44–2.00
Very important			0.32	0.10–1.01	0.31	0.10–0.96
Religious attendance[f]						
Rarely			0.92	0.51–1.64	0.93	0.51–1.68
Once or twice a month			0.78	0.29–2.10	0.83	0.31–2.22
Once a week or more			1.36	0.43–4.33	1.65	0.52–5.29
Exposure to users					1.21***	1.12–1.31
Pseudo R^2	0.12		0.13		0.18	

Comparison variables: [a] Male, [b] High School or less, [c] White, [d] Christian, [e] Not important, [f] Never

* $p < 0.01$; ** $p < 0.001$; *** $p < 0.0001$

broke down the protective effects of religiosity, step by step, and found that in some respects, these protective factors may have been dependent on exposure. Specifically, non-affiliated individuals were at increased odds for use of all drugs in the first step; however, when controlling for level of religious importance and attendance, such risk diminished, and level of attendance (i.e., once per week or more) better explained use. Therefore, Agnostics served as indicators of low attendance, but when examining attendance more directly, with all else equal, individuals with lower attendance, regardless of affiliation, were not protected. Exposure to users better explained recent use of these substances, regardless of level of religiosity. It should be noted that although religious individuals were not strongly protected, they were also not at specific risk when considering exposure.

Frequent attendees appear to be protected when they lack exposure to users, or have less opportunity to use. Research has found that higher levels of religiosity are related to lower

levels of exposure to illicit drug users (Palamar et al. 2011). Likewise, Chen et al. (2004) found that religious individuals were at lower odds of use due to lack of exposure to users; however, once an opportunity or exposure occurred, they were no longer strongly protected. Therefore, it is questionable whether there is a direct effect of religiosity on refusal of drug use. High levels of attendance may simply serve as a "time displacement" to avoid drug involvement (Chen et al. 2004), but it is more likely that attendance more closely affiliates religious individuals who are nonusers and limits exposure to less religious individuals who may also be at a greater likelihood of using illicit drugs. However, while religion is a popular method used to teach individuals morals and self-control, such virtues may not actually be tested or enacted under high exposure to users. A religious individual can report high levels of morality; however, abstinence in lack of exposure has different meaning than refusal upon exposure.

Limitations and Recommendations for Future Studies

This study was limited because the sample was not randomly selected, and due to over-sampling of subgroups, it was not fully representative of the NYC population. This sample was also more educated than the general population. Another limitation of this study was missing data. The most problematic missing data were the 6.2 % of respondents who chose not to answer the religious affiliation item and this did potentially bias results. Since this study was cross-sectional, temporality and causality should be interpreted with caution, particularly regarding the order of occurrence of exposure to users and use. In addition, national longitudinal studies have shown that many individuals change their religious affiliation or report varying levels of religiosity over time (Regnerus and Uecker 2006). Therefore, it is not known whether high levels of religiosity occurred before or after a potential exposure to users of each given drug. Likewise, patterns of drug use change over time (Palamar et al. 2008), so longitudinal assessments of use would be beneficial to determine trajectories of use in relation to religiosity and exposure to users. It is also possible that some individuals became religious after experiencing drug problems. Longitudinal studies and mediation models are needed to confirm direction of potential causality and more closely examine underlying temporal relationships because attendance may in fact be a critical factor that influences exposure to users. Similarly, use or exposure to users may influence religiosity. Future studies can delineate these associations over time and also assess how these concepts predict severity or trajectories of use.

Religious affiliation has been a problematic variable in past research. Specifically, those who identify with a specific affiliation may in fact be slipping away from their religion. It is unknown how much doubt is required for an individual to identify as Agnostic, and some individuals may consider themselves non-religious, but still identify with the teachings or culture of their religious background (e.g., "Atheist Jews"). Some Atheists and Agnostics also consider themselves religious to some extent. Likewise, it is difficult to assess whether an individual is merely a "marginal" Protestant, who is slipping into a non-religious group, or a "token" or "generic" Protestant who does not strongly adhere to religious teachings or only considers affiliation a label or part of his or her identity (Smith and Kim 2005). In order to control for such issues, this study also examined religious importance and attendance simultaneously. This study was also limited in that we could not break down Christianity into Mainline and Evangelical groups. While participants were given the option to fill in their specific denomination (regardless of the affiliation they checked off), 38 % of those who identified as Christian did not provide a response. Thus, since we were

unable to break down Christianity into clean categories, we left it as a single comparison group in the models. We also did not assess other dimensions of religiosity such as non-organizational religious involvement and macro-level religiosity. Future studies would benefit from also assessing participants' level of agreement with whether or not their religion prohibits the use of specific substances. This is important because individuals tend to hold different perceptions regarding the prohibitions of their religion. Religious prohibition of the illicit drugs examined in this study in many instances can be open to historical interpretation as many modern drugs did not exist prior to the creation of their holy texts. Likewise, even if a religion prohibits use of alcohol, it cannot always be assumed that the same prohibitions apply to other psychoactive substances.

This study is also valuable because findings from some national studies are limited. For example, the *Add Health* national adolescent dataset does not assess religious importance or attendance for "Nones" (those with no affiliation including Atheists and Agnostics). Thus, some authors have had to assume that such individuals had the lowest levels of attendance and importance in order to conduct analyses (e.g., Regnerus and Uecker 2006). This is problematic because Nones can in fact consider religion important or attend services. Some Atheists also report engaging in prayer or belief in Heaven and Hell. Many non-religious individuals may still be indirectly affiliated with religious services (e.g., family obligations, weddings, funerals, and baptisms) and may not be conventionally religious, but religious or spiritual in other respects (Franch 2008).

Conclusion

High levels of religious attendance can protect individuals from illicit drug use; however, religiosity is a personal characteristic that is not easily changed. Peers from one's denomination can encourage an individual to attend religious services more often, but it is difficult to alter one's underlying beliefs. Percentages of non-affiliated individuals are on the rise in the United States and now make up about 16 % of the population (PFRPL 2008). Therefore, alternative modes of prevention are needed to discourage such individuals from engaging in risk behavior. Perhaps, individuals who are less religious require stronger messages other than that drug use is "wrong." Such non-religious individuals may lack a social support network of a church to assist them in times of need (Kier and Davenport 2004), and they are also less likely to experience the "time displacement" from users commonly experienced by religious attendees, so attention should also be paid to extra-curricular activities that do not necessarily take place in a church, temple, or mosque. For example, large-scale studies have found that secular and civic participation also protects individuals from drug use (Bartkowski and Xu 2007).

Findings of this study are not intended to pathologize non-religious individuals, who may suffer a double-stigma in response to being non-religious and for being at high risk for drug use. Results should instead encourage academics to explore alternative methods to ensure a healthy lifestyle among individuals who are non-religious or do not participate in religious services. Religiosity, in many respects, can be seen as a proxy for conventionalism (Jackson et al. 2008); therefore, we need to explore novel prevention methods for such "nonconventional" individuals. Similarly, we cannot necessarily affect social determinants of religiosity and drug use. Males and Whites tend to report lower levels of religiosity and are at higher risk for drug use, and little can be done to change this. Therefore, while religiosity is oftentimes a powerful prevention mechanism, we also need to focus on alternative protective factors because it is difficult to alter an individual's identity or beliefs.

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