



Religiosity and the Earliest Stages of Adolescent Drug Involvement in Seven Countries of Latin America

Chuan-Yu Chen¹, Catherine M. Dormitzer¹, J. Bejarano², and James C. Anthony³

¹ Department of Mental Health, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD.

² Instituto sobre Alcoholismo y Farmacodependencia (IAFA), San Jose, Costa Rica.

³ Department of Epidemiology, College of Human Medicine, Michigan State University, East Lansing, MI.

Received for publication October 6, 2003; accepted for publication January 7, 2004.

To investigate the role of religiosity in the earliest stages of drug involvement, the authors studied recent-onset occurrence of first chances to try a drug and first actual drug use, expressed as a function of religious practice behaviors, levels of religious devotion, and religious affiliation. Based upon standardized questionnaire assessments of nationally representative samples of school-attending youths drawn in Panama, the five Spanish heritage countries of Central America, and the Dominican Republic ($n = 12,797$), the 1999–2000 study estimates indicate that higher levels of religious practice are inversely associated with the earliest stages of tobacco and cannabis experiences (i.e., the first chance to try and the first actual use) but not so for alcohol. To illustrate, for each unit increase in levels of religious practice behaviors, there was an associated reduced occurrence of the first chance to try tobacco (odds ratio = 0.76, 95% confidence interval: 0.62, 0.94). Occurrence of first actual use of tobacco and cannabis was not associated with levels of religious practice behaviors among youths exposed to the opportunity to try these drugs. As such, these behaviors apparently have not strengthened resistance. Rather, atarcesis may be at work, functioning to shield youths from drug exposure opportunities.

adolescent; alcohol drinking; cannabis; leisure activities; religion; tobacco

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; KR α , Kuder-Richardson 20 estimate of Cronbach's α ; OR, odds ratio; PACARDO, acronym for the countries comprising the study (Panama, Central America, Dominican Republic).

The main aim of this study is to estimate the degree to which engagement in religious activities might shield or otherwise protect youths from the earliest stages of drug involvement versus an alternative resistance-strengthening mechanism of protection. Background for this research includes more than a century of epidemiologic studies on the topic of health and religion (e.g., denominational affiliation: Catholic vs. Protestant and so on). During the 20th century, the concept of religiosity was broadened to encompass a behavioral facet (e.g., frequency of church attendance) and a psychological facet (e.g., level of personal commitment to the deity), as well as religion-associated diet or health practices such as circumcision (1).

Religiosity in these facets has links to an array of mental health-related conditions and behaviors, including drug involvement (1–8). For example, Miller et al. (3) studied a large epidemiologic sample of adolescents in the United

States and found lower occurrence of drug-related clinical problems among youths with high values on religious devotion. We appreciate religiosity as a multidimensional construct that encompasses, at minimum, both behavioral facets and psychological facets (1, 3, 8). Nonetheless, epidemiologic studies of health and religiosity often have neglected this multidimensional character; religiosity is often assessed by a single interview or questionnaire item (9). Even when religiosity is conceptualized and measured as a multidimensional concept, investigators tend to examine one dimension at a time, neglecting the other dimensions of religiosity (3, 10). Beyond issues of conceptualization and measurement of religiosity, another important issue in this line of research involves possible reciprocities such as might arise when effects of drug use include disengagement from previously valued facets of religiosity. These reciprocities become especially challenging when investigators study reli-

Correspondence to Dr. James C. Anthony, Department of Epidemiology, College of Human Medicine, Michigan State University, West Fee Hall, 6th Floor (B601), East Lansing, MI 48824 (e-mail address: janthony@epi.msu.edu).

giosity and the later stages of drug involvement, such as the risk of developing drug dependence syndromes or drug problems (3).

Mindful of issues such as these, we laid a plan to study religiosity as a multidimensional construct, with an effort to constrain possible reciprocities via a focus on the earliest stages of drug involvement, termed “drug exposure opportunities” (11, 12). Drug exposure opportunities typically occur at or near the time of a young person’s first chance to try a drug. Borrowing the useful concept of “autarcesis” from the early days of infectious disease epidemiology (13), our thesis is that adolescent religious practice behaviors may have *autarceologic* properties, functioning to shield youths from risk of harm, especially when there is a tangible “agent” in the pathogenesis, etiology, and natural history of a health condition. If religious behaviors are associated inversely with the occurrence of youthful drug use, one possibility is that these behaviors strengthen resistance once a chance to try the drug occurred (e.g., resistance against peer pressure to try drugs). A second possibility is that these behaviors have shielded the youths from chances to try drugs. It is in this second sense that these religious behaviors would be serving an autarceologic function that can be distinguished from the separate resistance-strengthening functions often stressed in drug prevention programs.

Analogous to standard epidemiologic case-control study procedures with a focus on the most recent incident cases of disease and nondiseased controls, our study focus is upon “recent-onset” cases of drug involvement (i.e., youths who first had a chance to try drugs within the 0–23 months prior to recruitment) and corresponding controls (i.e., youths who never have had a chance to try these drugs). This approach provides odds ratio estimates of the suspected protective associations and places some constraints upon the possible reciprocal processes through which actual drug use might influence religious practice behaviors or other dimensions of religiosity. The resulting odds ratio estimates are an approximation of estimates that might be achieved in a prospective study on this topic (14).

MATERIALS AND METHODS

Subjects

Our epidemiologic data are from a study conducted during 1999–2000 within Panama, the five Spanish heritage countries of Central America (Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica), and la Republica Dominicana. The study takes its name as an acronym for these countries (PA + CA + RDO) and is referred to as the “PACARDO” project; it has been described in prior detailed reports (15). In brief, this project involved an application of multistage probability sampling methods, which yielded a self-weighting sample of schools, and youths attending these schools, within each country. Within each sampled school, 1–3 classrooms were sampled at random from a roster of all classrooms with pupils who were 16 years of age. All designated sample classrooms participated. In aggregate, there was close to 100 percent school-level participation (96 percent). The research protocol included “passive” parental consent (via letters sent

home) and active youth assent. A total of 12,797 school-attending youth respondents participated in the PACARDO survey project as the lead assessor read aloud each preworded standardized item; more than 98 percent of eligible youths participated (15). The protocol was approved by institutional review boards for human subjects’ protection in each country and at Johns Hopkins University.

The standardized items of the PACARDO questionnaire were subject to a translation, back-translation, and harmonization process that involved all the leaders on the research teams, as well as pilot testing within these seven Latin American countries. The assessment plan involved a visit to each classroom by a pair of trained assessors, who worked to develop trust and rapport, secure youth assent, and administer the anonymous questionnaire during an hour-long session while the teacher was absent from the classroom. The questionnaire included separate modules to assess the adolescent behavioral repertoire and drug experiences.

For this study, we excluded 1) 43 respondents (0.5 percent) whose questionnaires indicated an age less than 12 years or more than 20 years for focus on school-attending youths’ experiences within these countries; 2) 97 respondents who reported use of “cadrina” (a nonexistent drug); and 3) 68 participants whose responses about the behavior repertoire exhibited illogical patterns (e.g., having the same participation frequency on all the items in the behavioral repertoire assessment). The mean age of the resulting 12,589 respondents was 16 years, one half of the respondents were female ($n = 6,491$, 51.6 percent), and about one third of the respondents attended private school (31.7 percent).

Assessment of drug involvement

The primary response variables of interest have been assessed by standardized anonymous questionnaire items on adolescent drug involvement in relation to alcohol, tobacco, and illegal drugs (e.g., cannabis). For each drug, “age of the first chance to try” and “age of first use” were assessed separately by questions in the following form (English translation): “Regarding the drug cannabis, how old were you when you first had the chance to try cannabis?” and “How old were you when you first used cannabis?” The time elapsed since onset of drug exposure opportunity (in years) was estimated by taking differences: age at assessment minus age at first chance to try a drug. Using these standardized items and difference scores, we identified recent-onset youths (difference = 0 or 1), youths with no such drug experiences, and those whose experiences were in the more distant past (difference > 1). Youths with onset in the more distant past have been excluded from the analyses to constrain the potential reciprocities and other influences discussed in our introduction. In the present study, the focus is upon the three most commonly consumed drugs in this study population (alcohol, tobacco, and cannabis). For these drugs, most youths with past exposure opportunity (difference > 1) already started use of one or more drugs (e.g., 83 percent of respondents with past alcohol opportunity had started using alcohol), and in this circumstance, the level of religiosity might depend on the drug taking rather than vice versa. Hence, in order to approximate estimates that might be found

in a future prospective study, we focused our study solely on the recent-onset youths, which constrains this possibility.

Measures of religiosity

Individual-level religiosity has been assessed by three domains of standardized survey items: religious practice behaviors, denomination, and devotion. To assess religious behavioral repertoire as part of the more general adolescent behavioral repertoire, we used the 25-item Behavioral Repertoire Self-rating Scale of Johanson et al. (16). This standardized measurement evaluates how the youths allocated their time across a variety of activities. On this scale, the four items on religious behavioral repertoire ask about the time allocated to “praying/reading the Bible,” “going to church,” “going to a religious revival,” and “going to a religious retreat.” Each item had eight response categories, ranging from “not even once this year” to “more than once each day.” Prior latent variable analyses for discrete categorical response variables disclosed that a religious activities dimension is one of five main dimensions of the adolescent behavioral repertoire as measured in this study (17). This latent structure analysis also yielded a standardized factor score for the religious practice behavior dimension, with an observed range from -0.86 (lowest) to 1.43 (highest) and a mean of 0.02 .

With respect to the denominational facet of religiosity, three main subgroups were formed: “Catholic (reference group),” “Protestant or other religions,” and “none,” on the basis of each youth’s response to a single question: “What is your religion?” For assessment of the psychological facet of religiosity, the youths have been sorted into two groups according to their responses to two standardized binary items, one on the importance of going to church on Sundays and one on the importance of participating in church activities. One subgroup has a higher level of religious devotion (two positive responses reported), and the other subgroup has a lower level of religious devotion (only zero or one positive response to these items).

Potentially confounding covariates under study

The school type (public/private) is from administrative records, and all other potentially confounding variables were assessed by self-report. We sorted these variables into three main groups: Group I, the religious denomination and religious devotion variables already described in the section on religiosity; Group II, exogenous sociodemographic covariates, not likely to be influenced by drug use (age, sex, parental education); and Group III, covariates that might be endogenous with respect to drug use, including levels of conduct problems, deviant peer affiliation, family attention, family drug use, school adaptation, and four main dimensions of adolescent behavioral repertoire (other than the religious practice dimension). The possibly endogenous constructs include the following: 1) conduct problems, assessed by 19 binary items (e.g., damaging other people’s belongings), with the Kuder-Richardson 20 estimate of Cronbach’s α (KR α) = 0.83 ; 2) deviant peer affiliation by a 13-item scale (KR α = 0.84); 3) family attention and moni-

toring using nine binary items such as, “Are your parents or guardians often aware of where you are and what you are doing?” (KR α = 0.70); 4) family drug use by four binary items on illegal and legal drugs such as, “During the last 6 months, has any family member (mother, father, or sibling) used tobacco (yes or no)?”; 5) school maladjustment by an 11-item scale with items such as, “Do you cut school more than two days a month (true or false)?” (KR α = 0.73); and 6) social withdrawal by eight items such as, “Have you been rejected by friends and other young people (yes or no)?” (KR α = 0.62). The four other main dimensions of the adolescent behavioral repertoire are a socializing activities dimension (e.g., going out on a date), a sports-related activities dimension, a home-based activities dimension (e.g., spending time with family), and a gender-associated socialization activities dimension (e.g., taking care of children).

Statistical analyses

Descriptive analyses first were used to characterize youths with and without recent-onset drug experiences in relation to the sociodemographic variables under study. In data analyses after the first data exploration steps and latent variable analyses, we regressed the occurrence of recent-onset drug experiences on three measures of religiosity (i.e., religious practice behavior, religious devotion, and religious affiliation), with the above-listed covariates held constant. The ordinary multiple logistic regression model fails to address the interdependent character of the PACARDO samples; for example, the respondents’ drug experiences within the same school were more similar than those of students randomly sampled from different schools. For this reason, we turned to a series of generalized linear models with the logistic link and a generalized estimating equations approach, building a marginal model to account for the interdependence of responses within the same school (18, 19). Here, an exchangeable correlation structure has been assumed as a starting specification for the model, but a robust estimation approach guards against misspecification errors in this respect. The strength of association between religiosity and recent-onset drug experience is estimated by an odds ratio; 95 percent confidence intervals and p values convey the precision of these estimates and strength of the evidence. The generalized linear model (logit link) was implemented via STATA version 7.0 software (20).

RESULTS

Within the sample of 12,589 youths, a total of 1,656 school-attending youths had just had the first chance to try alcohol and 1,956 had recent onset of alcohol use. The corresponding numbers are 973 and 1,051 for tobacco and 495 and 307 for cannabis. The ratios of these drug-specific numbers reflect the lag time between the first chance to try a drug and the first actual use of the drug. A sizeable number of youths had a past history of the chance to try the drug but did not start actual use of the drug until recently. As depicted in table 1, the mean age of these drug-experienced youths (and the drug-naive youths) is about 15–16 years. Recent-onset drug use was more common among males, youths with

TABLE 1. Selected characteristics of school-attending youths (*n* = 12,589), by recent-onset drug opportunity and initiation, PACARDO* project, 1999–2000

	Alcohol				Tobacco				Cannabis			
	Never		Recent onset		Never		Recent onset		Never		Recent onset	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
<i>Recent-onset drug exposure opportunity</i>												
Total youths	5,261	100.0	1,656	100.0	7,543	100.0	973	100.0	10,125	100.0	495	100.0
Age (years) (mean (SD*))	15.8	1.2	15.8	1.4	15.8	1.2	15.9	1.4	16.1	1.1	16.0	1.3
12–14	829	17.8	180	10.9	1,022	13.6	119	12.2	1,207	11.9	21	4.2
15–16	2,834	53.9	1,053	63.6	4,165	55.2	611	62.8	5,695	56.3	327	66.1
17–20	1,507	28.6	423	25.5	2,246	29.8	243	25.0	3,088	30.5	147	29.7
Sex												
Female	2,928	55.7	900	54.4	4,324	57.3	471	48.4	5,436	53.7	161	32.5
Male	774	42.8	746	45.0	3,114	41.3	496	51.0	4,554	45.0	333	67.3
Missing	79	1.5	11	0.6	105	1.4	6	0.6	135	1.3	1	0.2
Years of father's education												
0–5	1,210	23.0	236	14.3	1,514	20.1	123	12.6	1,862	18.4	52	10.5
6–8	1,456	27.7	413	24.9	2,019	26.8	216	22.2	2,610	25.8	100	20.2
9–11	833	15.8	339	20.5	1,276	16.9	202	20.8	1,838	18.2	153	30.9
12 or more	1,192	22.7	485	29.3	1,921	25.5	337	34.6	2,750	27.2	138	27.9
Missing	570	10.8	183	11.0	813	10.7	95	9.8	1,065	10.4	52	10.5
School of attendance												
Public school	3,791	72.1	1,125	67.9	5,368	71.2	588	60.4	6,870	67.9	274	55.4
Private school	1,447	27.5	525	31.7	2,141	28.4	381	39.2	3,203	31.6	217	43.8
Missing	23	0.4	6	0.4	34	0.4	4	0.4	52	0.5	4	0.8
<i>Recent-onset drug initiation</i>												
Total youths	5,511	100.0	1,956	100.0	8,206	100.0	1,051	100.0	10,655	100.0	307	100.0
Age (years) (mean (SD))	15.8	1.4	15.9	1.2	15.9	1.4	15.9	1.2	16.0	1.3	16.3	1.1
12–14	846	15.4	194	9.9	1,088	13.3	100	9.5	1,230	11.5	7	2.3
15–16	3,013	54.7	1,226	62.7	4,564	55.6	663	63.1	6,018	56.5	188	61.2
17–20	1,565	28.4	536	27.4	2,443	29.8	288	27.4	3,263	30.6	112	36.5
Sex												
Female	3,041	55.2	1,055	53.9	4,669	56.9	511	48.6	5,644	53.0	74	24.1
Male	2,392	43.4	888	45.4	3,429	41.8	531	50.5	4,875	45.8	231	75.0
Missing	78	1.4	13	0.7	108	1.3	9	0.9	136	1.2	2	0.7
Years of father's education												
0–5	1,266	23.0	274	14.0	1,603	19.5	150	14.3	1,923	18.1	34	11.1
6–8	1,531	27.8	466	23.8	2,189	26.7	239	22.7	2,713	25.5	64	20.9
9–11	874	15.9	419	21.4	1,414	17.2	220	20.9	1,988	18.7	85	27.7
12 or more	1,244	22.6	598	30.6	2,138	26.1	344	32.7	2,916	27.4	86	28.0
Missing	596	10.7	199	10.2	862	10.5	98	9.4	1,115	10.3	38	12.3
School of attendance												
Public school	3,994	72.5	1,273	65.1	5,817	70.9	640	60.9	7,202	67.6	180	58.6
Private school	1,495	27.1	674	34.5	2,254	28.7	404	38.4	3,399	31.9	125	40.7
Missing	22	0.4	9	0.4	35	0.4	7	7	54	0.5	2	0.7

* PACARDO, project acronym for the countries comprising the study (Panama, Central America, Dominican Republic); SD, standard deviation.

higher levels of paternal education, and those attending private school.

Table 2 depicts the cross-tabulation for each dimension of religiosity in relation to the occurrence of drug-specific experiences, as well as crude association estimates obtained from the regression analyses. In general, the occurrence of

recent-onset alcohol experiences was found to vary inversely with the levels of religious behavioral repertoire. For example, the odds of recent-onset chance to try alcohol were about 70 percent lower for each standard deviation increase in levels of religious practice activities (estimated odds ratio (OR) = 0.71, 95 percent confidence interval (CI): 0.64, 0.79;

TABLE 2. Estimated crude association between multidimensional religiosity and the occurrence of alcohol, tobacco, and cannabis opportunity and initiation among 12,589 participants in the PACARDO* project, 1999–2000

Covariates†	Drug opportunity							Initiation of drug use						
	Never		Recent onset		Crude			Never		Recent onset		Crude		
	No.	%	No.	%	OR*	95% CI*,‡	<i>p</i> value	No.	%	No.	%	OR	95% CI‡	<i>p</i> value
Alcohol estimates														
Religious practice (mean (SD*))	0.10	0.55	-0.02	0.52	0.71	0.64, 0.79	<0.001	0.10	0.55	-0.02	0.52	0.71	0.64, 0.78	<0.001
Religious devotion														
Lower	2,374	45.1	979	59.1	1.00			2,490	45.2	1,132	57.9	1.00		
Higher	2,810	53.4	651	39.3	0.62	0.56, 0.69	<0.001	2,948	53.5	791	40.4	0.64	0.58, 0.71	<0.001
Religious affiliation														
Catholic	2,968	56.4	1,107	66.9	1.00			3,096	56.2	1,325	67.7	1.00		
Protestant/others	1,824	34.7	370	22.3	0.62	0.55, 0.70	<0.001	1,929	35.0	421	21.5	0.58	0.52, 0.65	<0.001
None	350	6.7	147	8.9	1.21	1.01, 1.46	0.04	365	6.6	179	9.2	1.17	0.98, 1.39	0.08
Tobacco estimates														
Religious practice (mean (SD))	0.08	0.54	-0.08	0.52	0.61	0.54, 0.69	<0.001	0.08	0.53	-0.08	0.51	0.55	0.48, 0.62	<0.001
Religious devotion														
Lower	3,569	47.3	595	61.2	1.00			3,892	47.4	658	62.6	1.00		
Higher	3,874	51.4	369	37.9	0.63	0.55, 0.71	<0.001	4,212	51.3	378	36.0	0.59	0.51, 0.67	<0.001
Religious affiliation														
Catholic	4,569	60.6	663	68.0	1.00			4,992	60.8	713	67.8	1.00		
Protestant/others	2,344	31.1	187	19.2	0.62	0.54, 0.72	<0.001	2,531	30.8	190	18.1	0.56	0.49, 0.64	<0.001
None	485	6.4	103	10.6	1.46	1.18, 1.81	0.001	533	6.5	125	11.9	1.67	1.38, 2.01	<0.001
Cannabis estimates														
Religious practice (mean (SD))	0.03	0.53	-0.20	0.49	0.48	0.29, 0.58	<0.001	0.02	0.53	-0.29	0.49	0.31	0.23, 0.43	<0.001
Religious devotion														
Lower	5,187	51.2	346	69.9	1.00			5,520	51.8	227	73.9	1.00		
Higher	4,808	47.5	143	28.9	0.49	0.41, 0.59	<0.001	5,001	46.9	75	24.4	0.40	0.31, 0.51	<0.001
Religious affiliation														
Catholic	6,248	61.7	301	60.8	1.00			6,563	61.6	176	57.3	1.00		
Protestant/others	2,957	29.2	107	21.6	0.81	0.65, 1.01	0.06	3,100	29.1	63	20.5	0.84	0.63, 1.12	0.23
None	737	7.3	77	15.6	2.16	1.67, 2.80	<0.001	190	7.5	60	20.2	2.90	2.17, 3.89	<0.001

* PACARDO, project acronym for the countries comprising the study (Panama, Central America, Dominican Republic); OR, odds ratio; CI, confidence interval; SD, standard deviation.

† Some columns do not add up to 100% because of missing values.

‡ Estimated variance of association takes into account clustering of respondents within the sample.

$p < 0.001$). The odds ratio estimate for the religious practice dimension and the occurrence of actual alcohol use has almost the same strength (OR = 0.71, 95 percent CI: 0.64, 0.78; $p < 0.001$). In addition, the odds of recent-onset alcohol use were lower for youths with a higher level of religious devotion as compared with youths with a lower level of devotion (OR = 0.64, 95 percent CI: 0.58, 0.71; $p < 0.001$). Being a Protestant or member of some other (non-Catholic) religion showed an inverse association as well, as gauged against the odds of alcohol involvement for the Catholic majority reference group.

With respect to recent-onset tobacco involvement, there were inverse associations in relation to the levels of religious practice behaviors (opportunity: OR = 0.61, 95 percent CI: 0.54, 0.69; $p < 0.001$; initiation: OR = 0.55, 95 percent CI: 0.48, 0.62; $p < 0.001$), levels of religious devotion (opportunity: OR = 0.63, 95 percent CI: 0.55, 0.71; $p < 0.001$; initiation: OR = 0.59, 95 percent CI: 0.51, 0.67; $p < 0.001$), and

religious affiliation with Protestant or other religions versus Catholic affiliates (opportunity: OR = 0.62, 95 percent CI: 0.54, 0.72; $p < 0.001$; initiation: OR = 0.56, 95 percent CI: 0.49, 0.64; $p < 0.001$). However, youths with no religious affiliation had a modestly higher odds of recent-onset first chance to try tobacco (OR = 1.46, 95 percent CI: 1.18, 1.81; $p = 0.001$), as well as recent-onset first use of tobacco (OR = 1.67, 95 percent CI: 1.38, 2.01; $p < 0.001$).

Higher levels of religiosity had inverse associations with the odds of recent-onset cannabis involvement in the domains of behavior and denomination. For example, youths with higher levels of religious practice behavior tend to have a lower odds of recent-onset cannabis experiences (opportunity: OR = 0.48, 95 percent CI: 0.29, 0.58; $p < 0.001$; initiation: OR = 0.31, 95 percent CI: 0.23, 0.43; $p < 0.001$).

As compared with the Catholic youths, those affiliated with other religions had a lower odds to experience the two earliest stages of alcohol and tobacco involvement. Never-

TABLE 3. Estimated association between multidimensional religiosity and the occurrence of alcohol, tobacco, and cannabis opportunity, initiation, and initiation given opportunity, with statistical adjustment for covariates, among 12,589 participants in the PACARDO* project, 1999–2000

Covariates	Opportunity			Initiation of drug use			Initiation given opportunity		
	aOR*	95% CI†,‡	p value	aOR	95% CI†,‡	p value	aOR	95% CI†,‡	p value
Alcohol estimates									
Religious practice behaviors	0.90	0.75, 1.06	0.20	0.97	0.82, 1.14	0.69	1.09	0.69, 1.72	0.70
Religious devotion	0.77	0.64, 0.91	0.003	0.79	0.67, 0.93	0.006	0.78	0.47, 1.29	0.33
Religious affiliation									
Protestant/others vs. Catholic	0.67	0.55, 0.80	<0.001	0.62	0.52, 0.73	<0.001	0.53	0.33, 0.86	0.01
None vs. Catholic	0.86	0.63, 1.18	0.36	0.82	0.63, 1.02	0.16	0.61	0.27, 1.39	0.24
Tobacco estimates									
Religious practice behaviors	0.78	0.63, 0.96	0.02	0.77	0.62, 0.96	0.02	0.98	0.61, 1.58	0.94
Religious devotion	1.02	0.82, 1.27	0.88	0.91	0.73, 1.14	0.42	0.80	0.47, 1.38	0.42
Religious affiliation									
Protestant/others vs. Catholic	0.74	0.59, 0.92	0.01	0.72	0.58, 0.90	0.005	0.80	0.45, 1.38	0.42
None vs. Catholic	1.05	0.77, 1.43	0.76	1.10	0.82, 1.48	0.52	1.01	0.43, 2.37	0.99
Cannabis estimates									
Religious practice behaviors	0.73	0.56, 0.96	0.02	0.58	0.39, 0.85	0.005	0.62	0.31, 1.26	0.18
Religious devotion	0.86	0.64, 1.17	0.34	0.97	0.67, 1.39	0.86	1.00	0.51, 1.96	0.99
Religious affiliation									
Protestant/others vs. Catholic	1.10	0.79, 1.51	0.58	1.29	0.86, 1.94	0.22	1.29	0.66, 2.50	0.46
None vs. Catholic	1.33	0.88, 2.01	0.18	1.71	1.09, 2.67	0.02	1.78	0.83, 3.83	0.14

* PACARDO, project acronym for the countries comprising the study (Panama, Central America, Dominican Republic); aOR, adjusted odds ratio; CI, confidence interval.

† Estimated variance of association takes into account clustering of respondents within the sample.

‡ Adjusted for age, sex, paternal education, private school attendance, family drug use, family attention, social withdrawal, conduct problems, deviant peer affiliation, the other dimensions of religiosity, and the other four factor scores of adolescent behavioral repertoire.

theless, youths without any religious affiliation were about 2–3 times more likely to have the first chance to try cannabis as well as start cannabis use, as compared with Catholic youths (opportunity: OR = 2.16, 95 percent CI: 1.67, 2.80; $p < 0.001$; initiation: OR = 2.90, 95 percent CI: 2.17, 3.89; $p < 0.001$).

Observed associations between the dimensions of religiosity and the occurrence of recent-onset drug experiences were attenuated somewhat with statistical adjustment for age, sex, paternal education, private school attendance, family drug use, family attention, social withdrawal, conduct problems, deviant peer affiliation, and the other four facets of adolescent behavioral repertoire (table 3). For alcohol, tobacco, and cannabis, the covariate-adjusted inverse association between higher levels of religious behavior and the earliest stages of drug involvement was most pronounced for cannabis (opportunity: adjusted odds ratio (aOR) = 0.73, 95 percent CI: 0.56, 0.96; $p = 0.02$; initiation: aOR = 0.58, 95 percent CI: 0.39, 0.85; $p = 0.005$). In addition, youths with higher levels of religious devotion were less likely to have had recent-onset alcohol experiences (opportunity: aOR = 0.77, 95 percent CI: 0.64, 0.91; $p = 0.003$; initiation: aOR = 0.79, 95 percent CI: 0.67, 0.93; $p = 0.006$), but with covariate adjustment there was no appreciable variation in the relation to tobacco and cannabis. Patterns of association with reli-

gious denomination remain as they were reported based on models without covariate adjustment.

To probe into possible autarceologic mechanisms versus resistance-strengthening mechanisms underlying the observed inverse associations, we respecified the analyses of recent-onset drug use, conditioning on the occurrence of a recent chance to try the drug. The resulting conditional probability reflects a transition from drug exposure opportunity to actual drug use. As displayed in the final column of table 3, in this analysis we see an essentially null association linking levels of religious behavior practices to the odds of recent-onset alcohol use among youth with a recent-onset chance to try alcohol (aOR = 0.78, 95 percent CI: 0.47, 1.29; $p = 0.33$). The associations also are null for tobacco (aOR = 0.98, 95 percent CI: 0.61, 1.58; $p = 0.94$) and for cannabis (aOR = 0.62, 95 percent CI: 0.31, 1.26; $p = 0.18$). Affiliation as a Protestant or as a member of the other (non-Catholic) religions was associated with a lower odds of a transition from first alcohol exposure opportunity to actual use of alcohol (aOR = 0.53, 95 percent CI: 0.33, 0.86; $p = 0.01$).

Whereas our regression models held constant nonconformity and rule-breaking behaviors by a 19-item scale devised to measure conduct problems, we also examined whether the observed associations might be different for youths who experienced their first drug exposure opportunities in childhood and early adolescence, by repeating the analysis for the

subsample of adolescent respondents aged 15 years or less at the time of assessment. Estimates based on this subsample were consistent with estimates for the sample as a whole: Higher levels of religious practice behaviors are associated with a lower odds of recent-onset drug experiences, but not with reduced conditional probability of drug use, once drug exposure opportunity has occurred. Additional subsidiary analyses were conducted with a focus on the youths who had experienced the most recently incident drug experiences (i.e., age at assessment equal to the age at first drug exposure opportunity). Whereas the resulting estimates are not shown in a table, these analyses disclosed a pattern of associations linking religiosity and drug involvement not appreciably different from the patterns summarized above.

DISCUSSION

The main findings from this study of religiosity and youthful drug involvement may be summarized as follows: 1) higher levels of religious practice behaviors are inversely associated with the earliest stages of tobacco and cannabis experiences (i.e., the first chance to try and the first actual use); 2) youths with higher levels of religious devotion are less likely to have exposure opportunity to alcohol, as well as the first actual use of alcohol; this is not the case for tobacco or for cannabis; 3) as compared with Catholic affiliates, being a Protestant or a member of some other religion is inversely associated with recent-onset experiences of alcohol and tobacco; 4) for youths without religious affiliation, there was an excess occurrence of cannabis use; and 5) religious practice behaviors and levels of religious devotion are not associated with a rapid transition from the chance to try alcohol or tobacco to the first use of these drugs. Rather, it appears that these facets of religiosity are inversely associated with youthful tobacco and cannabis involvement by virtue of reduced occurrence of the first chance to try these drugs. This finding is consistent with the idea that religious practice behaviors may have protective effects that shield youths from contact with the chance to try tobacco or cannabis (i.e., consistent with “autarcesis” mechanisms), but these behaviors do not necessarily influence the youth’s decision to consume the drugs once the opportunity to do so has occurred (i.e., inconsistent with the separate “resistance-strengthening” mechanisms).

Some potential limitations of this study should be considered before detailed discussion. First, a major issue involves specification of the survey population in relation to school-attending youths. School attendance is determined by several factors, including teenager attributes, household characteristics, and environmental contexts, some of which also have been found as correlates for religious engagement as well as occurrence of drug-related experiences (1, 5, 21–24). As a result, there are limits when generalizing these findings to nonschool samples, such as dropouts, or nonattending youths. In addition, because of cultural, geographic, societal, and racial/ethnic compositional differences, we cannot assertively generalize these findings outside the region of the seven PACARDO countries. Replication elsewhere is needed. We also note that the within-country sample sizes were too small for replication of all these analyses at the

individual country level; results on the epidemiology of youthful drug involvement for the individual countries have been presented elsewhere, although not with a focus on religiosity issues (15).

Second, an important methodological issue in the present study is that all the information is assessed by self-report. Some studies have shown that self-report of alcohol and other drug use from adolescent samples is basically reliable and stable (25, 26), but validity is a concern (27, 28). A number of bioassays have been developed to measure drug taking within days or months of actual use (29), but these tests do not entrap the time interval of interest here (0–23 months prior to survey), nor do they reflect exposure to first chances to try each drug, which was our primary topic of inquiry (i.e., drug opportunity). In addition, these biologic methods may not yet be feasible in large-sample cross-national survey research.

Third, we held constant most of the prominent peer and parental influences on adolescent drug involvement by regression modeling. In future research, it should be possible to improve the measurements and to hold constant even more suspected confounding variables (e.g., youth conformity with family rules about behaviors). Finally, perhaps the most serious methodological issues in this study can be traced to its cross-sectional and nonexperimental design, which creates opportunities for errors in the specification of temporal sequences and which opens up opportunities for reciprocal influences. Because of potential reciprocities in these associations, it will be useful to examine these relations in the context of longitudinal research with multiple points of measurement for drug experiences and multidimensional religiosity. Nonetheless, estimates from cross-sectional and retrospective research are invaluable as a step forward toward prospective and longitudinal studies.

Notwithstanding limitations such as these, our study in seven Latin American countries suggests that links between religiosity and drug-related experiences depend upon the facet of religiosity, the drugs under study, and stage of drug involvement, a pattern of findings consistent with prior work in the United States (3, 30). For example, we found that “psychological religiosity” was inversely associated with the occurrence of alcohol initiation and the odds of alcohol opportunity, the earliest stage of drug experiences. However, for the behavioral facet of religiosity (religious practice), the observed links are mainly with tobacco and cannabis experiences. The association between religious practice and alcohol experiences is quite modest in these study data, perhaps because alcoholic beverage consumption is often integrated within family and community life in Latin America (31).

On this basis, one may surmise that more frequent practice of religious behaviors can 1) help shield youths from drug-using youths and 2) bring youths into spheres of adult (e.g., pastoral) influences that may serve their own protective functions (32). Here, also, it is pertinent that the observed association between religion/religiosity and drug experiences might be due to selective processes associated with personal characteristics (e.g., personality traits) (23, 33). Twin studies have suggested that religiosity in the form of religious upbringing and religious practice might shape the

display of personality traits (e.g., sensation seeking) and also might modify liabilities to initiate drug use (34, 35).

In sum, there are numerous theories and mechanisms posited to explain the presumed beneficial effects of religious practice or beliefs on mental health and behavior (36, 37), but this study's evidence is more consistent with our thesis about the "shielding" mechanisms of behavioral autarcesis and less consistent with "resistance-strengthening" mechanisms. If the effects of religiosity are operating via "resistance" mechanisms at the point of the chance to try drugs, then we should be seeing an inverse association that links higher levels of religiosity with lower conditional probability of drug use, once the chance to try drugs has occurred. Instead, the pattern of evidence is one of null associations with this conditional probability. Inverse associations, when observed, pertain to the occurrence of the first chance to try the drug (i.e., consistent with "autarceologic" shielding).

It is possible that the autarceologic functions of religious practice behaviors with respect to the first chance to try drugs may be due to time displacement. For example, adolescents who attend church-related services on a regular basis may have fewer opportunities to get in touch with peers outside this particular social network, because of preoccupation with religion-related activities. In this situation, the salutary effects of religious behaviors may actually be partially due to the mediational effects of attenuated affiliation with peers who have started to use drugs and greater participation in pro-social behavior. Multiwave longitudinal data are needed to assess these conceptualizations about processes and sequences that link the multiple dimensions of religiosity with these earliest stages of drug involvement in adolescence.

ACKNOWLEDGMENTS

This work was supported by the PACARDO research team, the Organization of American States, the Inter-American Drug Abuse Control Commission, a National Institute of Drug Abuse research grant award (RO1DA10502) and training grant awards T32 DA07292 and F31 DA14757, and a National Institute of Drug Abuse KO5 senior scientist award to the senior author (J. C. A.).

The authors thank Dr. Carla L. Storr for valuable comments on a revision of this paper.

REFERENCES

1. Koenig HG, McCullough ME, Larson DB. Handbook of religion and health. New York, NY: Oxford University Press, 2001.
2. Kandel DB, Adler I. Socialization into cannabis use among French adolescents: a cross-cultural comparison with the United States. *J Health Soc Behav* 1982;23:295–309.
3. Miller L, Davies M, Greenwald S. Religiosity and substance use and abuse among adolescents in the National Comorbidity Survey. *J Am Acad Child Adolesc Psychiatry* 2000;39:1190–7.
4. Brown TL, Parks GS, Zimmerman RS, et al. The role of religion in predicting adolescent alcohol use and problem drinking. *J Stud Alcohol* 2001;62:696–705.
5. Ellison CG, Boardman JD, Williams DR, et al. Religious involvement, stress, and mental health: findings from the 1995 Detroit Area Study. *Soc Forces* 2001;80:215–49.
6. Hilton SC, Fellingham GW, Lyon JL. Suicide rates and religious commitment in young adult males in Utah. *Am J Epidemiol* 2002;155:413–19.
7. Blum RW, Halcon L, Beuhring T, et al. Adolescent health in the Caribbean: risk and protective factors. *Am J Public Health* 2003;93:456–60.
8. Kendler KS, Liu XQ, Gardner CO, et al. Dimensions of religiosity and their relationship to lifetime psychiatric and substance use disorders. *Am J Psychiatry* 2003;160:496–503.
9. Whooley MA, Boyd AL, Gardin JM, et al. Religious involvement and cigarette smoking in youth adults. *Arch Intern Med* 2002;162:1604–10.
10. Miller L, Gur M. Religiosity, depression, and physical maturation in adolescent girls. *J Am Acad Child Adolesc Psychiatry* 2002;41:206–14.
11. Crum RM, Lillie-Blanton M, Anthony JC. Neighborhood environment and opportunity to use cocaine and other drugs in late childhood and early adolescence. *Drug Alcohol Depend* 1996;43:155–61.
12. Wagner FA, Anthony JC. Into the world of illegal drug use: exposure opportunity and other mechanisms linking the use of alcohol, tobacco, cannabis, and cocaine. *Am J Epidemiol* 2002;155:918–25.
13. Shaw EB. Autarcesis against measles in early infancy. *J Infect Dis* 1979;140:1015–16.
14. Becker MS. Cannabis use and social control. *Soc Probl* 1955;4:35–44.
15. Dormitzer CM, Gonzales G, Bejarano J, et al. Equipos PACARDO: youthful drug involvement in Panama, Central America, the Dominican Republic. *Rev Panam Salud Publica* (in press).
16. Johanson CE, Duffy FF, Anthony JC. Associations between drug use and behavioral repertoire in urban youths. *Addiction* 1996;91:523–34.
17. Muthén BO, Muthén LK. The Mplus user's guide. Los Angeles, CA: Muthen & Muthen, 1999–2000.
18. Qaqish BF, Liang KY. Marginal models for correlated binary responses with multiple classes and multiple levels of nesting. *Biometrics* 1992;48:939–50.
19. Liang KY, Zeger SL. Longitudinal data analysis using generalized linear models. *Biometrika* 1986;73:13–22.
20. Stata Corp. STATA statistical software: release 7.0. College Station, TX: Stata Corporation, 2001.
21. Anthony JC, Warner LA, Kessler RC. Comparative epidemiology of dependence on tobacco, alcohol, controlled substances, and inhalants: basic findings from the National Comorbidity Survey. *Exp Clin Psychopharmacol* 1994;2:244–68.
22. Funkhouser E. Cyclical economic conditions and school attendance in Costa Rica. *Econ Edu Rev* 1999;14:31–50.
23. Kendler KS, Gardner CO, Prescott CA. Clarifying the relationship between religiosity and psychiatric illness: the impact of covariates and the specificity of buffering effects. *Twin Res* 1999;2:137–44.
24. Anthony JC, Helzer JE. Epidemiology of drug dependence. In: Tsuang MT, Tohen M, eds. Textbook in psychiatric epidemiology. New York, NY: Wiley-Liss, Inc, 2002:479–561.
25. Shillington AM, Clapp JD. Self-report stability of adolescent substance use: are there differences for gender, ethnicity and age? *Drug Alcohol Depend* 2000;60:19–27.
26. Shillington AM, Cottler LB, Mager DE, et al. Self-report stability for substance use over 10 years: data from the St. Louis Epidemiologic Catchment Study. *Drug Alcohol Depend* 1995;40:

- 103–9.
27. Harrison L. The validity of self-reported drug use in survey research: an overview and critique of research methods. *NIDA Res Monogr* 1997;167:227–446.
 28. Anthony JC, Neumark TD, Eten ML. Do I do what I say? A perspective on self-report methods in drug dependence epidemiology. In: Stone AA, Turkon JS, Bachrach CA, et al, eds. *The science of self-report implications for research and practice*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc, 2000: 175–98.
 29. Colon HM, Robles RR, Sahai H. The validity of drug use responses in a household survey in Puerto Rico: comparison of survey responses of cocaine and heroin use with hair tests. *Int J Epidemiol* 2001;30:1042–9.
 30. Kendler KS, Gardner CO, Prescott CA. Religion, psychopathology, and substance use and abuse; a multimeasure, genetic-epidemiologic study. *Am J Psychiatry* 1997;154:322–9.
 31. Demers A, Room R, Bourgault C. Surveys of drinking patterns and problems in developing countries. Geneva, Switzerland: World Health Organization, 2001.
 32. Osgood DW, Wilson JK, O'Malley PM, et al. Routine activities and individual deviant behavior. *Am Sociol Rev* 1996;61:635–55.
 33. Francis LJ. The psychology of gender differences in religion: a review of empirical research. *Religion* 1997;27:81–96.
 34. Boomsma DI, de Geus EJ, van Baal GC, et al. A religious upbringing reduces the influence of genetic factors on disinhibition: evidence for interaction between genotype and environment on personality. *Twin Res* 1999;2:115–25.
 35. Koopmans JR, Slutske WS, van Baal GC, et al. The influence of religion on alcohol use initiation: evidence for genotype × environment interaction. *Behav Genet* 1999;29:445–53.
 36. House JS, Landis KR, Umberson D. Social relationships and health. *Science* 1988;241:540–5.
 37. Chatters LM. Religion and health: public health research and practice. *Annu Rev Public Health* 2002;21:335–67.