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Associations between Sexual Abstinence Ideals, Religiosity, and Alcohol Abstinence: A Longitudinal Study of Finnish Twins

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Abstract

We analyzed prevalence and stability of attitudes endorsing sexual abstinence ideals from late adolescence into early adulthood and studied associations of these attitudes with religiosity and alcohol abstinence in a sexually liberal Nordic society. Our population-based sample of Finnish twins permitted comparisons of co-twins concordant for religiosity but discordant for drinking to evaluate the association of sexual abstinence ideals with alcohol abstinence, controlling for household environment. From age 17 to 24, endorsement of sexual abstinence as a romantic ideal declined from 25% to 15%. Religiosity and alcohol abstinence correlated, both separately and together, with endorsing sexual abstinence. Abstinence ideals were associated with literal belief in fundamental tenets of the Bible. The association of sexual abstinence ideals with alcohol abstinence was confirmed in within-family comparisons of co-twins discordant for drinking but concordant for religiosity. Alcohol-abstinent twins were significantly more likely than their non-alcohol-abstinent twin siblings to endorse sexual abstinence ideals; that result suggests the association of sexual abstinence ideals with abstaining from alcohol is not explained by unmeasured confounds in familial background and structure. Our longitudinal results and analyses of discordant twins suggest that attitudes toward sexual abstinence ideals are embedded within other conservative attitudes and behaviors.

Finland is, in many ways, a liberal country with regard to sexual attitudes (Kontula, 2009; Widmer, Treas, & Newcomb, 1998). Finns value sexual relationships and regard them as important for health and happiness, and sexual relations are widely accepted within steady dating or partnered (but nonmarital) relationships. Most young adult Finns now cohabit and are sexually active years before marriage. By the 1990s, half of Finnish men and two-thirds of Finnish women, aged 18 to 34, experienced initial sexual intercourse with a steady partner. One-third of the men and one-fifth of the women had a short-term partner in their first sexual intercourse, and very few Finns (about 3%) experienced initial coitus with their

fiancé or married spouse (Haavio-Mannila & Kontula, 2003). As cohabitation has become more popular at a young age, marriage has become less common in later life. For example, in 1980, only 14% of men aged 40 to 49 were not married; in 2008, that figure had risen to 29%. Among women in the same age group and during the same time period, the proportion that was unmarried similarly doubled from 10% to 21% (Nikander, 2010). It is common, even among those who profess religious beliefs, to regard becoming engaged as unofficial societal permission to be sexually active. But the important value is to be sexually active only with one to whom you are committed. Recently, Finns have shown a dramatic shift, in both attitude and behavior, to more faithful sexual relationships—a shift described as “the renaissance of romanticism” (Kontula, 2009; Kontula & Haavio-Mannila, 2004). Marital (or partner) infidelity is less accepted than ever, and it is less often reported in nationwide surveys of Finns, especially among younger groups. This is the core of what may be called the sexual abstinence ideal in contemporary Finland (Kontula, 2009). Within this context, a minority of adolescent and young adult Finns express a romantic intent to postpone their coital debut until marriage. In a 2001 European survey, 7% of 15- to 24-year-old Finns disapproved of sex before marriage (European Opinion Research Group, 2001).

Abstinence ideals that emphasize delaying coitus until marriage reflect traditional Christian moral ethics. They are core teachings of the Finnish Evangelical Lutheran Church, in which 88% of all Finns nominally held membership in 1990 when baseline assessment of our twin sample began; despite increasing numbers of Finns who declare no formal church membership, 78% retained membership in 2010 (“Kirkon tilastollinen vuosikirja,” 2010). Importantly, for the analyses reported here, nearly nine in 10 Finns are, at age 14, exposed to these church teachings; in 2008, 88% of 14-year-old Finns attended two-week confirmation camps organized by Finland’s Evangelical Lutheran Church and were then confirmed in it (Innanen & Niemelä, 2009). Confirmation training is part of Finnish adolescent culture, less as an activity identifying a Finnish teen as religious than as an expected part of Finnish social experience in teenage years. That training assures widespread, socially shared exposure to the sexual abstinence teachings of the Finnish Church and provides the contextual setting for our study.

Finns who are religiously active espouse the most conservative sexual ethics (Kääriäinen, 2003). Religiosity is protective for early sexual risk taking, an association evident in longitudinal studies of two decades of published studies (Rostosky, Wilcox, Wright, & Randall, 2004). Recent research adds new evidence suggesting religious involvement is associated with attitudes that delay transitions into early sexual activities (Das, Eargle, & Butts, 2011; Meier, 2003). But religiosity is not the only reason why some adolescents and young adults endorse sexual abstinence ideals. Although, for many, the idea of romantic love no longer requires sexual abstinence until marriage, personal and familial characteristics other than religiosity are predictive of endorsing a traditional, conservative standard of sexual abstinence. We hypothesized that sexual abstinence attitudes would be associated with other forms of conservative behavior as well. Sexual abstinence is not an isolated behavior; adolescents who delay initiation of smoking and drinking beyond the normative age of their peers tend also to delay onset of sexual behaviors. Nor do adolescents conceptualize sexual abstinence/initiation as a simple behavioral decision (Ott, Pfeiffer, & Fortenberry, 2006); instead, it is set within the context of normal behavioral development

and a more general set of values that are reflected in several dimensions of adolescent life. In the analyses we report here, we focused on alcohol abstinence to illustrate one such dimension and hypothesized that alcohol abstinence would be associated with sexual abstinence ideals, in both between-family correlations and in within-family comparisons of drinking-discordant twin siblings.

Most research evidence on effects of religiosity on adolescent sexual behavior has been correlational, cross-sectional, and atheoretical (Rostosky et al., 2004). But a recent analysis of multiwave data cast within a theoretical model offered evidence that the association of adolescent religiosity with sexual behavior may be causal (Hull, Hennessy, Bleakley, Fishbein, & Jordan, 2011). The data modeling more convincingly confirmed the behavioral influence of attitudes that adolescents hold about sexual debut.

Reviews of relevant longitudinal research (Meier, 2003; Rostosky et al., 2004; Zimmer-Gembeck, & Helfand, 2007) find multiple correlates (e.g., family structure, parenting patterns, and accelerated pubertal maturation) of adolescent coital debut, so effects of religiosity must be embedded within familial and developmental contexts. The effect of religiosity on first sex is mediated by attitudes about sex; and, reciprocally, having experienced sex for the first time significantly affects later attitudes (Meier, 2003).

Given inherent limitations of correlational research, the association of religiosity with adolescent sexual attitudes and behaviors, albeit widely replicated, may be due to third variable confounds in familial background, parenting behaviors, and other sources of unmeasured between-family variation. Early onset sexual intercourse is observed among adolescents not living with both biological parents and among those reared with reduced parental monitoring, as well as those who engage in early alcohol use (Zimmer-Gembeck & Helfand, 2007). Our longitudinal studies of Finnish twins confirm the same familial and household risk factors influence drinking or abstaining at age 14 (Rose, Dick, Viken, Pulkkinen, & Kaprio, 2001). Further, these risk factors covary: Adolescent girls reared in father-absent homes experience earlier menarche and initiate smoking, drinking, and sexual behavior at an earlier age as well. Such evidence raises the question: Is the apparently robust association of delayed sexual debut with religiosity and abstinence from alcohol confounded with (and mediated by) differences in family structure, status, and household environments? Exploiting the twin structure of our data, we compare a subset of drinking-discordant co-twins to address this question.

Co-twins discordant for both alcohol abstinence and sexual abstinence ideals offer an incisive control for effects of unmeasured between-family differences in status and structure, household environment, and school and neighborhood environments (Dick, Johnson, Viken, & Rose, 2000; Dick, Rose, Viken, & Kaprio, 2000). Twin siblings reared together until late adolescence share cumulative experiences in common environments (and half or all of their segregating genes) directly relevant to individual differences in religiosity, alcohol use, and age at coital debut. In conventional correlations among singletons raised in different families, the associations of religiosity, alcohol abstinence, and sexual abstinence may be mediated by between-family differences—many unmeasured, some unknown. But twin siblings discordant for both alcohol abstinence and sexual abstinence control for these and,

with adequate samples, offer more confidence in attribution of causality to correlational evidence. The obvious limitation is in finding adequate samples of discordant twin pairs. Religiosity is highly familial, so sibling discordance for religiosity at age 16 is very limited; sibling discordance for alcohol abstinence at the same age is much less so, presumably reflecting greater influence from peers than from parents.

To summarize, earlier studies have pinpointed close covariation between sexual abstinence, alcohol abstinence, and religiosity. Less is known of how these associations develop over the life course, especially during the critical period from adolescence to young adulthood when lifestyle choices are made and many behavioral experiences related to sex and alcohol first occur. Further, earlier research has suggested that these behaviors and ideals run in families, so disentangling effects of shared family environments from effects arising from an adolescent's individual experience is important.

Our longitudinal design permits us to contribute to this research by comparing Finns who have maintained sexual abstinence attitudes from adolescence (age 17) into young adulthood (age 24) with birth cohort-matched Finns who did not endorse abstinence ideal attitudes at age 17 and with those who did at 17 but not in follow-up at age 24. We ask how nonreligious and religious Finns with sexual abstinence attitudes differ from each other and how alcohol abstinence associates with these attitudes. Because population-based cohorts of twins provide our data, we can evaluate the association of alcohol abstinence with sexual abstinence ideals via within-family comparisons of drinking-discordant co-twins.

Research Questions

We asked four sets of questions of our data:

- R1. How common are abstinence ideals among young Finns, and how does their endorsement of abstinence ideals change during the developmental period from adolescence to young adulthood?
- R2. How are religiosity and alcohol abstinence related to sexual abstinence ideals?
- R3. Can we replicate the association of alcohol abstinence and sexual abstinence found in analyses of twins as individuals in within-family comparisons of twin siblings who are discordant for drinking?
- R4. Given the data we have, can we identify characteristics of young adult Finns who hold sexual abstinence ideals? What are the distinguishing characteristics of their sexual behavior and their social/sexual circumstances in early adulthood?

Material and Methods

Sample

Our sample consisted of young adult twins from the longitudinal FinnTwin16–25 study, a population-based study of five consecutive birth cohorts (1975–1979) of Finnish twins obtained from Finland's Central Population Registry. The study began in late 1990 with pilot testing of Finnish twins born in the final quarter of 1974; over the next five years, birth

cohorts of Finnish twins born from 1975 through 1979 were sequentially invited into the study with 10 postal mailings annually as twins in each birth cohort reached their 16th birthdays. Twins were followed up at age 17, 18.5, and around age 24. The National Institute on Alcohol Abuse and Alcoholism (of the U.S. National Institutes of Health) provided major funding, and the primary research aims were to identify genetic and environmental precursors of alcoholism. Many publications on this twin sample reflect those research aims (e.g., Dick, Meyers, Rose, Kaprio, & Kendler, 2011; Korhonen, Kujala, Rose, & Kaprio, 2009; Koskinen et al., 2011; Rose, Kaprio, Winter, Koskenvuo, & Viken, 1999; Viken, Kaprio, Koskenvuo, & Rose, 1999), but the longitudinal data have been informative for diverse research analyses, including genetic and familial influences on body mass index (Pietiläinen et al., 1999), the interactive cycle of physical inactivity and obesity (Pietiläinen et al., 2008), self-rated health (Silventoinen, Posthuma, Lahelma, Rose, & Kaprio, 2007), and testing for effects of pre-natal androgen exposure in 16-year-old sisters of twin brothers (Rose et al., 2002).

Directly relevant to this report is a behavior-genetic analysis of individual differences in sexual behaviors (Mustanski, Viken, Kaprio, Winter, & Rose, 2007). Initiation/abstinence of sexual intercourse, age of onset of coital debut, and number of sexual partners, based on the fourth-wave questionnaire of this twin sample and administered at average age 24, were the focus of the Mustanski et al. (2007) report. In this article, these sexual outcome behaviors are studied for their association with religiosity and alcohol abstinence.

Data collection protocols were submitted to and approved by the ethics committee at the University of Helsinki and the institutional review board of Indiana University. A total of 1,967 male and 2,490 female twins (62% of the men and 77% of the women who at age 16 were sent questionnaires) participated in all three surveys from which we here use data, at age 16, 17, and 24. Individual response rates were high: at age 16, 84% of men and 89% of women responded; at age 17, 92% and 97% of those who had participated at baseline; and at age 24, 81% and 90%. After deleting individuals missing questionnaire content necessary for our analyses, the final sample contained 1,735 men and 2,345 women with complete data across the longitudinal assessments.

Major Variables

We assessed attitudes about sex before marriage with a dichotomous question: “Which statement fits your opinion better? (a) People should be sexually experienced before marriage. (b) It is better that married couples have their first sexual experiences with each other.” This question, included in the Sensation Seeking Scales (Zuckerman, 1994), was embedded into the questionnaire administered at age 17. Endorsing the second alternative was regarded as representing the emerging Finnish interpretation of what we call *sexual abstinence ideals*.

Religiosity was measured at age 16 with four dichotomous *True/False* items from the Religious (REL) Fundamentalism Scale derived from the Minnesota Multiphasic Personality Inventory (MMPI; Wiggins, 1966). The four items from the REL Scale are as follows: (1) “I believe there is a God”; (2) “I believe in the second coming of Christ”; (3) “I believe there is a Devil and Hell in the afterlife”; (4) “Everything is turning out just like the prophets of the

Bible said it would.” Individuals who answered *False* to all four items (32%) were classified as “nonreligious”; those who answered *True* to item 1 (belief in God), but *False* to the other three REL items (30%) were classified as “slightly religious”; those who answered *True* to item 1 and *True* also to one or two of the other three items (29%) were classified as “moderately religious”; and those who answered *True* to all four items (9%) were classified as “Bible religious.”

Alcohol use was assessed at age 16 with a structured question employed earlier in nationwide youth surveys in Finland (Lintonen, Rimpelä, Ahlström, Rimpelä, & Vikat, 2000; Rimpelä, Rimpelä, Rahkonen, & Teperi, 1988) and in analyses of drinking patterns in the twin sample on which we report here (Rose et al., 1999). The question asks: “How often do you use alcohol?” and offers nine response alternatives ordered from *Daily* to *I do not use alcohol*. Those who responded *I do not use alcohol* were classified as alcohol abstainers, consistent with earlier surveys in Finland.

Potential Confounds Included in the Analyses

To measure psychosexual development at age 16, girls were asked the age when they started menstruating, and boys were asked the age when their voice was beginning to change. Responses were recorded to the nearest year (Kaprio et al., 1995). To assess whether personality dimensions related to thrill seeking and adventure seeking were associated with sexual abstinence, we used the Experience Seeking subscale (ES) from the Sensation Seeking Scale (Zuckerman, 1994), which describes a nonconformist lifestyle, seeking novel experiences. ES was included in the age 17 questionnaire. The Cronbach’s alpha coefficient of reliability was 0.55 for the nine dichotomous items, which was a rather low score. The Zuckerman item concerning sex before marriage was not included in the ES scale.

Feelings of loneliness and of not belonging to one’s social surrounding were measured by the Harris-Lingoes Social Alienation Scale composed of nine MMPI items (Graham, 1977; Winter, 1998) included in the age 16 questionnaire. The two items with the highest factor loadings were “I am sure I get a raw deal from life” and “No one seems to understand me.” The Cronbach’s alpha coefficient of reliability was 0.65 for the nine dichotomous items, which was a rather low although acceptable reliability coefficient. School performance at age 16 was self-reported by twins for the question “What kind of grades did you receive last term, compared to the average in your class or course?” Possible grades varied between 4 and 10, which is the standard scale used in Finnish schools. The responses on school performance were based on each pupil’s own subjective judgments. Classification of socioeconomic status was based on fathers’ information provided in individual questionnaires completed when their twin children were age 16. The five socioeconomic classes were *Upper-level employees*, *Lower-level employees*, *Manual workers*, *Self-employed*, and *Other, farmers* (Statistics Finland, 1989).

To measure with whom the adolescent spent his or her free time, we asked, “With whom do you spend your free time together?” Those who answered *Alone*, *With one friend* or *With the family* were grouped in one category, and those who answered *Together with two friends* or *Together with several friends* were grouped together in another category. Classification of peers’ alcohol consumption was based on three different questions asking separately about

beer, wine, and hard liquor consumption among peers of the same sex as the respondent twin. Age at first sexual intercourse was asked at age 24 with the question: "How old were you when you had your first sexual intercourse?" Twins also reported the number of their sexual partners and the number of their biological children at age 24.

Regions of residence at age 16 were classified according to the four standard divisions used by the Statistical Office of the European Union (Statistics Finland, 1998): (a) the Uusimaa region, the most developed and secular region, which includes the Helsinki metropolitan area; (b) the region of Southern Finland, which is more urban than rural; (c) the region of Ostrobothnia, the most religious region; and (d) the region of Northeastern Finland, more rural than urban.

Statistical Methods

Analyses were made using a cluster option for families (in Stata, the Svytab command for frequencies and the CL option in the logistic regression analysis) to account for the clustering of co-twins within a (family) cluster with correlated measures. The multivariate analyses used logistic regression analysis. To exclude nonsignificant variables, we used backward stepwise multivariate logistic models predicting sexual abstinence ideals at ages 17 and 24. We used the probability of 0.20 as the limit for including variables following the recommendation of Hosmer and Lemeshow (2000). The goodness of fit of the logistic model was measured with the Hosmer-Lemeshow chi-square test.

The Hosmer and Lemeshow (2000) test assesses the fit of the model by comparing model-based fitted events with observed ones. The events are compared in the subgroups of the model populations. The subgroups are chosen arbitrarily. It is recommended that the way of choosing the subgroups guarantees a sufficient enough number of events in each subgroup (Hosmer & Lemeshow, 2000). The statistical analyses were carried out using Stata, Version 8 (2003).

In the final analytic step, we identified twin pairs discordant for alcohol abstinence (at 16) and for sexual abstinence ideals (at 17 and 24) to ask if the abstinent co-twin at 16 was the twin who later endorsed sexual abstinence. Because nearly all our Finnish twins shared the same household, parenting, and neighborhood environments into late adolescence, co-twin comparisons evaluate the contribution of social background factors, including exposure to family values, parental models, and neighborhood and school influences in mediating the association of alcohol and sexual abstinence. The informative pairs are those discordant for *both* alcohol abstinence at age 16 and later (age 17 and 24) discordance for sexual abstinence ideals. Too few twin pairs were discordant for religiosity at age 16 to perform parallel comparisons with it, but within pairs informative for the association of alcohol abstinence and sexual abstinence, we compared those who were concordantly religious with those concordantly nonreligious. Matching co-twins for their religiosity, we asked whether the nondrinking co-twin at age 16 was the twin who later endorsed sexual abstinence ideals.

Results

Descriptive Results

We first present descriptive findings (refer to Table 1). One-quarter of the adolescent Finnish twins in our sample (452 of 1,735 males, 26%; 581 of 2,345 females, 25%) endorsed sexual abstinence ideals at age 17. During the period of follow-up, support for these ideals decreased from 25% to 15%, as 290 males and 349 females who endorsed the abstinence ideal at 17 did not seven years later. Two-thirds of those who endorsed sexual abstinence ideals at 24 had already done so at age 17. There were no statistically significant differences in the endorsement of these ideals by men and women at either of the two measurement ages or in the proportions of men and women that stably endorsed sexual abstinence ideals across the seven-year follow-up.

Religiosity at age 16 was significantly associated with sexual abstinence ideals but only among the subset of individuals (162 males and 232 females) who stably endorsed abstinence ideals at both age 17 and again at age 24. Among these, significantly more (39%) were Bible religious and fewer were categorized as nonreligious or slightly religious ($p < 0.01$, chi square adjusted for clustered sampling). In contrast, alcohol abstinence at age 16 was significantly predictive both of those who endorsed sexual abstinence ideals at age 17 but not at age 24 and of those who stably endorsed the ideals at both age 17 and 24 ($p < 0.01$, chi square adjusted for clustered sampling).

Sexual abstinence ideals at both age 17 and age 24 were more common among those with later pubertal maturation, those with lower scores on Experience Seeking Sensation Seeking, and those who had not experienced sexual intercourse before age 17. Sexual abstinence ideals at both age 17 and age 24 were also more common among those spending their leisure time alone, at home, or with a close friend; those whose peers used less alcohol than average; those living with both parents in adolescence; and those who lived outside the metropolitan and densely populated region of Southern Finland.

Multivariate Analysis Results

To study the stability of sexual abstinence ideals from ages 17 to 24, we performed logistic regression analysis (refer to Table 2). We excluded from this analysis the 191 individual twins who did not endorse sexual abstinence ideals at 17 but did so at age 24 because we wished to study predictors of stability of the attitude. The analysis was based on the remaining 3,889 twin individuals, including 394 (10%) who endorsed sexual abstinence ideals at both 17 and 24. We performed a backward stepwise logistic regression analysis (if $p > 0.20$, the variable was removed from the model) predicting the stability of having sexual abstinence ideals using the variables suggested in the descriptive results previously described.

Based on the backward stepwise logistic regression analysis results, we excluded gender, school performance, family structure, and fathers' socioeconomic position from the analysis; eight independent variables remained predictive of the stability of sexual abstinence. We then checked the multicollinearity between the remaining 10 variables using correlation analysis. Three correlations exceeded 0.30: between the stability of sexual abstinence ideals

and alcohol abstinence at age 16 ($r=0.36$); between peer drinking and alcohol abstinence at age 16 ($r=0.35$); and between having a girlfriend or boyfriend in late adolescence and having had sexual intercourse before age 17 ($r=0.30$). The highest variance inflation factor (VIF) among the variables was 1.23 for sexual intercourse before age 17, which suggested no severe multicollinearity (Tabachnick & Fidell, 2001).

The logistic regression analysis (Table 2) reveals how religiosity and alcohol abstinence predicted the stability of sexual abstinence ideals from 17 to 24 when other relevant and potentially confounding factors were included in the regression model (see Table 2 footnote). The logistic regression model was differentially predictive of the 394 twin individuals who endorsed sexual abstinence ideals at both 17 and 24 against those who did not endorse the ideal at either age ($n=2,856$), combined with those who endorsed the ideal at 17 but not at age 24 ($n=639$).

Both religiosity and alcohol abstinence were significantly related to the stability of sexual abstinence ideals when relevant confounding factors were included in the model. The odds ratio (OR) was 2.61 (95% CI 1.8 to 3.9) for those we categorized as moderately religious and substantially greater, OR =12.58 (8.1 to 19.5), for those we call Bible religious. Four of the seven significant associations found in the cross-sectional models were significant for predicting stability of sexual abstinence ideals in the longitudinal model as well. Ranked by highest OR, these variables were religiosity at age 16 (those who were moderately and Bible religious), alcohol abstinence at age 16, region of residence at age 16 (Ostrobothnia and Eastern and Northern Finland), and having had sexual intercourse by age 17. Compared with the associations in cross-sectional models, religiosity at age 16 and region of residence at age 16 were stronger predictors when predicting stability of sexual abstinence ideals in the longitudinal model. The Hosmer and Lemeshow (2000) tests were nonsignificant in all four models, indicating a good fit for the models, but confidence intervals were quite wide. The approximation of the Hosmer-Lemeshow test is better if the number of observed events in each group is high. We chose the number of groups (38) in such a way to guarantee a big number of observed values in each group.

In the next final step of our analyses (refer to Table 3), we took into account the twin structure of our sample. There were, altogether, 4,302 individual twins, comprising 1,866 pairs, plus 570 singleton twins. Of these pairs, there were 1,333 pairs concordant for religiosity: both co-twins were religious or both were nonreligious. We analyzed all pairs ($n=184$) discordant for alcohol abstinence at age 16 and contrasted pairs in which both co-twins were nonreligious and those in which both co-twins were religious. The informative pairs in this analysis are those in which the co-twins were discordant not only for alcohol abstinence at 16 but discordant also for endorsing sexual abstinence ideals at age 17 ($n=60$ of 184) and at 24 ($n=47$ of 184).

The entries in the first row of Table 3 show 116 twin pairs concordant for religiosity (both are nonreligious on the first line) but discordant for alcohol abstinence at age 16. Of these 116 pairs, 38 pairs were also discordant for endorsing sexual abstinence ideals at age 17. And in 29 of these 38 twin pairs, it was the alcohol abstinent co-twin who endorsed the sexually abstinence ideal. That result (29/9) yielded OR =3.2 (95% CI 1.5 to 6.8). In the

second row of Table 3, a smaller subsample of 68 twin pairs are identified as drinking discordant at 16 but concordantly religious (both co-twins in each pair moderately religious or Bible religious as assessed by the REL Scale items); 22 of these drinking-discordant but concordantly religious twin pairs were discordant also for endorsing sexual abstinence ideals. And in 20 of these 22 doubly discordant pairs, it was the alcohol-abstinent twin who endorsed sexual abstinence ideals, yielding OR =10.0 (95% CI 2.3 to 47.8). A weaker association was found at age 24; among concordantly nonreligious but drinking-discordant pairs there was no significant association of alcohol abstinence with sexual abstinence attitudes. But in 25 of 30 concordantly religious pairs, it was the alcohol-abstinent twin at age 16 who endorsed sexual abstinence ideals at 24, yielding an OR =5.0. (95% CI 1.9 to 13.1). Thus, among both concordantly religious and nonreligious twin pairs, the odds ratio of endorsing sexual abstinence ideals among the alcohol-abstaining twin compared to his or her non-abstinent co-twin was statistically significant at age 17. At age 24, this was true only among those pairs concordantly religious.

Finally, we addressed our fourth research question, making comparisons to identify behavioral characteristics of those who endorse sexual abstinence ideals. We first compared nonreligious and religious participants who had endorsed sexual abstinence ideals at age 17 and age 24 and then compared these two subgroups with all other participants. Among the nonreligious compared to the religious, there were more men ($p < 0.01$, chi square adjusted for clustered sampling), more respondents with low ES scores ($p = 0.01$, chi square adjusted for clustered sampling), fewer respondents with excellent school grades, more with heightened Social Alienation scores ($p = 0.04$, chi square adjusted for clustered sampling), and more respondents with fathers who were workers ($p = 0.03$, chi square adjusted for clustered sampling). Fewer of the nonreligious were resident in the metropolitan Helsinki area; more resided in communities of 20,000 or fewer inhabitants ($p < 0.01$, chi square adjusted for clustered sampling). Among the religious, there were more respondents who self-reported excellent school grades ($p = 0.01$, chi square adjusted for clustered sampling), and more were living with both parents ($p = 0.03$, chi square adjusted for clustered sampling).

We then compared differences in sexual experience (having had sexual intercourse and with how many different individuals, currently having a partner, and having had children) at age 24 between the nonreligious and religious who endorsed sexual abstinence ideals at age 17 and age 24 (refer to Table 4). We sought to answer: Does endorsing sexual abstinence ideals predict more conservative sexual behavior among those who are religious? A strong majority of the 394 individuals in our sample who endorsed sexual abstinence ideals at both ages 17 and 24 (83% of those who were religious and 70% of those nonreligious) reported having had at most a single sexual intercourse partner at age 24. Less than 30% of all others in the sample reported their experience was limited to no more than one sexual partner. In accordance with their ideals, many more among those endorsing sexual abstinence ideals had no sexual experience at age 24 compared to the others. Among the 394 who stably endorsed sexual abstinence ideals, those who were religious were significantly more likely than the nonreligious to have had one or more biological children by age 24.

Discussion

Our analysis was directed to four research questions, and here we summarize the results for each.

1. *Prevalence and stability of abstinence ideals:* One in four of our Finnish twins endorsed sexual abstinence ideals at 17; only one in seven did so at age 24. Of all who endorsed the attitude at 17, only 38% did so seven years later; and although much less common, 1 in 25 in our sample who did not endorse sexual abstinence ideals at 17 later did so at 24. In analyses of longitudinal data from the Add Health study in the United States, Meier (2003) found that having sex for the first time significantly affected later attitudes about sex, and that reciprocal effect may explain the changes in individual endorsement of abstinence ideals we observed.
2. *Associations of abstinence ideals with religiosity and alcohol abstinence:* Our results showed a robust association between alcohol abstinence at 16 and subsequent attitudes about sexual abstinence. Associations of abstinence ideals with religiosity at age 16 were less robust and were significant only for the subsample that stably endorsed sexual abstinence ideals across the developmental period from 17 to 24. Alcohol abstinence at age 16 significantly predicted endorsing sexual abstinence ideals at both ages 17 and 24. Both religiosity and alcohol abstinence were significantly associated with the stability of sexual abstinence ideals when measured confounding variables were included in a logistic regression model, and the association was much greater among those who were classified as Bible religious.
3. *Association of alcohol abstinence and sexual abstinence attitudes in discordant twins:* We identified 184 twin pairs in which the co-twins were drinking-discordant at age 16 for within-family replication of the association; of these 184 twin pairs, 60 at age 17, and 37 at age 24 were discordant as well for endorsing the sexual abstinence ideal. Controlling for differences in religiosity between these informative pairs, the alcohol-abstinent co-twin was significantly more likely to be the twin who endorsed the sexual abstinence ideal in three of the four comparisons.
4. Finally, *what characterizes young adult Finns who hold sexual abstinence ideals?* Two evident characteristics are that they are likely to hold traditional religious beliefs and to have delayed their initiation of alcohol use beyond age 16, an age at which about three in four Finns have begun drinking. Suggestive, but less definitive, characterizations are that Finns who hold sexual abstinence ideals are less likely high scorers on sensation-seeking, more likely to have lived with both biological parents, performed well in school and had peers who used less alcohol than did their age-matched Finns; finally, those who held sexual abstinence ideals were, as adolescents, disproportionately resident outside the metropolitan and densely populated region of Southern Finland. At age 24, they were more likely than others in the sample to report having experienced sexual intercourse with only one partner (or none), and having a biological child at 24 was clearly more

common among those who were religious at 16 and who endorsed sexual abstinence ideals.

Our analysis has both unusual strengths and important limitations. Strengths of the data set include the large, population-based twin sample, age standardization of adolescent assessments, and the multiwave longitudinal design. The sample of Finnish twins permitted a test of associations of sexual abstinence attitudes with religiosity within a secular society in which the vast majority of families hold nominal membership in a state-supported religious denomination and to which nine of ten adolescents have shared exposure to basic Christian teachings. The twin sample permitted a discordant twin analysis, results of which importantly suggest that the association between alcohol abstinence at 16 and subsequent sexual abstinence ideals is not wholly due to effects of third-variable confounds.

We acknowledge the rather low reliability coefficients of Cronbach's alpha for the Experience Seeking subscale and the Social Alienation scale. Although coefficients less than 0.7 (but more than 0.5) show a poor or questionable internal scale consistency, these scales can be acceptable if the scale has fewer than 10 items or if there is good evidence of validity or a good theoretical reason for the scale (Loewenthal, 2001). This was true for the Experience Seeking subscale and the Social Alienation scale. Better internal consistency for the scales would, however, have been desirable.

Several additional limitations in our report are important. Our assessments of both sexual abstinence ideals and of religiosity were limited. A single-item dichotomous preference assessed the first; four true/false questions about religious beliefs defined the second. Few young Finns delay their sexual experience until marriage, and our question offered them a romantic attitudinal ideal more than a behavioral reality. Our measure of sexual abstinence ideal was as a normative orientation: We assessed endorsement of the statement "People should be sexually experienced before marriage." Results might have differed had we used measures of sexual abstinence that referred specifically to one's own history of sexual experience.

Nonetheless, we found predictable associations (in drinking behavior and in religiosity) for individual differences in endorsement of that attitude, as well as behavioral associations (number of sexual partners and number of children) in young adulthood. Although the discordant twin analysis has the potential to clarify the meaning of associations such as those studied here, the reality is that most behaviors of interest are familial and behavioral correlations among twin siblings will be substantial; identifying large numbers of informatively discordant twin pairs requires screening very large population-based samples. We began with a large sample of twins, but the number of informatively doubly discordant pairs was, as expected, quite small, and our analysis was accordingly constrained. Co-twins discordant for religiosity were so few that no meaningful comparison could be made. An additional limitation is that data on outcome measures of sexuality occurred during fourth-wave questionnaire data collection, completed nearly ten years ago. The dated nature of these self-reports is a limitation, because sexual behaviors and attitudes are rapidly changing across recent decades. The final data on which we here report were collected in the autumn of 2002 from our youngest cohort of twins, born in 1979. Our results are, accordingly, on

assessed sexual-related attitudes and behaviors from the end of the 1990s and first years of the 21st century. Fortunately, Finnish survey data from 1992, 1999, and 2007, suggest attitudes toward sexuality remained quite stable across that 15-year period (Kontula, 2009).

In conclusion and acknowledging limitations, we emphasize that our results show associations of religiosity and alcohol abstinence with sexual abstinence ideals in a Nordic society with a state-sponsored religion to which eight of ten families nominally hold membership, and a society which is sexually liberal and in which alcohol use typically begins by midadolescence. That within such a society, religiosity and alcohol abstinence are shown influential in endorsing sexual abstinence ideals and that these abstinence ideals may relate to early adult outcomes, including number of sexual partners, are results of interest that warrant further study.

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Table 1

Descriptive Statistics for Sexual Abstinence Ideals by Variables Used in the Article

Variable	Sexual Abstinence Ideals					Total %	Total N	Probability of Chi Square Adjusted for Clustered Sampling
	Favor Sexual Abstinence Ideals at Age 17 and Age 24	Favor Sexual Abstinence Ideals at Age 24 But Not at Age 17	Favor Sexual Abstinence Ideals at Age 17 But Not at Age 24	Do Not Favor Sexual Abstinence Ideals at Age 17 or at Age 24				
Sex								
Men	9	5	17	68	100	1,735	0.08	
Women	10	4	15	71	100	2,345		
Puberty								
Early, normal	9	5	15	72	100	3,103	<0.01	
Late	12	5	18	65	100	977		
Sexual intercourse experience before age 17								
Yes	2	4	9	85	100	1,326	<0.01	
No	13	5	19	63	100	2,754		
Experience seeking at age 17								
High, normal	8	5	15	72	100	3,276	<0.01	
Low	15	5	20	60	100	804		
Social alienation								
Low	10	4	15	70	100	2,705	0.04	
Middle	9	5	18	68	100	576		
High	7	6	15	72	100	768		
Religiosity at age 16								
Nonreligious	5	5	17	73	100	1,325	<0.01	
Slightly	4	4	12	79	100	1,223		
Moderately religious	11	4	17	68	100	1,168		
Bible religious	42	5	18	35	100	364		
School performance at age 16								
Lower than average or good	9	5	16	71	100	3,208	0.10	
Excellent	12	4	15	68	100	812		
Leisure time orientation at age 16								
In a group	8	4	13	75	100	2,154	<0.01	

Variable	Sexual Abstinence Ideals					Total %	Total N	Probability of Chi Square Adjusted for Clustered Sampling
	Favor Sexual Abstinence Ideals at Age 17 and Age 24	Favor Sexual Abstinence Ideals at Age 24 But Not at Age 17	Favor Sexual Abstinence Ideals at Age 17 But Not at Age 24	Do Not Favor Sexual Abstinence Ideals at Age 17 or at Age 24				
At home, alone, or with one friend	11	5	19	65	100	1,926		
Alcohol abstaining at age 16								
No	5	4	13	78	100	3,189	<0.01	
Yes	28	5	25	42	100	891		
Peer drinking								
Everybody	4	5	11	80	100	1,200	<0.01	
Most of them	7	4	15	74	100	1,327		
Half of them	8	5	16	71	100	585		
Some of them	22	5	22	51	100	968		
Family structure (N=4,020)								
Dual parent	11	4	16	69	100	3,362	<0.01	
Single parent or else	5	6	14	74	100	718		
Father's socioeconomic status (N=3,374)								
Upper white-collar employees	8	4	14	73	100	861	0.17	
Lower white-collar employees	12	5	16	67	100	562		
Worker	11	5	15	69	100	1,276		
Entrepreneur	10	4	11	75	100	343		
Farmer	12	5	19	64	100	332		
Region of residence at age 16								
Uusimaa	5	4	14	77	100	886	<0.01	
Southern Finland	9	5	16	70	100	1,425		
Ostrobothnia	16	5	16	64	100	729		
Eastern and Northern Finland	11	5	16	68	100	1,040		

Note. N=4,080.

Table 2

Multivariate Logistic Regression Models Predicting Endorsement of Sexual Abstinence Ideals at Both Age 17 and Age 24

Model Stability of Sexual Abstinence Ideals From Age 17 to Age 24			
		Odds Ratio	Confidence Interval
Religiosity at age 16			
Nonreligious	32%	1.0	
Slightly	30%	1.03	(0.7–1.6)
Moderately religious	29%	2.61	(1.8–3.9)
Bible religious	9%	12.58	(8.1–19.5)
	100%		
Alcohol abstaining at age 16			
No	78%	1.0	
Yes	22%	4.66	(3.5–6.2)
	100%		
Hosmer and Lemeshow test for 38 groups		$p=0.113$	
	$N=3,889$	$N=3,215$	

Note. Odds ratios and 95% confidence intervals adjusted for clustered sampling; $N=3,889$ and $N=3,215$ when confounders included. The following variables not shown in Table 2 were included in the analysis as confounders: *Puberty*, *Experience seeking at age 17*, *Peer drinking at age 16*, *Boyfriend or girlfriend at age 18½*, *Father's socioeconomic status*, *Region of residence at age 16*.

Table 3

Twin Pairs Discordant for Endorsing Sexual Abstinence Ideals at 17 by Discordant Alcohol Abstinence Pairs and Same Religiousness Pairs at 16

	Drinking-Discordant Twin Pairs at Age 16	Pairs Discordant for Sexual Abstinence Ideals at 17 Among Those Discordant for Alcohol Abstinence at 16	OR and 95% CI Adjusted for Clustered Sampling: Co-Twins Clustered Within Families
Age 17			
Both nonreligious	116	38 (29/9)	3.2 (1.5–6.8)
Both religious	68	22 (20/2)	10.0 (2.3–47.8)
Age 24			
Both nonreligious	116	17 (7/10)	0.7 (0.3–1.8)
Both religious	68	30 (25/5)	5.0 (1.9–13.1)

Note. Odds ratios (OR) and 95% confidence intervals (CI) at age 17 and age 24; $N=4,302$. There are more participants because of fewer variables and fewer missing answers.

Table 4

Sexual Behavioral Characteristics by Religiosity and Sexual Abstinence Ideals

	Religious, Supporting Sexual Abstinence Ideals at Age 17 and Age 24	Nonreligious, Supporting Sexual Abstinence Ideals at Age 17 and Age 24	All Other	Total
How many sexual partners at age 24				
No experience	41		33	9
One	42		37	20
Two or more	17		30	71
Total %	100		100	100
Total <i>N</i>	279		115	4,080
Probability of chi square adjusted for clustered sampling		0.03		
A partner at age 24				
No	42		50	35
Yes	58		50	65
Total %	100		100	100
Total <i>N</i>	279		115	4,075
Probability of chi square adjusted for clustered sampling		0.16		
Own children at age 24				
No	74		88	87
Yes	26		12	13
Total %	100		100	100
Total <i>N</i>	279		115	4,079
Probability of chi square adjusted for clustered sampling		<0.01		

Note. Chi square adjusted for clustered sampling between religious and nonreligious; *N*=4,080.