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Early Adolescent Sexual Initiation as a Problem Behavior: A Comparative Study of Five Nations

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Abstract

Purpose—Using a Problem Behavior Theory (PBT) framework, this paper examines the extent to which psychosocial correlates of early sexual initiation (before age 16) vary across developed nations.

Methods—Fifteen-year-old participants (n=5,624) in the 1997-1998 WHO collaborative Health Behavior in School-Aged Children survey (Finland, Scotland, France and Poland) and the 1996 US Add Health survey self-reported substance use (alcohol and tobacco), school attachment, positive parental communication, and early sexual intercourse experience. Stratifying by gender, we performed univariate, bivariate, and multivariable analyses controlling for family socioeconomic status, family structure, and nation fixed effects.

Results—Self-reported early sexual experience, substance use, school attachment and positive communication with parents varied significantly across nations for both boys and girls. In both crude and adjusted analyses, substance use was positively associated with early sexual experience among boys and girls across nations, although associations were stronger in Europe than the US (adjusted odds ratio [AOR] range 1.56-3.74). School attachment was similarly inversely related to early sexual experience among boys and girls across nations (AOR range 0.63-0.94). However, positive parent communication was significantly inversely related to early sexual experience only among US females (AOR 0.50).

Conclusions—Findings overall supported the fit of early adolescent sexual initiation as a risk behavior within a PBT framework cross-nationally, suggesting that similar factors could be targeted to prevent early sexual initiation across some developed nations. However further research is warranted examining the temporality of these relationships.

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Keywords

adolescent; sexual behavior; Problem Behavior Theory; cross-national

Introduction

Background

Initiation of sexual intercourse during adolescence is statistically normative among developed nations. Among young adults (age 20-25) surveyed in eleven European nations in the early 1990s, the prevalence of sexual initiation before age 20 for males ranged from 73% in the Netherlands to 88% in Iceland; for females, the low was in Portugal at 51% and the high in Denmark at 90% [1]. In the US, over 90% of young adults in 2001 reported sexual debut during adolescence and prior to marriage [2]. Using data from the mid-1990s, researchers at the Guttmacher Institute found that differences in prevalence of adolescent sexual debut were minimal between the United States, Sweden, France, Canada and Great Britain, although adolescents in the United States were slightly more likely to initiate sexual intercourse before age 15 [3].

Despite its statistical normality, sexual initiation during adolescence, regardless of timing, has largely been characterized as problematic in the US Concern about unintended pregnancy and sexually transmitted infections (STIs), which are more likely with younger ages at debut [4, 5], is one rationale for this framing. Demographic characteristics, such as family structures other than two biologic parents and lower socioeconomic status (SES), have also been related to earlier adolescent sexual initiation in the US [6,7]. Associations between adolescent sexual initiation and negative mental health symptoms [8], substance use [9], and weaker attachments to conventional institutions (i.e., parents, school and religious organizations) [10] are cited in recent US sex education policies as evidence that adolescent sexual activity is age-inappropriate and developmentally risky [11,12]. However, some US-based researchers assert that negative psychosocial consequences of adolescent sexual debut tend to be concentrated among early initiators – those less than age 16 at sexual debut – or among girls [13-15].

The above characterization of adolescent sexual activity is consistent with the concept of a risk behavior in Problem Behavior Theory [16]. Problem Behavior Theory posits that early initiation of developmental transitions will evoke negative or control reactions from the environment when the transition violates socially defined norms for transition timing [17]. Risk behaviors, including precocious entry into adult behaviors, tend to cluster together and have common psychosocial root causes. The common psychosocial root causes include risk and protective factors in five domains: biology/genetics (e.g., family history, intelligence), other behaviors (e.g., problem drinking, church attendance), personality (e.g., low perceived life chances, value placed on achievement), perceived environment (e.g., models for deviant or conventional behavior), and social environment (e.g., poverty, school quality). Socialization forces that are especially prominent in this theory include parents, school, and peers. Based on a model of early adolescent sexual initiation as a problem or risk behavior, we would expect sexual initiation to be negatively associated with good parent communication and school attachment, and positively associated with risk behaviors like substance use, which are linked to interactions with deviant peers.

Another less frequently studied tenant of Problem Behavior Theory is that a specific behavior is only problematic to the extent that the society in which the adolescent is embedded defines it as such [17]. Therefore, to the extent that societies differ in their conceptualization of adolescent sexual behavior as problematic, the associations between sexual initiation and other factors may vary. Alternatively, relatively early sexual initiation may be more universally

problematic no matter what the cultural context, based on adolescents' physical and/or emotional immaturity.

Comparisons of the correlates of sexual initiation across countries can offer insight regarding the specificity or universality of adolescent sexual initiation as a potentially problematic risk behavior. Negative health outcomes ascribed to adolescent sexual activity, such as STIs and adolescent pregnancy, are much more common in the US than in other Western nations, despite similar levels of adolescent sexual activity [3]. Family structures other than two biologic parents have been associated with earlier sexual initiation among girls in the US, France, Scotland and Sweden, and among boys in Scotland [7,18-20]. In terms of psychosocial correlates, evidence is mixed. In separate studies using various quantitative surveys, substance use (cigarette smoking, alcohol use, and/or other substance use) has been supported as a risk factor for early sexual initiation (before age 16) in France (only girls studied), Finland, Scotland and Poland [18,21-23], although the relationship between substance use and later sexual debut is less clear. In multi-country qualitative studies, researchers have found that family relationship disruption around sexual initiation was greater in the US than other studied European countries (Netherlands, France and Germany) [24,25], although negative parental appraisal of debut before age 16 was more consistent. Fewer investigations of the role of school attachment in sexual behavior have been conducted cross-nationally. One study, conducted in Poland, found truancy to be positively related to early sexual initiation for both genders [23]; another study, examining correlates of early sexual initiation among French girls, found above average school performance and attachment to school to be negatively related to early initiation [18].

Although these studies offer insights into the potential universality of early adolescent sexual initiation as a problematic risk behavior across various nations, it is difficult to ascertain the relative strength of associations with negative correlates without data from multiple countries combined in a single study. Further, any differences that are apparent may be artifactual – the product of different methodological approaches across surveys. The purpose of this analysis is to examine cross-national consistencies in the association between various psychosocial factors from Problem Behavior Theory and early adolescent sexual initiation simultaneously across a sample of developed nations.

Methods

Data

Analyses drew upon data from two datasets: the National Longitudinal Study of Adolescent Health (Add Health, 1996) and the Health Behavior in School-Aged Children (HBSC, 1997-98). Add Health was designed to examine the determinants of health and health-related behaviors of US adolescents in grades 7-12 in the 1994-1995 school year. The primary sampling units were schools; in the secondary sampling stage, a representative core sample and several special samples (e.g., siblings, adolescents with disabilities, etc.) of adolescents were selected for in-home interviews [26]. Over 21,000 respondents completed in-home interviews in 1995 (Wave I), of whom almost 15,000 were reinterviewed at Wave II in 1996 (88% of those eligible) [27]. Only data from Wave II were included in the present analysis, as Wave II corresponds most closely to the 1997/98 data collection period for HBSC. All original Add Health study protocols were approved by the institutional review board (IRB) at the University of North Carolina at Chapel Hill.

HBSC 1997-98 was conducted in 28 countries in collaboration with the World Health Organization Regional Office for Europe.[a] It was designed to examine the health and health behaviors of adolescents across national contexts [28]. Schools were the primary sampling units; children aged 11, 13, and 15 years were the target for that international study. Anonymous

surveys were conducted by pen-and-paper within classrooms. Strict adherence to the data collection protocols was required for inclusion in the international dataset. Over 120,000 students were included in the 1997-98 international HBSC dataset. For HBSC, each country obtained approval to conduct the survey from the relevant ethics review board.

Analytic Sample

We applied a number of sample inclusion criteria. First, as sexual behavior questions were optional in the 1997-98 HBSC survey, we limited analyses to the four HBSC countries with the most complete information on sexual behavior (Finland, Scotland, France,[b] and Poland). Second, in HBSC, only participants in their 15th year were asked sexual behavior questions; therefore, we included only students who were in their 15th year at the time of the Add Health or HBSC survey. Third, because we do not have population weights for the HBSC samples, and only the core sample in Add Health is representative of the US population without such weights, we limit our US respondents to those who were part of the Add Health core sample. Finally, we included only students with complete covariate data. This left a sample size of 1,343 for the US, 1,315 for Scotland, 798 for Finland, 922 for France, and 1,246 for Poland.

Measures

Table 1 provides comparisons of question wording and response options between Add Health and HBSC, as well as variable recodes. There are some differences in question phrasing and response options, which warrant caution in interpreting results; however, the level of similarity in content allows comparison.

Dependent Variable—The main dependent variable, *sexual initiation*, was based on a question inquiring if the respondent ever had sexual intercourse. Because all respondents were in their 15th year, an affirmative response indicates relatively early sexual initiation by Western European and US standards [3,13,14].

Independent Variables—Three substance use variables, *tobacco use frequency*, *alcohol use frequency*, and *ever drunk* were examined as components of the behavior domain. Item responses were categorized to be as similar as possible across datasets (see Table 1). Because preliminary bivariate analyses indicated that proportional odds models for the frequency variables were inappropriate (i.e., parallelism assumption were not met for one or more countries), we combined substance use variables into an index using polychoric principal components analysis (PCA) (i.e., item loadings on first principal component used as weights) [29].

One variable from the personality domain, *attachment to school*, was based on an index of questions querying feelings about and perceptions of the school environment (see Table 1). Again PCA was used to generate the summary score.

Results from PCAs for both substance use and school attachment supported a single-factor solution regardless of gender or nation, based on eigenvalues and a visual examination of scree plots. Although some differences were apparent in item loadings across gender and countries, such differences on the whole were not substantial. We concluded that running a single PCA (for each substance use and school attachment) using all respondents together was preferable so that index scores across countries would be directly comparable. A score of zero on the

[a]The U.S. participates in the HBSC survey, but has not included the sexual behavior questions. As such, we had to rely upon another data source in the U.S. The data source with the most recent data and most comparable content to HBSC was the Add Health survey; the administration years that were most closely aligned between Add Health and HBSC were 1996 and 1997/98, respectively.
[b]France was represented by two regions only in the 1997/1998 HBSC.

index is equivalent to the mean level of substance use or school attachment across the entire sample; a score of +1 represents one standard deviation above the mean; and a score of -1 represents one standard deviation below the mean.

Finally, one indicator of the perceived environment system, *positive parent communication*, was based on questions asking respondents' perceptions of communication with mothers and fathers. If the adolescent reported on two parents, the average of both parental communication variables was taken; if the adolescent only reported one parent, their rating of communication with that parent was used.

Controls and Modifiers—A number of potential confounders and effect modifiers were included. Given findings of gender differences in associations between sexual behavior and other problem behaviors [30], *gender* (male/female) was treated as an effect modifier. *Living arrangement* (with both biologic parents / stepfamily / single parent / other) and *family socioeconomic status (SES)* were included as potential confounders, because of their associations with adolescent sexual initiation [31,32] and some forms of substance use [33, 34]. Because comparable measures of SES were not available across the datasets, a three-category ordinal indicator of parental education (higher of residential mother or father, less than high school or high school diploma or GED / some postsecondary / college graduate or more) was used for Add Health, while the Family Affluence Scale (a four-item family material assets scale, converted to a three-level ordinal indicator) was used for the HBSC countries [35]. *Nation* was treated as an effect modifier, since we wanted to test cross-national differences in associations between adolescent sexual initiation and the outcomes. Indicators for other attitudinal or problem behaviors were not included, as they may act as mediators between sexual behavior and other outcomes.

Analysis

We examined the distribution of analytic variables separately by gender and nation. Bivariate relationships between the independent variables and sexual initiation were examined using binary logistic regression. Multivariable logistic models regressing sexual initiation on controls for living arrangement and family SES, the independent variable (separate models for each), nation, and an interaction between nation and each independent variable were run separately by gender, testing (1) the adjusted association between the independent variable and sexual initiation net of the control factors, and (2) the differences in the association between sexual initiation and identified independent variables by nation. A high alpha level (α=0.2) was used for significance testing of interaction terms, given the low power of such tests [36]. For models with an index as the independent variable (school attachment or substance use), odds ratios contrast students with an index score one standard deviation above the mean to those with an index score at the mean. Including nation fixed effects controlled for unmeasured differences between countries (e.g., racial/ethnic and immigrant composition) [37], and permitted significance testing of the between-nation differences with the interaction term. Adjustment of standard errors for non-independence between individuals in the same school was accomplished by using the robust option in STATA, because identifiers for clustering units (i.e., schools) were unavailable for all HBSC countries.

Results

Descriptive characteristics of the sample, by gender and nation, are presented in Table 2. Significant differences between countries were observed across all variables. For example, the prevalence of sexual initiation among boys varied from a low of 18.0% in Finland to a high of 33.1% in Scotland; among girls, the lowest observed prevalence of sexual initiation was in Poland (11.5%) and the highest in Scotland (36.9%). Generally, US adolescents reported

significantly lower substance use, more positive parent communication, and greater school attachment than adolescents in the European nations. Mean scores on the substance use index were significantly greater among boys and girls in Scotland, Finland, France and Poland compared to the US, while mean scores on school attachment and positive parent communication were significantly greater for US adolescents compared to Scottish, Finnish, French and Polish adolescents.

As bivariate results were very similar to results from adjusted models, we present only results from multivariable models (Tables 3 and 4). Table 3 presents adjusted odds ratio estimates and statistical significance for each variable included in the models, while Table 4 provides adjusted odds ratio estimates for each independent variable by gender and national group. Having a family composition other than two biologic parents was significantly positively associated with sexual initiation for both boys and girls across models, although the strength of this association varies by independent variable. A significant positive association between substance use and sexual initiation among both boys and girls across nations was observed, although associations were significantly stronger in European nations than the US. For example, US males with a substance use score one standard deviation above the mean had 1.6 times the odds of sexual initiation compared to US males with a mean substance use score; in Finland, a one standard deviation increase in substance use score was associated with 3.7 times the odds of sexual initiation. School attachment was negatively related to sexual initiation among boys and girls across nations. Tests of interaction terms did not support significant between-nation differences in the magnitude of these associations. Finally, positive parent communication was significantly inversely related to sexual initiation only among girls in the US: reporting high versus low positive parental communication is associated with a 50% lower odds of sexual initiation within this group. Although these adjusted odds ratio estimates were only significant in the US, tests of the interaction terms indicated that the magnitude of associations did not vary significantly across countries.

Discussion

Guided by Problem Behavior Theory, we explored the association between early adolescent sexual initiation (i.e., before age 16) and substance use, positive parent communication and school attachment in the US, Scotland, Finland, France and Scotland. We also examined the degree to which these relationships varied between nations for male and female adolescents. This study contributes novel information about the fit of early adolescent sexual initiation within a Problem Behavior Theory framework cross-nationally, using large, population-based surveys.

Our hypotheses that early adolescent sexual initiation would be positively associated with substance use and negatively related to school attachment were supported across both gender and nations. These findings are consistent with both past US-based studies and those conducted in European nations [9,18,21-23]. Similarity in the direction of this association across countries suggests early sexual initiation fits well as a risk behavior within Problem Behavior Theory for the studied countries. We note however that the association between substance use and early sexual initiation was stronger in European nations than in the US. It is possible that this difference in magnitude stems from the higher substance use scores in HBSC countries versus the US, differences across nations in the cultural acceptability of adolescent alcohol and/or tobacco use, and/or variability in public health approaches to adolescent substance use between European nations (harm reduction emphasis) and the US (zero tolerance). Future studies should empirically explore reasons for this between-countries difference.

In contrast, our third hypothesis, that early adolescent sexual initiation would be inversely related to positive parent communication, was supported only among female adolescents in

the US. This finding is consistent with past work suggesting such initiation to be less disruptive to family dynamics in some European nations than in the US [24,25], and that negative reactions to sexual initiation are especially pronounced for females [38]. However caution is warranted in the interpretation of this between-countries difference, given the discrepancy in item wording between the surveys (i.e., "satisfaction" with communication for Add Health vs. "ease" of communication for HBSC). If the US includes the sexual behavior module as part of its HBSC survey in future years, this question should be revisited.

Overall we found that the relationship between early adolescent sexual initiation and other constructs within Problem Behavior Theory did not vary substantively across nations. Although the relationship between positive parent communication and early sexual initiation was statistically significant only among females in the US, between-nation differences in the point estimates were not statistically significant. This could reflect either the low power of statistical tests of interaction terms, or that the association between positive parent communication and early sexual experience among female adolescents in the US is spurious. Further, although the magnitude of the association between substance use and sexual initiation was greater in European countries than the US, all relationships were significant and positive within countries, suggesting a comparable overall pattern. Such similarities across countries may arise from our study of sexual initiation before age 16 – that is, relatively early initiation by American and Western European standards [3,13,14]. These regularities may reflect shared values within post-industrial societies, where early adolescence is a period dedicated to educational and friendship pursuits, rather than sexual relationships. If we were studying sexual initiation at older ages within adolescence, it is possible we would observe greater cross-national variation.

Although this study has many strengths, including the use of large, nationally-representative samples from several nations, results should be interpreted with an understanding of the study's limitations. First, although question and response wording across the different surveys (Add Health and HBSC) was remarkably similar, there was some variation (e.g., in the time frame referent for substance use and the wording of the parent communication questions). As such, estimates of differences between the US and other studied nations may reflect such survey inconsistencies rather than actual dissimilarities between countries. Second, we are missing some key control variables, such as immigrant status and ethnicity, which may confound the relationship between independent variables and sexual initiation. Although country fixed-effects control for country-level differences in the prevalence of these characteristics, they do not control for individual-level status. Third, we lose a substantial portion of our analysis sample when limiting to respondents with complete covariate data, despite the rate of missing values on all individual items being lower than 5%. Such inclusion criteria could result in selection biases, though the direction of such biases cannot be determined. Finally, we were only able to include data from five nations, and thus caution is warranted in generalizing findings. Countries that included sexual behavior questions may be self-selected based on cultural acceptance and openness toward adolescent sexuality. Given a less accepting orientation toward adolescent sexual behavior in the US, one might expect more or greater differences between the US and the European HBSC countries. As we largely found consistencies between the U.S and other countries, this suggests that even in countries with widely different cultural attitudes toward adolescent sexuality generally, early adolescent sexual initiation is still associated with problematic risk indicators.

In the present study, we found general consistency across the US, Finland, Scotland, France and Poland in the association between early adolescent sexual initiation and substance use, school attachment, and, less convincingly, parent communication. Such findings suggest that the fit of early adolescent sexual initiation as a risk behavior within a Problem Behavior Theory framework holds for multiple post-industrial national settings, and that early sexual initiation

is positively related to other problem behaviors and inversely related to school attachment. Although further research is warranted regarding the temporality of these relationships across multiple national contexts, these results suggest that it might be appropriate to target similar interventions to delay sexual initiation past age 15 across several nations.

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Table 1

Variable renaming and response recodes for Add Health and HBSC Survey Items

HBSC 1997/98:	RECODE	ADD HEALTH 1996:	RECODE
Sexual Intercourse			
Have you ever had sexual intercourse?		Have you ever had sexual intercourse?	
1 = Yes	0 = No	1 = Yes	0 = No
0 = No	1 = Yes	0 = No	1 = Yes
Substance Use			
How often do you smoke tobacco at present?		In the past 30 days, how many days did you smoke cigarettes?	
1 = Daily	0 = Do not smoke (4)	0-30	0 = Do not smoke (0)
2 = Weekly	1 = Less than daily (2,3)		1 = Less than daily (1-29)
3 = <Weekly	2 = Daily (1)		2 = Daily (30)
4 = Do not smoke			
How often do you currently drink [wine/spirits/beer]?	[most frequent of drinks]	During the past 12 months, on how many days did you drink alcohol?	
1 = Daily	0 = Never (5)	1 = Every/almost every day	0 = Never (7, 97)
2 = Weekly	1 = Rarely (4)	2 = 3-5 days/week	1 = Rarely (5, 6)
3 = Monthly	2 = Monthly (3)	3 = 1-2 days/week	2 = Monthly (4)
4 = Rarely	3 = Weekly or more (2,1)	4 = 2 or 3 days/month	3 = Weekly or more (1, 2, 3)
5 = Never		5 = ≤1^{ce} per month or less	
		6 = 1 or 2 days past year	
		7 = Never	
		97 = Legit skip	
Have you ever had so much alcohol that you were really drunk?		How often drunk in past 12 months?	
0 = Never	0 = Never (0)	1 = Every/almost every day	0 = Never (7, 97)
1 = Once	1 = Once or more (1-4)	2 = 3-5 days/week	1 = Once or more (1-6)
2 = 2-3 times		3 = 1 or 2 days/week	
3 = 4-10 times		4 = 2 or 3 days/month	
4 = >10 times		5 = ≤1^{ce} per month	
		6 = 1 or 2 days past year	
		7 = Never	
		97 = Legit skip	

HBSC 1997/98:	RECODE	ADD HEALTH 1996:	RECODE
School attachment			
I like school		You are happy to be at your school.	[coding scheme 1]
1 = Like a lot	1 = Like (1,2)	1 = Strongly agree	1 = Like (1,2)
2 = Like a bit	0 = Dislike (3,4)	2 = Agree	0 = Dislike (3-5)
3 = Not very much		3 = Neutral	[coding scheme 2]
4 = Not at all		4 = Disagree	1 = Like (1-3)
		5 = Strongly disagree	0 = Dislike (4,5)
Teachers treat students fairly		The teachers at your school treat students fairly	
1 = Strongly agree	1 = Strongly disagree (5)	1 = Strongly agree	1 = Strongly disagree (5)
2 = Agree	2 = Disagree (4)	2 = Agree	2 = Disagree (4)
3 = Neutral	3 = Neutral (3)	3 = Neutral	3 = Neutral (3)
4 = Disagree	4 = Agree (2)	4 = Disagree	4 = Agree (2)
5 = Strongly disagree	5 = Strongly agree (1)	5 = Strongly disagree	5 = Strongly agree (1)
Teachers show an interest in me as a person		How much do you feel that your teachers care about you?	
1 = Strongly agree	1 = Not at all (5)	1 = Not at all	1 = Not at all
2 = Agree	2 = Very little (4)	2 = Very little	2 = Very little
3 = Neutral	3 = Somewhat (3)	3 = Somewhat	3 = Somewhat
4 = Disagree	4 = Quite a bit (2)	4 = Quite a bit	4 = Quite a bit
5 = Strongly disagree	5 = Very much (1)	5 = Very much	5 = Very much
I feel like I belong at school		You feel like you are part of your school.	
1 = Strongly agree	1 = Strongly disagree (5)	1 = Strongly agree	1 = Strongly disagree (5)
2 = Agree	2 = Disagree (4)	2 = Agree	2 = Disagree (4)
3 = Neutral	3 = Neutral (3)	3 = Neutral	3 = Neutral (3)
4 = Disagree	4 = Agree (2)	4 = Disagree	4 = Agree (2)
5 = Strongly disagree	5 = Strongly agree (1)	5 = Strongly disagree	5 = Strongly agree (1)
Positive parent communication			
How easy is it for you to talk with your mother/father?	[mean of mom/dad]	You are satisfied with the way [MOM/DAD] and you communicate with each other?	[mean of mom/dad]
1 = Very easy	1 = Good communication (1,2)	1 = Strongly agree	1 = Good communication (1,2)
2 = Easy	0 = Bad communication (3,4)	2 = Agree	0 = Bad communication (3-5)
3 = Difficult		3 = Neutral	
4 = Very difficult		4 = Disagree	

HBSC 1997/98:	RECODE	ADD HEALTH 1996:	RECODE
		5 = Strongly disagree	

Table 2

Demographic characteristics, sexual initiation, substance use, attachment to school, and positive parent communication among 15-year-olds: Prevalence and means by gender and nation

	BOYS (n=2,722)						GIRLS (n=2,902)					
	United States (n=625)	Scotland (n=616)	Finland (n=377)	France[b] (n=431)	Poland (n=673)	*p-value*[a]	United States (n=718)	Scotland (n=699)	Finland (n=421)	France (n=491)	Poland (n=573)	*p-value*[a]
Prevalence												
Family SES												
Low (%)	42.1	50.7	46.7	31.3	63.6	***	43.2	51.2	57.0	37.3	73.3	***
Medium (%)	19.0	28.3	30.2	30.4	27.0		21.9	31.0	29.9	30.4	20.2	
High (%)	38.9	21.1	23.1	38.3	9.4		35.0	17.7	13.1	32.4	6.5	
Living arrangement												
Two biologic parents (%)	58.9	77.1	75.1	76.8	86.5	***	56.0	70.7	71.0	79.6	86.9	***
Stepfamily (%)	17.4	6.8	9.3	8.4	3.0		15.6	9.4	9.5	8.4	4.4	
Single parent (%)	21.3	14.3	14.6	13.7	10.3		26.0	18.6	19.2	11.4	8.4	
Other (%)	2.4	1.8	1.1	1.2	0.3		2.4	1.3	0.2	0.6	0.4	
Sexual initiation (%)	29.6	33.1	18.0	29.9	28.2	***	30.4	36.9	26.6	20.2	11.5	***
Means (SE)												
Substance use (range -1.58 to 1.96)	-0.76 (0.04)	-0.36 (0.04)	-0.06 (0.06)	0.04 (0.05)	0.01 (0.04)	***	-0.66 (0.04)	0.43 (0.04)	0.06 (0.05)	-0.12 (0.05)	-0.35 (0.04)	***
School attachment (range -3.43 to 2.73)	0.41 (0.05)	-0.22 (0.05)	-0.72 (0.06)	-0.44 (0.06)	0.07 (0.05)	***	0.40 (0.05)	-0.08 (0.04)	-0.65 (0.05)	-0.33 (0.05)	0.03 (0.04)	***
Positive parent communication (range 0 - 1)	0.84 (0.01)	0.68 (0.02)	0.64 (0.02)	0.65 (0.02)	0.71 (0.01)	***	0.72 (0.01)	0.62 (0.01)	0.52 (0.02)	0.50 (0.02)	0.60 (0.02)	***

* p<0.05

** p<0.01

*** p<0.001

[a] Chi-square or ANOVA test for differences between countries within gender

[b] France was represented by two regions only in the 1998 HBSC.

Table 3

Sexual initiation: Associations with substance use, school attachment and positive parent communication, controlling for demographics

	DEPENDENT VARIABLE: SEXUAL INITIATION					
	Model 1: Substance Use		**Model 2: School Attachment**		**Model 3: Positive Parent Communication**	
	Boys (n=2,722) AOR[a]	**Girls (n=2,902) AOR[a]**	**Boys (n=2,722) AOR[a]**	**Girls (n=2,902) AOR[a]**	**Boys (n=2,722) AOR[a]**	**Girls (n=2,902) AOR[a]**
Family composition						
Two biologic parents	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Stepfamily	2.08***	1.73***	2.11***	2.25***	2.16***	2.15***
Single parent	1.63***	1.61***	1.52***	1.60***	1.56***	1.67***
Other	2.28*	3.97***	2.14*	3.43**	2.41**	3.37**
Family SES						
Low	1.30*	1.56**	1.18	1.32*	1.23†	1.38**
Medium	1.04	1.41*	1.03	1.19	1.03	1.20§
High	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Nation						
United States	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Scotland	0.64**	0.44***	1.15	1.25†	1.10	1.07
Finland	0.25***	0.39***	0.35***	0.66*	0.45*	0.53*
France[b]	0.69*	0.39***	0.85	0.51***	1.23	0.48**
Poland	0.60**	0.21***	1.01	0.30***	1.09	0.23***
Substance use	1.56***	2.02***	--	--	--	--
School attachment	--	--	0.81**	0.69***	--	--
Positive parent communication	--	--	--	--	0.84	0.50**
Interactions						
IV[c] × Scotland	1.47**	1.81***	0.99	1.08	1.24	1.48§
IV[c] × Finland	2.40***	1.57**	0.78†	1.12	1.36	2.05*
IV[c] × France	1.61**	1.17	0.81†	1.01	0.88	1.54
IV[c] × Poland	1.85***	1.30§	1.04	1.36†	0.96	1.63

[a] AOR = Adjusted odds ratio from multivariable logistic models; p-values reflect robust standard errors

[b] France was represented by two regions only in the 1998 HBSC.

[c] IV = independent variable

§ p<0.20

† p<0.10

* p<0.05

** p<0.01

*** p<0.001

Table 4
Independent variables' adjusted odds ratio estimates: By gender and nation

	SEXUAL INITIATION			
	Boys (n=2,722)		Girls (n=2,902)	
	AOR (95% CI)[a]	Interaction p-value[b]	AOR (95% CI)[a]	Interaction p-value[b]
Substance Use				
United States	1.56 (1.33 – 1.82)***	<.001	2.02 (1.74 – 2.35)***	<.001
Scotland	2.30 (1.86 – 2.84)***		3.65 (2.94 – 4.53)***	
Finland	3.74 (2.55 – 5.50)***		3.17 (2.40 – 4.19)***	
France[c]	2.51 (1.98 – 3.18)***		2.37 (1.91 – 2.94)***	
Poland	2.89 (2.38 – 3.50)***		2.63 (1.99 – 3.48)***	
School Attachment				
United States	0.81 (0.71 – 0.93)**	0.117	0.69 (0.61 – 0.79)***	0.415
Scotland	0.80 (0.69 – 0.94)**		0.74 (0.64 – 0.86)***	
Finland	0.63 (0.49 – 0.82)***		0.77 (0.63 – 0.94)**	
France[c]	0.66 (0.55 – 0.79)***		0.70 (0.57 – 0.86)**	
Poland	0.84 (0.73 – 0.98)*		0.94 (0.70 – 1.26)	
Positive Parent Communication				
United States	0.84 (0.50 – 1.43)	0.740	0.50 (0.34 – 0.75)**	0.300
Scotland	1.05 (0.68 – 1.63)		0.74 (0.49 – 1.12)	
Finland	1.15 (0.63 – 2.11)		1.03 (0.59 – 1.79)	
France[c]	0.74 (0.45 – 1.21)		0.77 (0.44 – 1.35)	
Poland	0.81 (0.52 – 1.25)		0.82 (0.41 – 1.63)	

* p<0.05

** p<0.01

*** p<0.001

[a] AOR = Adjusted odds ratio from multivariable logistic models with robust standard errors

[b] Joint test of significance for all interaction terms in model

[c] France was represented by two regions only in the 1998 HBSC.