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Adolescents' First Tobacco Product: Results from a Nationally Representative Survey

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Abstract

Objectives—To inform targeted prevention efforts, it is important to understand which tobacco products are used first and associations by demographic characteristics.

Methods—We conducted a nationally-representative random digit-dial telephone survey of 1125 adolescents ages 13-17. Adolescents reported the first tobacco product they tried, and we analyzed associations with demographic variables.

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Conflict of Interest Statement

The authors have no conflicts of interest to report.

Preliminary analyses of these findings were presented as a poster at the 2016 Meeting of the Society for Research on Nicotine & Tobacco.

Results—Two-hundred nineteen (18.6%) adolescents reported ever using a tobacco product. The most common first product tried was cigarettes (35.4%), followed by electronic nicotine delivery systems (24.3%), smokeless tobacco (17.7%), cigars (11.4%), and waterpipe (11.2%). Weighted multivariable logistic regression analyses showed girls were 2.7 times more likely than boys to report cigarettes as their first product, Hispanic/Latinos were 5.0 times more likely than non-Hispanic/Latinos to report cigarettes, and those whose mothers had at least a 4-year college degree were 6.1 times more likely to report waterpipe compared to those whose mothers had less than a 4-year college degree.

Conclusions—Nearly one in 5 adolescents had tried a tobacco product. Although cigarettes were the most frequently reported product, most youth initiated with a non-cigarette tobacco product, and demographic differences were found. These findings point towards potential regulatory policies, including targeted campaigns, which might deter adolescents from initiating tobacco use.

Keywords

tobacco; adolescents; e-cigarettes; waterpipe; cigars; cigarettes; smokeless

Although cigarette smoking rates have declined among youth, the use of and experimentation with non-cigarette tobacco products (NCTPs) has grown. The National Youth Tobacco Survey shows a decline of cigarette smoking rates among high school students from 15.9% in 2011 to 9.3% in 2015.¹ However, the landscape of tobacco products has changed substantially, and the decreases in cigarette smoking rates are offset by use of other tobacco products, resulting in stable rates of overall tobacco product use. In 2015, 25.3% of high school students reported current use of any tobacco product, a slight increase from 24.2% in 2011. The most substantial change in patterns of youth tobacco use have come with the advent of electronic nicotine delivery systems (ENDS), with current use increasing among high school students from 1.5% in 2011 to 16% in 2015. Waterpipe tobacco rates also have increased significantly from 4.1% in 2011 to 7.2% in 2015.¹

Youth generally have misperceptions about the relative harm of NCTPs compared to cigarettes and find these products more appealing, thus resulting in tobacco product trial.² NCTPs are generally perceived to be less harmful and less addictive than cigarette smoking³ for several reasons, including that, compared to cigarettes, they are used infrequently.⁴ Additionally, many youth think that cigars are more pure and natural than cigarettes,⁵ and that the water filters out the “bad” parts of water-pipe tobacco.⁴ Similarly, research has documented that ENDS are perceived to be less dangerous than cigarettes because some believe them to only contain water vapor and to not contain nicotine, and they come in flavors that are pleasant to inhale.^{6,7} Additionally, youth are generally not aware of the chemicals that are in ENDS and other NCTPs.⁸ Non-combustible tobacco products, such as ENDS and smokeless tobacco (SLT), are somewhat less harmful than combusted tobacco products because the tobacco is not burned.^{9–11} Although non-combustible tobacco products may be less harmful than cigarettes, they still present health risks and expose youth to nicotine, which can contribute to long-term harm to brain development and potential life-long addiction.¹² Furthermore, there is mounting evidence that those who initiate tobacco with ENDS are likely to go on to smoke combusted tobacco products.^{13,14} Additionally, the

long-term health effects associated with ENDS are still unknown. These misperceptions about the harms of NCTPs may result in increased tobacco initiation with these products rather than cigarettes.

The tobacco industry, through marketing and advertising, also has influenced youth perceptions of harm regarding NCTPs and resulted in increased use.¹⁵ Advertisements for NCTPs appear in a variety of locations, including at the point-of-sale, in print media, and on social media. There is substantial research documenting that exposure to tobacco advertising/marketing results in use for many tobacco products including cigarettes, ENDS, water-pipe tobacco, cigars, and SLT.^{16–22} Additionally, the content of many NCTP advertisements promote or imply the product as being less dangerous than cigarettes, contributing to misperceptions about the relative harm of these products compared to cigarettes. For example, waterpipe establishment websites and marketing materials promote water-pipe tobacco as safer than other tobacco products by promoting it as being *free of chemicals, smokeless, addiction-free, and safer than cigarette smoking*.^{23,24} Additionally, cigars have been promoted as being non-addictive, pure tobacco, and not as dangerous because they are not inhaled and used in moderation.²⁵

Furthermore, NCTPs are appealing because they come in a variety of flavors, unlike cigarettes, which only come as unflavored or menthol flavored. Research has shown flavors to influence youth initiation and use of tobacco products.^{4,6,28,29} Initiation of tobacco with an appealing flavored product may lead to addiction and increases risk of continued use and potential escalation to cigarettes.³⁰

Given the changing landscape of tobacco products, experimentation among adolescents also may be changing. Historically, tobacco product use began with cigarettes.^{31–33} However, the introduction and increasing use of new tobacco products, alongside decreasing cigarette rates, suggests youth may be initiating tobacco with NCTPs. There have been no recent published nationally representative data on youth's reporting of their first tobacco product tried and demographic associations of that choice. To date, data on first product have been reported for young adults both nationally and in regional cohorts, and the only data available for first tobacco product among a sample of adolescents is limited to one state in the United States (US) or was limited in the tobacco products assessed.^{31–36} Newer data using a nationally representative sample of adolescents are necessary to assess changing first tobacco products as prevalence data continues to shift.

It is imperative to understand tobacco products with which adolescents are initiating to inform specific regulatory actions and prevention efforts, including targeted communication campaigns. If we can reduce initiation of NCTPs by those who have rejected cigarettes, we could see an overall reduction in population levels of tobacco use, and, ultimately, have a large impact on reducing the burden of tobacco use. Thus, the purpose of this study was to assess first tobacco product tried and demographic associations in a national sample of adolescents.

METHODS

Sample

Data were collected using a national population-based sample of adolescents ages 13-17. Adolescents were recruited and interviewed via telephone between November 2014 and June 2015 by the Carolina Survey Research Laboratory at the University of North Carolina-Chapel Hill. To recruit adolescent participants, 3 independent and non-overlapping sampling frames were used: random digit dial landline, random digit dial cell phone, and a targeted list (non-overlapping directory-listed sample that targeted households with teenagers), resulting in approximately 98% coverage of all US households.³⁷ All adolescents ages 13-17 in a household were eligible to participate. Counties with the highest prevalence of smokers (>26.4%) and poverty (>\$38,793) were successfully oversampled. All samples were stratified by household income (4 levels) and county-level cigarette smoking rates (4 levels) obtained, using Behavioral Risk Factor Surveillance System (BRFSS) county smoking rates from 2012. Interviewers first obtained verbal consent from a parent or guardian and verbal assent from the adolescent. This resulted in a final sample of 1125 completed interviews and a weighted response rate of 66%. A standard 3-step sample procedure was conducted, and this process, along with more information about the sampling, is detailed in Boynton et al.³⁸

Measures

For all adolescents in the study, first tobacco product used was assessed with an open-ended question: "What was the first tobacco product that you ever used, even just one time?" Interviewers then selected pre-programmed tobacco products based on their response: cigarette, traditional cigar, little cigar/cigarillo, chewing tobacco, moist or dry snuff, snus, dissolvable tobacco, pipe tobacco, e-cigarette, hookah, other, or never used a tobacco product. Product descriptions and definitions were provided earlier in the phone survey when questions about novel tobacco product (e-cigarette, hookah, little cigar/cigarillo) use (lifetime and past 30 days) were asked. Product descriptions used in the phone survey appear in the Appendix. Responses selected as "other" were then back-coded by the study team into the pre-defined tobacco product categories. For analyses, we combined traditional cigar and little cigar/cigarillo into a single cigar product category; and chewing tobacco, moist or dry snuff, snus, and dissolvable tobacco were combined into a single SLT category.

Demographic characteristics included current age (13-15, 16-17), sex (female, male), race (white, non-white), ethnicity (Hispanic/Latino, non-Hispanic/Latino), sexual attraction (attracted to same sex or both sexes, opposite sex), mother's highest level of education as a proxy of socioeconomic status (SES; at least a 4-year college degree, less than a 4-year college degree), and census region (Mid-west, Northeast, West, South) to assess if there were potentially any regional differences in tobacco product initiation.

Data Analysis

All analyses used weights to reflect the probability of selection as well as a non-response adjustment. Weighted frequencies of demographic characteristics are presented by first tobacco product. For each of the 5 tobacco products (cigarettes, SLT, ENDS, cigars,

waterpipe), a weighted logistic regression model was constructed using PROC SURVEY-LOGISTIC in SAS version 9.4. For each tobacco product, odds ratios for using that product first versus any of the other tobacco products first are presented, along with 95% confidence intervals.

RESULTS

Overall, 18.6% of adolescents (N = 219) had ever tried a tobacco product. Cigarettes were the most frequently reported product first tried (35.4%, N = 76), followed by ENDS (24.3%, N = 42), SLT (17.7%, N = 44), cigars (11.4%, N = 24), water-pipe tobacco (11.2%, N = 23), and one pipe user; 9 people used a tobacco product but were not sure what their first tobacco product was. Thus, the analysis sample was N = 209. Overall, NCTPs were reported as the first tobacco product tried by 64.6% of adolescent tobacco users. The sample of adolescent users (N = 219) was 58.9% male, 85.6% white, and 7.7% black/African American. Table 1 contains weighted demographic characteristics for the analysis sample.

Multivariable logistic regression models were constructed to assess whether demographic factors were associated with first tobacco product (Table 2). We found demographic differences for initiation for each of the tobacco products. Adolescents with a higher SES (using mother's educational attainment as a proxy for SES) were significantly less likely than low SES adolescents to report experimenting with *cigarettes* as their first tobacco product (aOR = 0.3, 95% CI: 0.1-0.7). However, higher SES adolescents compared to lower SES adolescents were more likely to report initiating tobacco use with *waterpipe tobacco* (aOR = 6.1, 95% CI: 1.9-19.4). Additionally, Hispanic/Latino adolescents were 5 times more likely than non-Hispanic/Latino adolescents to report first experimenting with *cigarettes* (aOR = 5.0, 95% CI: 1.3-19.8), and females were more likely than males to report initiating tobacco use with *cigarettes* (aOR = 2.7, 95% CI: 1.3-5.6). However, females were less likely than males to report initiating tobacco with *SLT* (aOR = 0.01, 95% CI: 0.002-0.1). Additionally, nonwhite adolescents compared to white adolescents were less likely to report initiating tobacco with *SLT* (aOR = 0.07, 95% CI: 0.01, 0.6).

Adolescents living in the Northeast (aOR = 4.3, 95% CI: 1.4-13.2), Midwest (aOR = 3.2, 95% CI: 1.2-8.6), or the West (aOR = 5.5, 95% CI: 1.8-16.9) census regions compared to adolescents living in the South census region of the US were more likely to report initiating tobacco use with *ENDS*. Finally, adolescents who were ages 13-15 compared to adolescents who were ages 16-17 were less likely to initiate tobacco with *cigars* (aOR = 0.3, 95% CI: 0.1-0.9).

DISCUSSION

Using a nationally representative sample of adolescents ages 13-17, this study assessed which tobacco products were used first. Although cigarettes were the most frequently reported first tried product (35.4%), most adolescents (64.6%) initiated tobacco use with one of several types of non-cigarette tobacco products, indicating a potential shift in tobacco product initiation patterns among youth. Using data from a cohort of college students in 2010, Sutfin et al reported that the most common first tobacco product was cigarettes

(37.9%), but, similar to the current study, most young adults reported their first tobacco products were NCTPs (eg, 29.3% for cigars, 24.5% for waterpipe tobacco) and combusted tobacco products.³¹ In a national sample of young adults (ages 18-34) in 2011, 73% reported initiating tobacco with cigarettes followed by cigars (11%).³³ Similarly, from 2012-2013 data, college students reported cigarettes as their most often first product tried (50%), followed by waterpipe (24.2%).³² Thus, our study and other data strongly suggest a change in tobacco product initiation away from cigarettes and toward NCTPs, especially ENDS.

Given recent concerns about ENDS use among adolescents,¹² ENDS were reported as the most common NCTP initiated by youth (24.3%). Because of the shifting trends in tobacco product initiation among youth, and the appeal of ENDS to youth, it is imperative that longitudinal studies on ENDS use are undertaken. For instance, more research is needed to determine if ENDS use leads to use of other tobacco products. Several studies have been published assessing this association, demonstrating that those who had tried ENDS were more likely to have subsequent use of cigarettes at followup.^{13,14,39,40} However, research is needed on whether this resulted in experimentation of cigarettes, combustible tobacco products, or regular use. Additionally, it is important to examine whether adolescents who are not susceptible to cigarettes experiment with ENDS, and, subsequently move on to use of combusted tobacco products.

We also examined the association between demographic factors and first tobacco product. Several findings were similar to prevalence data on which demographic groups are more likely to use each product. For example, we found youth who reported initiating tobacco with SLT were more likely to be white and male, which reflects US prevalence data.⁴¹ Similarly, we found waterpipe tobacco was more likely to be the first product initiated by youth whose mothers had at least a college degree. Waterpipe tobacco use has been associated previously with higher education.⁴¹

We also found that youth who reported initiating tobacco with cigarettes compared to other tobacco products were more likely to be female, Hispanic/ Latino, and have mothers with less than a college education (low SES). Cigarette smoking is associated with lower income and less education, so our finding reflects prevalence data.⁴¹ Historically, Hispanics/Latinos have had low rates of tobacco use;⁴¹ however, data from the National Youth Tobacco Survey found that Hispanic youth reported higher use of tobacco than other races/ethnicities.¹ The changes in tobacco use patterns may be a result of acculturation and tobacco industry marketing.^{42,43}

The only predictor of youth initiating with ENDS was US census region, with those living in regions other than the South more likely to report ENDS as their first product. This suggests initiating with ENDS cuts across demographic categories, which may reflect product novelty and widespread curiosity.

Finally, youth who initiated with cigar products were more likely to be ages 16-17 compared to 13-15. Cigar products are sometimes used with marijuana,⁴⁴ so it may be possible that those who are initiating with cigars might be using them for marijuana, which is more common among older than younger adolescents.⁴⁵

Limitations

This study was limited by a small number of tobacco users, making it impossible to assess the relationship between first tobacco product tried and current tobacco product use. Research is needed to understand how specific first tobacco products might be associated with future use of other tobacco products. Furthermore, the cross-sectional nature of the data did not allow us to assess causes of tobacco product initiation, such as the impact of flavoring and living with family members who use tobacco products. Similarly, we were not able to collect data on reasons for initiating with a specific product, which should be a focus of future research.

IMPLICATIONS FOR TOBACCO REGULATORY SCIENCE

Our findings have implications for tobacco product regulation. One factor that all NCTPs have in common is that they come in a variety of flavors, which may explain some of the shifting trends in tobacco initiation. Research has shown that flavors influence youth initiation and use of tobacco products.^{4,6,28,29} The Food and Drug Administration (FDA) banned the use of flavors, except menthol, in cigarettes to reduce appeal to youth. It may benefit public health to ban characterizing flavors in all tobacco products to decrease appeal and, subsequently, initiation and use. Similarly, NCTPs are perceived to be less harmful and less addictive than cigarette smoking³, which is another potential explanation for why most adolescents are initiating tobacco with NCTPs. Thus, public education is needed to educate youth about the risks of these tobacco products.

Furthermore, the demographic associations with first tobacco product tried underscores the importance of targeted messaging to educate youth about the risks of all tobacco products. Public education efforts aimed at all tobacco products may help counteract the techniques that the tobacco industry has used for decades to target advertisements towards specific populations and influence consumer perceptions of harm.^{16,20,46} Previous and current national anti-tobacco campaigns, including the Truth Campaign and the FDA's "The Real Cost," have demonstrated effectiveness at reducing youth initiation of cigarettes and increasing negative attitudes towards cigarettes and cigarette companies.⁴⁷⁻⁴⁹

However, there has been little public education about the health risks of NCTPs compared to what has been implemented for cigarettes, but this area is growing. One systematic review of health communication for NCTPs⁵⁰ revealed only 6 studies that assessed the effectiveness of communication campaigns that had been implemented.⁵¹⁻⁵⁶ Only 2 of these were implemented in the US, and they were both about SLT.^{51,55} The FDA now regulates all tobacco products, so they have an opportunity and responsibility to implement policies to reduce use and to correct misconceptions about the harm of all tobacco products. We are beginning to see campaigns for NCTPs, including the FDA's "The Real Cost" for SLT aimed at reducing SLT use among rural adolescent and young adult males. Similarly, the Fresh Empire campaign was launched by the FDA in 2015 to reduce tobacco use among at-risk African-American, Hispanic, and Asian/Pacific Islander youth in the US.⁵⁷ In addition to several state- and county-level anti-ENDS campaigns, such as California's "Still Blowing Smoke" campaign, the FDA released its first ENDS campaign message targeted at youth prevention. Overall, campaigns about NCTPs are scarce, but growing, and research on the

evaluation of these campaigns remains important. Future campaigns and research should continue to assess the extent to which tailoring based on demographic factors impacts anti-tobacco message and campaign effectiveness, including impacts on attitudes and behavior, as it has been found to be effective in other areas of health communication.⁵⁸

Our study examined adolescents' first tobacco product tried using a national sample of US adolescents. Although the most frequently initiated tobacco product was cigarettes, with 35.4% youth reporting this as their first tobacco product, most youth are initiating with non-cigarette tobacco products. This reflects the continuously changing landscape and continued need for monitoring new tobacco products to continue public education efforts about the risks of all tobacco products.

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Appendix: Phone Survey Tobacco Product Definitions

Tobacco Product	Definition	Additional Information Provided if Needed
Electronic Nicotine Delivery Systems	The next few questions are about electronic or e-cigarettes and other vaping devices, such as e-hookah and vape pens. Popular brands include Blu, Vuse, NJOY, and Flavor Vapes.	These devices are battery powered and produce vapor instead of smoke. Some look like normal cigarettes, some are very colorful, and some have tanks that contain liquid.
Waterpipe	The next few questions are about smoking tobacco in a hookah, which is a waterpipe with one or more hoses. Although people sometimes smoke marijuana in a hookah, we are only asking about smoking tobacco.	A hookah is a water pipe used to smoke specially flavored tobacco called shisha. The tobacco is heated with charcoal and filtered through the water-filled body of the pipe before being inhaled through a hose. Shisha brands include Jewels, Starbuzz, and Strikingly Fresh.
Little Cigars and Cigarillos	The next few items are about little cigars and cigarillos that contain tobacco, and not marijuana. These are smaller than traditional cigars and some are even the same size as cigarettes. Popular brands are "Black & Mild" and "Swisher Sweets."	Little cigars are slightly larger than cigarettes, while cigarillos resemble full-sized cigars, but are smaller. Both contain pipe tobacco wrapped in tobacco leaves and come in flavored varieties. They are available with and without a filter and/or tip.

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Human Subjects Statement

The University of North Carolina-Chapel Hill Institutional Review Board approved this study. An NIH Certificate of Confidentiality was obtained to provide protection for participant privacy.

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Table 1

Demographic Characteristics of Adolescent Tobacco Product Users, 2014-2015

	First Tobacco Product					
	Total Sample N = 209	Cigarettes N = 76	ENDS N = 42	Cigars N = 24	Waterpipe N = 23	SLT N = 44
	N (Wt %)	N (Wt %)	N (Wt %)	N (Wt %)	N (Wt %)	N (Wt %)
Sex						
Male	123 (61.4)	30 (47.3)	23 (52.9)	17 (78.0)	10 (49.2)	43 (98.3)
Female	86 (38.6)	46 (52.7)	19 (47.1)	7 (22.0)	13 (50.8)	1 (1.7)
Race						
White	179 (78.0)	61 (67.3)	36 (78.2)	18 (72.3)	21 (87.7)	43 (96.6)
Black	16 (10.0)	7 (13.3)	3 (8.9)	6 (27.7)	0 (0.0)	0 (0.0)
Other	14 (12.0)	8 (19.4)	3 (12.9)	0 (0.0)	2 (12.3)	1 (3.4)
Ethnicity						
Hispanic/Latino	15 (10.3)	9 (19.8)	2 (6.4)	3 (9.3)	1 (5.7)	0 (0.0)
Non-Hispanic/Latino	194 (89.7)	67 (80.2)	40 (93.6)	21 (90.7)	22 (94.3)	44 (100.0)
Current Age						
13-15	77 (36.4)	30 (38.5)	16 (40.7)	5 (18.2)	9 (36.9)	17 (37.9)
16-17	132 (63.6)	46 (61.5)	26 (59.3)	19 (81.8)	14 (63.1)	27 (62.1)
Sexual Attraction						
Opposite Sex	191 (92.8)	66 (87.4)	39 (92.9)	22 (98.6)	20 (92.3)	44 (100.0)
Same Sex; Same Sex & Opposite Sex Equally	16 (7.2)	10 (12.6)	3 (7.1)	1 (14)	2 (7.7)	0 (0.0)
Mother's Education						
At Least College Degree	95 (47.5)	22 (28.5)	26 (61.7)	12 (52.0)	17 (79.6)	18 (42.1)
Less Than College Degree	112 (52.5)	53 (71.5)	16 (38.3)	12 (48.0)	6 (20.4)	25 (57.9)
Census Region						
South	109 (38.1)	47 (44.5)	11 (16.9)	13 (45.0)	12 (36.6)	26 (51.0)
Midwest	42 (17.3)	12 (15.9)	12 (20.1)	4 (13.9)	3 (12.0)	11 (21.7)
Northeast	29 (17.9)	5 (7.8)	9 (23.1)	5 (27.3)	4 (21.0)	6 (22.9)
West	29 (26.7)	12 (31.7)	10 (39.9)	2 (13.8)	4 (30.4)	1 (4.4)

Note.

Wt % = weighted percent

Table 2

Multivariable Logistic Regression of Demographic Factors Associated with First Tobacco Product

Predictors	Cigarettes aOR (95% CI)	ENDS aOR (95% CI)	SLT aOR (95% CI)	Cigars aOR (95% CI)	Waterpipe aOR (95% CI)
Female vs Male	2.7 (1.3, 5.6)	1.8 (0.8, 4.2)	0.01 (0.002, 0.1)	0.5 (0.2, 1.5)	1.6 (0.6, 4.5)
Age: 13-15 vs 16-17	0.9 (0.4, 2.0)	1.4 (0.6, 3.1)	2.1 (0.9, 4.9)	0.3 (0.1, 0.9)	1.0 (0.4, 2.9)
Non-white vs White	1.9 (0.7, 5.3)	1.1 (0.4, 3.3)	0.07 (0.01, 0.6)	2.6 (0.7, 9.4)	0.6 (0.1, 2.9)
Hispanic/Latino vs Not	5.0 (1.3, 19.8)	0.3 (0.1, 2.0)	n/a	0.7 (0.1, 5.2)	0.6 (0.1, 6.8)
Sexual Attraction: SS/OS vs OS	1.8 (0.4, 7.7)	1.0 (0.2, 3.8)	n/a	0.3 (0.02, 2.8)	1.5 (0.4, 6.4)
Mother 4 Year Degree vs < 4 Year	0.3 (0.1, 0.7)	1.6 (0.7, 3.8)	0.5 (0.2, 1.3)	1.4 (0.5, 3.6)	6.1 (1.9, 19.4)
Census Region					
Midwest vs South	0.8 (0.3, 1.8)	3.2 (1.2, 8.6)	1.0 (0.4, 2.6)	0.7 (0.2, 2.3)	0.5 (0.1, 1.6)
Northeast vs South	0.3 (0.1, 0.8)	4.3 (1.4, 13.2)	0.7 (0.2, 2.3)	1.2 (0.3, 5.1)	1.1 (0.3, 4.2)
West vs South	0.9 (0.3, 2.8)	5.5 (1.8, 16.9)	0.09 (0.01, 0.6)	0.3 (0.04, 2.3)	1.0 (0.3, 3.9)

Note.

For sexual attraction, SS/OS = attracted to same sex only or same sex and opposite sex equally; OS= only attracted to opposite sex

Bold indicates statistical significance, $p < .05$