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# Are homeschooled adolescents less likely to use alcohol, tobacco, and other drugs?

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ABSTRACT

*Background:* Nearly two million school-aged children in US are currently homeschooled. This study seeks to examine homeschooled adolescents' attitudes toward, access to, and use of alcohol, tobacco, and other drugs (ATOD) compared to their non-homeschooled peers.
*Methods:* The study uses data between 2002 and 2013 from the National Survey on Drug Use and Health (NSDUH) for school-attending respondents aged 12–17 ($n$ = 200,824). Participants were questioned regarding peer use of licit and illicit substances, ease of accessing illicit substances, and past 12-month substance use. Survey adjusted binary logistic regression analyses were systematically executed to compare non-homeschooled adolescents with homeschooled adolescents with respect to views toward, access to, and use of substances.
*Results:* Findings indicate that homeschooled adolescents were significantly more likely to strongly disapprove of their peers drinking (AOR = 1.23) and trying (AOR = 1.47) and routinely using (AOR = 1.59) marijuana. Homeschooled adolescents were significantly less likely to report using tobacco (AOR = 0.76), alcohol (AOR = 0.50), cannabis (AOR = 0.56) and other illicit drugs and to be diagnosed with an alcohol (AOR = 0.65) or marijuana (AOR = 0.60) use disorder. Finally, homeschooled adolescents were also less likely to report easier access to illicit drugs and to be approached by someone trying to sell drugs compared to non-homeschooled peers.
*Conclusions:* Homeschooled adolescents' views, access, use and abuse of ATOD are uniquely different from those of non-homeschooled adolescents. Findings point to the need to more extensively examine the underlying mechanisms that may account for these differences.


## 1. Introduction

More than 1.7 million school-age children, or 3.4% of the school-age population, are currently homeschooled in the United States (U.S. Department of Education, 2013). The number of homeschooled children has been steadily increasing over the past decade. While 1.7% of the school-age population was homeschooled in 1999, 2.2% of school-age children and 2.9% of school-age children were homeschooled in 2003 and 2007, respectively (U.S. Department of Education, 2008). On average, homeschooled children tend to live in rural or suburban areas, are White, and have parents with some college experience or a bachelor's degree (U.S. Department of Education, 2013). Additionally, a higher percentage of children from near-poor families are homeschooled than children from poor or non-poor families (U.S. Department of Education, 2010).

According to findings from the National Household Education Surveys Program (U.S. Department of Education, 2013), the most important reasons why adolescents are home-schooled include parental concerns about the school environment, such as safety, drugs, or negative peer pressure, dissatisfaction with academic instruction at other schools, and a desire to provide religious instruction. Additional research converges with these results. Collom (2005), in particular, examined parental motivators for homeschooling among 235 homeschooling parents, and the most important reasons included concerns about the public schooling experience and the ability to provide additional support and quality schooling for adolescents at home. Among a group of 136 parents of

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homeschooled children, Green and Hoover-Dempsey (2007) identified important motivators for homeschooling one's children to include parental views that they are primarily responsible for their child's educational outcomes and beliefs that they have the time and skills to effectively homeschool.

Prior research has examined a variety of behavioral and health outcomes among homeschooled adolescents in the United States. In particular, a review by Medlin (2000) found measures of self-concept and self-esteem to be similar between home and non-homeschooled adolescents. Additionally, homeschooled adolescents have been found to exhibit no significant differences in problem behaviors than non-homeschool adolescents (Valdez, 2005). Furthermore, homeschooled adolescents are significantly less likely than non-homeschooled adolescents to visit a health care professional annually and to have received the HPV vaccine, but no difference between these two groups has been found with health insurance coverage, receipt of annual dental care, and vaccination for meningitis and tetanus (Cordner, 2012).

Research on social outcomes for homeschooled adolescents remains mixed. Some evidence suggests that homeschooled adolescents have fewer close social connections than non-homeschooled adolescents (Chatham-Carpenter, 1994) while also engaging in less volunteerism (Hill and den Dulk, 2013). However, other research has found homeschooled adolescents to be involved in a similar number of extracurricular activities and to have similar social skills as their non-homeschooled peers (Kunzman and Gaither, 2013). Moreover, Lopez-Haugen (2006) found homeschooled adolescents to have higher social skills ratings than their non-schooled peers while findings from Reavis and Zakriski (2005) suggest home-schooled children have similar number of close friends and friendship quality as non-schooled children. However, research also suggests that the socialization experience of adolescents varies based on schooling. In particular, homeschooled adolescents have been found to interact with adults more frequently (Murphy, 2014) and to have greater involvement with religiously inclined adults (Thomson, 2014) than their non-homeschooled peers. Additionally, Thomson (2014) found homeschooled adolescents to have fewer drug-using and deviant peers than publically schooled adolescents.

The differential socialization experiences of homeschooled versus non-homeschooled adolescents can have significant implications on substance use outcomes. In particular, fewer substance using friends may reduce homeschooled adolescents' access and use of alcohol, tobacco, and other drugs (ATOD) (Barnes et al., 2006; Ennett et al., 2006; Branstetter et al., 2011). Additionally, similar to studies of the protective effects of adult supervision (Aizer, 2004; Na et al., 2014), additional time spent with adults may also influence attitudes toward ATOD (Barnes et al., 2006; Ennett et al., 2006; Bahr et al., 2005; Branstetter et al., 2011). Prior research by Thomson (2014) offers support that homeschooled adolescents engage in less substance use than non-homeschooled adolescents, although religious ties was an important moderator in this relationship. While the odds of drinking were higher among non-homeschooled adolescents, group differences were non-significant once religious variables were included. Similar results were found by Green-Hennessy (2014), in which 3% of homeschooled adolescents with strong religious ties had a substance use disorder compared to 6% of religious non-homeschooled students and 15% of homeschooled non-religious adolescents. These findings are consistent with research by Salas-Wright et al. (2012), who observed more religious adolescents to participate in less substance use behavior.

Despite the contributions of previous research, however, several important shortcomings should be noted. Particularly, reviews of the homeschooling literature have consistently cited a lack of high-quality empirical research to adequately assess homeschooling outcomes (Kunzman and Gaither, 2013; Murphy, 2014; Lubienski et al., 2013; Isenberg, 2007). In fact, half of the literature mentioned previously had small sample sizes or utilized convenience samples unrepresentative of the general population (Valdez, 2005; Chatham-Carpenter, 1994; Lopez-Haugen, 2006; Reavis and Zakriski, 2005; Collom, 2005), limiting inferences that can be made from these findings. Additionally, much of the homeschooling research consists of qualitative research or highly flawed quantitative methods (Kunzman and Gaither, 2013). As Kunzman and Gaither (2013) explain, homeschooling research studies "suffer from serious design limitations and are often used disingenuously to make generalizations beyond what their specific conclusions warrant." Further, homeschooling research is heavily biased as studies are frequently published and supported by homeschooling advocacy groups, who utilize the data to influence families and policymakers (Lubienski et al., 2013).

The present study employs data from a large and long-running population-based study (National Survey on Drug Use and Health [NSDUH]) of adolescents in the United States between 2002 and 2013 to address limitations in prior research such as sampling bias and an overall lack of generalizability. The research base is also understandably focused toward academic and social outcomes of homeschooled students and as a result has neglected to consider the potential impact of homeschooling on risky behaviors such as substance use. While homeschooled adolescents do indeed have contact with non-homeschooled peers – an important source of substance use initiation – the differential socialization and demographic patterns suggest that homeschooled adolescents may be at substantially reduced risk with regard to substance use than adolescents who attend a school. As such, we hypothesize that homeschooled, compared to non-homeschooled, adolescents will report significantly different attitudes toward and reduced access to and use of ATOD.

## 2. Material and methods

Study findings are based on data from the NSDUH between 2002 and 2013. The NSDUH provides population estimates of substance use and health-related behaviors in the U.S. general population. It utilizes multistage area probability sampling methods to select a representative sample of the U.S. civilian, non-institutionalized population aged 12 years or older. A more detailed description of the NSDUH design and procedures is available elsewhere (SAMHSA, 2011). The current study restricted analyses to school-attending respondents between the ages of 12 and 17 ($n$ = 200,824).

### 2.1. Measures

*2.1.1. Homeschool status.* Respondents were classified as homeschooled (0 = no, 1 = yes) on the basis of the following question: "Some parents decide to educate their children at home rather than send them to school. Have you been home-schooled at any time during the past 12 months?" Youth who reported not attending any type of school in the past 12 months were coded as missing and excluded from all statistical analyses.

*2.1.2. Substance use views.* Respondents were asked about their views on people their age regularly using licit and illicit substances. Consistent with the coding structure suggested by SAMHSA in the NSDUH codebook, youth reporting strong disapproval were coded as 1 and all other youth (i.e., "neither approve nor disapprove" or "somewhat disapprove") coded as 0. This analytic approach is consistent with recent studies highlighting the importance of strong disapproval with respect to adolescent substance use (Salas-Wright et al., 2015).

**Table 1**
Sociodemographic characteristics of homeschooled adolescents ages 12–17 in the United States.

| | Have you been home-schooled at any time during the past 12 months? | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | No (*n* = 199,503; 99.32%) | | Yes (*n* = 1321; 0.68%) | | Unadjusted | | Adjusted | |
| Sociodemographic factors | % | 95% CI | % | 95% CI | OR | (95% CI) | AOR | (95% CI) |
| *Age* | | | | | | | | |
| 12–14 years | 47.96 | (47.67–48.26) | 53.65 | (49.98–57.28) | **1.26** | **(1.08–1.45)** | **1.25** | **(1.08–1.45)** |
| 15–17 years | 52.04 | (51.74–52.33) | 46.35 | (42.72–50.02) | 1.00 | | 1.00 | |
| *Gender* | | | | | | | | |
| Female | 48.88 | (48.58–49.17) | 50.34 | (46.68–53.99) | 1.00 | | 1.00 | |
| Male | 51.12 | (50.83–51.42) | 49.66 | (46.01–33.32) | 0.94 | (0.81–1.09) | 0.95 | (0.81–1.10) |
| *Race/ethnicity* | | | | | | | | |
| Non-Hispanic white | 60.81 | (60.51–61.10) | 67.01 | (63.32–70.50) | 1.00 | | 1.00 | |
| African-American | 14.06 | (13.86– 14.26) | 10.67 | (8.58–13.19) | **0.69** | **(0.54–0.88)** | **0.53** | **(0.41–0.68)** |
| Native American/Alaska native | 0.56 | (0.52–0.60) | 0.55 | (0.31–0.98) | 0.90 | (0.50–1.60) | 0.71 | (0.40–1.27) |
| Asian | 4.53 | (4.38–4.68) | 2.35 | (1.29–4.24) | **0.47** | **(0.25–0.87)** | **0.45** | **(0.24–0.82)** |
| Multi-racial | 2.10 | (2.02–2.17) | 1.49 | (0.96–2.30) | 0.64 | (0.41–1.01) | **0.57** | **(0.36–0.90)** |
| Hispanic | 17.95 | (17.71–18.21) | 17.93 | (15.03–21.26) | 0.91 | (0.73–1.12) | **0.73** | **(0.58–0.91)** |
| *Household income* | | | | | | | | |
| <$20,000 | 16.12 | (15.91–16.34) | 22.61 | (19.66–25.86) | **2.03** | **(1.63–2.53)** | **2.46** | **(1.95–3.12)** |
| $20,000–$49,999 | 31.61 | (31.34–31.89) | 35.84 | (32.41–39.42) | **1.64** | **(1.34–1.99)** | **1.82** | **(1.49–2.23)** |
| $50,000–$74,999 | 18.47 | (18.25–18.69) | 18.18 | (15.63–21.05) | **1.42** | **(1.14–1.78)** | **1.47** | **(1.17–1.85)** |
| >$75,000 | 33.79 | (33.52–34.07) | 23.37 | (20.37–26.66) | 1.00 | | 1.00 | |

Note: Adjusted odds ratios adjusted for adjusted for age, gender, race/ethnicity, and household income.
Odds ratios and confidence intervals in bold are statistically significant.

*2.1.3. Access to illicit substances.* Youth were asked about the difficulty or ease of accessing a variety of illicit substances. Consistent with the coding structure suggested by SAMHSA in the NSDUH codebook, those reporting that it would be "fairly easy" or "very easy" were coded as 1 and youth reporting greater difficulty in accessing drugs (i.e., "fairly difficult", "very difficult", "impossible") were coded as 0. Youth were also asked if they had been approached by someone who intended to sell them an illegal drug in the previous 30 days. Youth responding affirmatively were coded as 1 and all other youth coded as 0.

*2.1.4. Substance use.* Dichotomous (0 = no, 1 = yes) substance use measures included past 12-month use of tobacco, alcohol, cannabis, cocaine/crack, ecstasy, hallucinogens, inhalants, stimulants, and tranquilizers. In order to ensure model stability, only substances with a prevalence of greater than 1% in the general population of youth were included in statistical analyses. Categorizing substance use variables invariably places limitations on the information that can be gleaned in particular statistical analyses. We elected to draw a clear distinction between those who use substances (i.e., one use or more) versus those who do not (i.e., abstainers). This approach is consistent with the recent NSDUH-based studies on substance use among adolescents (Edlund et al., 2015; Salas-Wright et al., 2014) as well as with primary prevention programs focused on preventing drug use initiation (Botvin and Griffin, 2007). We also examined measures of alcohol, cannabis, and "other" illicit drug (e.g., cocaine, hallucinogens, etc.) disorders (either abuse or dependence) based on criteria from the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) criteria (American Psychiatric Association, 2000). The NSDUH measures of substance use disorders are based on a battery of questions related to core DSM diagnostic criteria (e.g., unable to cut down or stop using substance, continued to use substance, even though it was causing problems, etc.). Prior research suggests that these measures of substance use disorders have good validity and reliability (Grucza et al., 2007; Jordan et al., 2008)

*2.1.5. Sociodemographic factors.* The following demographic variables were used: age (i.e., 12–14 years, 15–17 years), gender (female, male), race/ethnicity (i.e., non-Hispanic white, African-American, American Indian/Alaska native, Asian, persons reporting more than one race, and Hispanic), and total annual family income (i.e., less than $20,000; $20,000–$49,999; $50,000–$74,999; $75,000 or greater).

### 2.2. Statistical analyses

Binary logistic regression analyses were systematically executed to compare non-homeschooled adolescents with homeschooled adolescents with respect to sociodemographic characteristics, substance use views and access to illicit substances, and past 12 month substance use and substance use disorders. All analyses were conducted while controlling for sociodemographic factors, including age, gender, race/ethnicity, and household income. Our analyses were survey adjusted. This system implements a Taylor series linearization to correct standard errors of estimates for complex survey sampling design effects including those found in clustered data. Odds ratios (ORs) and 95% confidence intervals (CIs) are presented to reflect association strength. ORs were considered statistically significant if associated confidence intervals did not include cross 1.0. Weighted prevalence estimates and standard errors were computed using Stata 13.1 SE software (StataCorp, 2013).

## 3. Results

### 3.1. Sociodemographic characteristics of homeschooled adolescents in the United States

As illustrated in Table 1, adolescents who are homeschooled are significantly more likely to be early adolescents (AOR = 1.25, 95% CI = 1.08–1.45) and to reside in households earning less than $75,000 per year. Compared to non-Hispanic whites, homeschooled adolescents are significantly less likely to be African-American (AOR = 0.53, 95% CI = 0.41–0.68), Asian (AOR = 0.45, 95% CI = 0.24–0.82), multiracial (AOR = 0.57, 95% CI = 0.36–0.90), or Hispanic (AOR = 0.73, 95% CI = 0.58–0.91). No significant differences were identified between homeschooled and non-homeschooled adolescents with respect to gender.

**Table 2**
Substance use views among homeschooled adolescents in the United States.

| | *Have you been home-schooled at any time during the past 12 months?* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | No (*n* = 199,503; 99.32%) | | Yes (*n* = 1321; 0.68%) | | Unadjusted | | Adjusted | |
| | % | 95% CI | % | 95% CI | OR | (95% CI) | AOR | (95% CI) |
| **How do you feel about someone your age:** | | | | | | | | |
| *Smoking one or more packs of cigarettes a day?* | | | | | | | | |
| Somewhat disapprove | 23.62 | (23.37–23.87) | 24.66 | (21.57–28.04) | 1.00 | | 1.00 | |
| Strongly disapprove | 76.38 | (76.13–76.63) | 75.34 | (71.96–78.43) | 0.94 | (0.79–1.12) | 0.97 | (0.82–1.16) |
| *Having one or two drinks of an alcoholic beverage nearly every day?* | | | | | | | | |
| Somewhat disapprove | 30.38 | (30.12–30.66) | 26.39 | (23.22–29.2) | 1.00 | | 1.00 | |
| Strongly disapprove | 69.62 | (69.34–69.88) | 73.61 | (70.18–76.78) | **1.22** | **(1.03–1.44)** | **1.23** | **(1.03–1.46)** |
| *Trying marijuana or hashish once or twice?* | | | | | | | | |
| Somewhat disapprove | 34.37 | (34.09–34.65) | 25.95 | (22.74–29.43) | 1.00 | | 1.00 | |
| Strongly disapprove | 65.63 | (65.35–65.91) | 74.05 | (70.57–77.26) | **1.49** | **(1.25–1.78)** | **1.47** | **(1.22–1.77)** |
| *Using marijuana once a month or more?* | | | | | | | | |
| Somewhat disapprove | 35.55 | (35.27–35.83) | 25.51 | (22.31–29.00) | 1.00 | | 1.00 | |
| Strongly disapprove | 65.45 | (64.17–64.73) | 74.49 | (71.00–77.69) | **1.61** | **(1.35–1.92)** | **1.59** | **(1.32–1.92)** |

Note: Adjusted odds ratios adjusted for adjusted for age, gender, race/ethnicity, and household income. "Somewhat disapprove" category also includes feelings of ambivalence. Odds ratios and confidence intervals in bold are statistically significant.

### 3.2. Are homeschooled adolescents more likely to disapprove of substance use?

As shown in Table 2, compared to non-homeschooled adolescents, homeschooled adolescents are significantly more likely to report strong disapproval of adolescent alcohol use (AOR = 1.23, 95% CI = 1.03–1.46) as well as trying (AOR = 1.47, 95% CI = 1.22–1.77) and routinely using (AOR = 1.59, 95% CI = 1.32–1.82) marijuana. Notably, no significant association was observed with respect to homeschooled status and strong disapproval of an adolescent smoking one or more packs of cigarettes per day.

### 3.3. Does homeschool status impact access to illicit substances?

Table 3 shows the odds ratios for the relationship between homeschooled status and perceived ease of access to the illicit substances. Compared to non-homeschooled adolescents, homeschooled adolescents were significantly less likely to report easy access to marijuana (AOR = 0.38, 95% CI = 0.32–0.46), cocaine (AOR = 0.81, 95% CI = 0.67–0.98), and crack (AOR = 0.76, 95% CI = 0.61–0.94). Notably, as evidenced by the nonoverlapping 95% confidence intervals, the effects for marijuana access were significantly greater than those of cocaine and crack. No significant relationship was identified between homeschooled status and access to LSD. Homeschooled adolescents were also significantly less likely to report having been approached by someone selling illegal drugs in the past 30 days (AOR = 0.43, 95% CI = 0.33–0.57).

### 3.4. Are homeschooled adolescents less likely to use tobacco, alcohol, and illicit drugs?

As presented in Table 4, controlling for age, gender, race/ethnicity, and household income, homeschooled adolescents are significantly less likely than non-homeschooled adolescents

**Table 3**
Perceived ease of access to illicit substances and drug offers among homeschooled adolescents in the United States.

| | *Have you been home-schooled at any time during the past 12 months?* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | No (*n* = 199,503; 99.32%) | | Yes (*n* = 1321; 0.68%) | | Unadjusted | | Adjusted | |
| | % | 95% CI | % | 95% CI | OR | (95% CI) | AOR | (95% CI) |
| **How difficult or easy would it be for you to get some:** | | | | | | | | |
| *Marijuana* | | | | | | | | |
| Impossible/very difficult/fairly difficult | 48.08 | (47.78–48.38) | 69.26 | (65.65–72.64) | 1.00 | | 1.00 | |
| Fairly easy/very easy | 51.92 | (51.62–52.22) | 30.74 | (27.36–34.35) | **0.41** | **(0.35–0.48)** | **0.38** | **(0.32–0.46)** |
| *Cocaine* | | | | | | | | |
| Impossible/very difficult/fairly difficult | 77.91 | (77.66–78.16) | 81.67 | (78.74–84.28) | 1.00 | | 1.00 | |
| Fairly easy/very easy | 22.09 | (21.84–22.34) | 18.33 | (15.72–21.26) | **0.79** | **(0.66–0.95)** | **0.81** | **(0.67–0.98)** |
| *Crack* | | | | | | | | |
| Impossible/very difficult/fairly difficult | 77.13 | (76.88–77.38) | 81.89 | (78.60–84.78) | 1.00 | | 1.00 | v |
| Fairly easy/very easy | 22.87 | (22.62–23.12) | 18.11 | (15.22–21.40) | **0.74** | **(0.60–0.92)** | **0.76** | **(0.61–0.94)** |
| *LSD* | | | | | | | | |
| Impossible/very difficult/fairly difficult | 85.16 | (84.94–85.37) | 87.67 | (85.07–89.87) | 1.00 | | 1.00 | |
| Fairly easy/very easy | 14.84 | (14.63–15.06) | 12.33 | (10.13–14.93) | 0.81 | (0.65–1.01) | 0.83 | (0.66–1.04) |
| **Drug offers** | | | | | | | | |
| *In the past 30 days, has anyone approached you to sell you an illegal drug?* | | | | | | | | |
| No | 85.02 | (84.81–85.23) | 93.03 | (91.05–94.60) | 1.00 | | 1.00 | |
| Yes | 14.98 | (14.77–15.19) | 6.97 | (5.40–8.95) | **0.42** | **(0.32–0.56)** | **0.43** | **(0.33–0.57)** |

Adjusted odds ratios adjusted for age, gender, race/ethnicity, and household income.
Odds ratios and confidence intervals in bold are statistically significant.

**Table 4**
Substance use characteristics of homeschooled adolescents the United States.

| | *Have you been home-schooled at any time during the past 12 months?* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | No (*n* = 199,503; 99.32%) | | Yes (*n* = 1321; 0.68%) | | Unadjusted | | Adjusted | |
| | % | 95% CI | % | 95% CI | OR | (95% CI) | AOR | (95% CI) |
| **Substance use (last 12 months)** | | | | | | | | |
| *Tobacco* | | | | | | | | |
| No | 80.10 | (79.87–80.33) | 83.53 | (80.83–85.93) | 1.00 | | 1.00 | |
| Yes | 19.90 | (19.67–20.13) | 16.47 | (14.07–19.17) | **0.79** | **(0.66–0.95)** | **0.76** | **(0.63–0.93)** |
| *Alcohol* | | | | | | | | |
| No | 68.16 | (67.88–68.43) | 80.55 | (77.62–83.18) | 1.00 | | 1.00 | |
| Yes | 31.84 | (31.57–32.12) | 19.45 | (16.82–22.38) | **0.52** | **(0.43–0.62)** | **0.50** | **(0.42–0.60)** |
| *Cannabis* | | | | | | | | |
| No | 85.65 | (85.44–85.85) | 91.37 | (89.14–93.17) | 1.00 | | 1.00 | |
| Yes | 14.35 | (14.15–14.56) | 8.63 | (6.83–10.86) | **0.56** | **(0.44–0.73)** | **0.56** | **(0.43–0.73)** |
| *Cocaine/crack* | | | | | | | | |
| No | 98.68 | (98.61–98.74) | 98.87 | (97.75–99.43) | 1.00 | | 1.00 | |
| Yes | 1.32 | (1.26–1.39) | 1.13 | (0.57–2.25) | 0.86 | (0.43–1.72) | 0.84 | (0.42–1.69) |
| *Ecstasy* | | | | | | | | |
| No | 98.52 | (98.44–98.59) | 99.37 | (98.78–99.68) | 1.00 | | 1.00 | |
| Yes | 1.48 | (1.41–1.56) | 0.63 | (0.32–1.22) | **0.42** | **(0.21–0.82)** | **0.41** | **(0.21–0.81)** |
| *Hallucinogens* | | | | | | | | |
| No | 97.15 | (97.05–97.24) | 98.21 | (97.18–98.87) | 1.00 | | 1.00 | |
| Yes | 2.85 | (2.76–2.95) | 1.79 | (1.13–2.82) | **0.62** | **(0.39–0.99)** | **0.61** | **(0.38–0.98)** |
| *Inhalants* | | | | | | | | |
| No | 96.22 | (96.11–96.33) | 96.63 | (95.07–97.71) | 1.00 | | 1.00 | |
| Yes | 3.78 | (3.67–3.89) | 3.37 | (2.29–4.92) | 0.89 | (0.60–1.32) | 0.84 | (0.56–1.26) |
| *Stimulants* | | | | | | | | |
| No | 98.28 | (98.21–98.36) | 98.97 | (97.93–99.49) | 1.00 | | 1.00 | |
| Yes | 1.72 | (1.64–1.79) | 1.03 | (0.51–2.07) | 0.60 | (0.29–1.21) | 0.58 | (0.29–1.19) |
| *Tranquilizers* | | | | | | | | |
| No | 97.99 | (97.90–98.07) | 98.40 | (97.27–99.07) | 1.00 | | 1.00 | |
| Yes | 2.01 | (1.93–2.10) | 1.60 | (0.93–2.73) | 0.79 | (0.46–1.37) | 0.75 | (0.43–1.30) |
| **Substance use disorders (abuse/dependence)** | | | | | | | | |
| *Alcohol* | | | | | | | | |
| No | 94.97 | (94.85–95.10) | 96.68 | (95.08–90.78) | 1.00 | | 1.00 | |
| Yes | 5.03 | (4.90–5.15) | 3.32 | (2.22–4.92) | **0.65** | **(0.43–0.98)** | **0.65** | **(0.43–0.98)** |
| *Cannabis* | | | | | | | | |
| No | 96.38 | (96.27–96.49) | 97.79 | (96.45–98.63) | 1.00 | | 1.00 | |
| Yes | 3.62 | (3.51–3.73) | 2.21 | (1.37–3.55) | **0.60** | **(0.37–0.98)** | **0.60** | **(0.37–0.98)** |
| *Other illicit drugs* | | | | | | | | |
| No | 98.17 | (98.09–98.25) | 97.91 | (96.77–98.65) | 1.00 | | 1.00 | |
| Yes | 1.83 | (1.75–1.91) | 2.09 | (1.35–3.23) | 1.15 | (0.73–1.80) | 1.09 | (0.69–1.71) |

Note: Adjusted odds ratios adjusted for age, gender, race/ethnicity, and household income.
Odds ratios and confidence intervals in bold are statistically significant.

to report use of tobacco (AOR = 0.76, 95% CI = 0.63–0.93), alcohol (AOR = 0.50, 95% CI = 0.42–0.60), and cannabis (AOR = 0.56, 95% CI = 0.43–0.73). Notably, no significant differences were observed with respect to crack/cocaine, inhalants, stimulants, or tranquilizers; however, homeschooled adolescents were significantly less likely to have used ecstasy (AOR = 0.41, 95% CI = 0.21–0.81), and hallucinogens (AOR = 0.61, 95% CI = 0.38–0.98). Given that some illicit drug use outcomes have a rather low prevalence among homeschooled youth, we also ran supplementary analyses (not shown) to examine the prevalence of "illicit drug use" (i.e., illicit drugs excluding marijuana) as well as results of a multivariate logistic regression equation for this composite measure of illicit drug use. Results of these logistic regression analyses revealed that homeschooled adolescents (Prevalence = 6.22%, 95% CI = 4.76–8.09) were significantly less likely than their non-homeschooled counterparts (Prevalence = 7.97%, 95% CI = 7.82–8.13) to report having used one or more illicit drugs in the previous 12 months (AOR = 0.74, 95% CI = 0.55–0.98). With respect to substance use disorders, homeschooled adolescents were significantly less likely to have met criteria for alcohol (AOR = 0.65, 95% CI = 0.43–0.90) and cannabis (AOR = 0.60, 95% CI = 0.37–0.98) use disorders, but no significant association was observed for other illicit drug use disorders.

We also examined the degree to which the link between homeschool and substance use is invariant across early and late adolescence (see Fig. 1). To estimate the significance of the differences in use between early and late adolescents, we used logistic regression to examine the association between homeschool status and substance use among the early and late adolescent subsamples while controlling for social demographic factors. Specifically, conducted analyses in which we specify homeschool status as the dependent variable and include substance use – tobacco, alcohol, marijuana, other illicit drugs – as an independent variable along with gender, race/ethnicity, and household income. Independent regression analyses were conducted for early and late adolescents. Although the association between homeschool status and tobacco use was significant for early (AOR = 0.63, 95% CI = 0.44–0.91) but not late (AOR = 0.83, 95% CI = 0.66–1.05) adolescents, the overlapping 95% confidence intervals suggest that the magnitude of

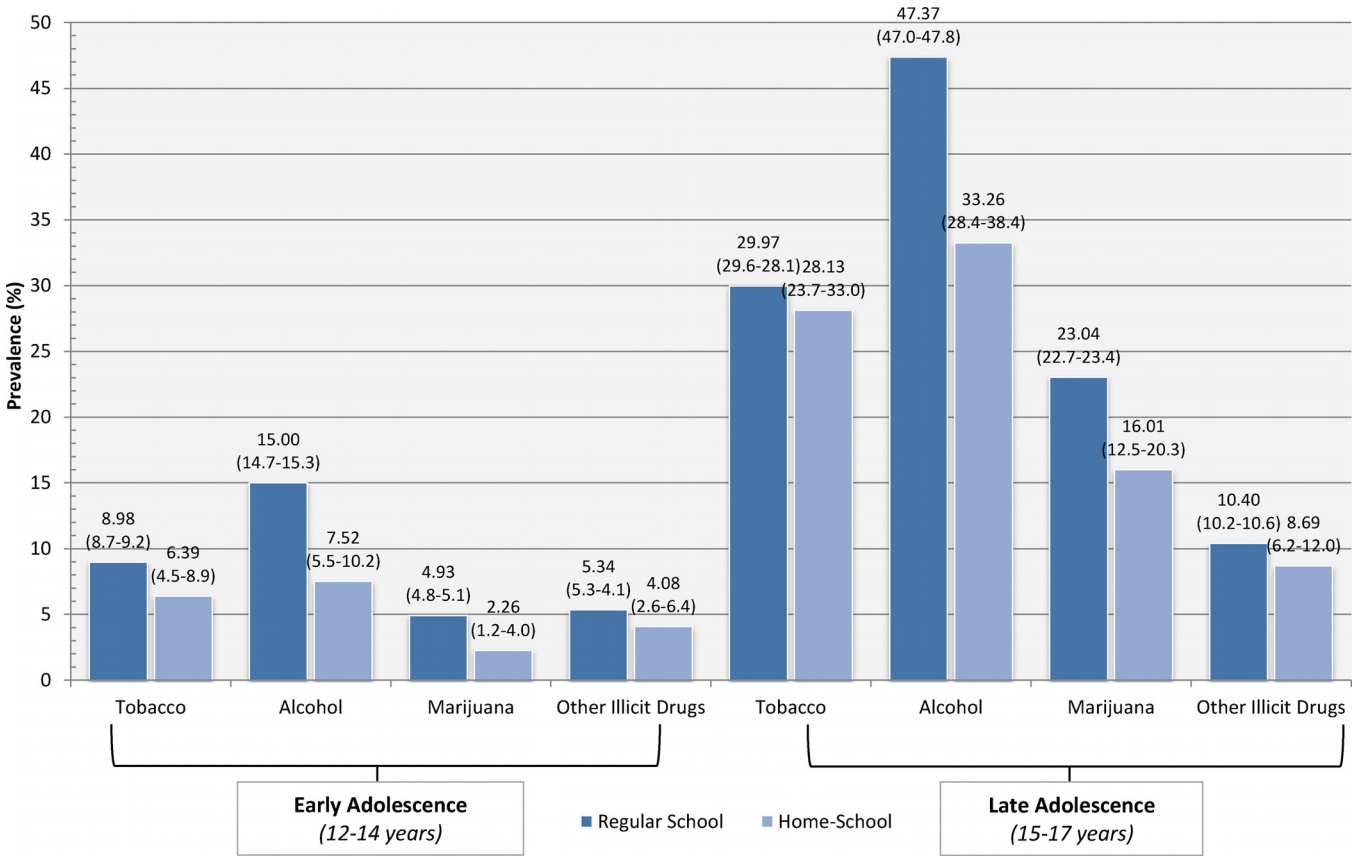


**Fig. 1.** Prevalence of last 12-months substance use among home-schooled and non-homeschooled adolescents by developmental subgroups.

the association between homeschool status and tobacco use is not significantly different among these subgroups. Across both developmental subgroups, homeschooled adolescents were significantly less likely to use alcohol (early adolescent: AOR = 0.44, 95% CI = 0.31–0.61; late adolescent: AOR = 0.54, 95% CI = 0.43–0.68) and marijuana (early adolescent: AOR = 0.42, 95% CI = 0.23–0.77; AOR = 0.60, 95% CI = 0.45–0.80) than their non-homeschooled peers. As evidenced by overlapping 95% confidence intervals, the magnitude of the relationship between homeschool status and substance use was not significantly greater among early than late adolescents.

## 4. Discussion

There are an increasing number of students being homeschooled – at present, almost 2 million children are homeschooled in the United States. Indeed, homeschooling seems to have gone mainstream and is fairly well accepted; however, homeschooling continues to remain contentious as it is driven largely by ideological and values-based arguments with little rigorous research to support or debunk the numerous claims of positive and negative effects of homeschooling on a variety of adolescent outcomes. Given the increasing number of students being homeschooled, and the sparse research on effects of homeschooling, research is needed to better understand characteristics of students that are homeschooled compared to those educated in conventional school settings. Given the different socialization experiences and demographic background of homeschooled adolescents, we hypothesized that adolescents who are homeschooled may be at substantially reduced risk for substance use than non-home schooled adolescents. Using a large, population-based study, we examined differences in attitudes, access, and use of tobacco, alcohol and illicit substances by adolescents that are homeschooled compared to non-homeschooled adolescents. Results indicate that there are indeed differences between homeschooled and non-homeschooled students in all three areas; however, findings were not consistent across all types of substances examined.

In terms of how adolescents viewed peers who smoke, drank or used marijuana, adolescents who were homeschooled were more likely to disapprove of their peers drinking and, to a greater extent, more likely to disapprove of trying and using marijuana. Homeschooled adolescents, however, were not more likely to disapprove of smoking. It appears that a large proportion of adolescents across both groups strongly disapprove of smoking, which could be due to the longstanding and ongoing public campaigns against smoking and regulations and taxes imposed upon the tobacco industry that could account for the similarly high rates of disapproval of smoking across both groups (Farrelly et al., 2013; Tworek et al., 2010). In terms of views of peers using alcohol and trying and using marijuana, which have not had the same extent and consistency of public service campaigns across the United States, the differences in the disapproval of alcohol and marijuana among homeschooled adolescents may be a function of the characteristics associated with the types of families that homeschool and the characteristics of homeschooled adolescents and their homeschooled peers (Medlin, 2013). Or it could simply be a product of less variability in the data due to potentially greater homogeneity in the homeschooled population. More research on the reasons for why homeschooled youth are more likely to disapprove of alcohol and marijuana compared to non-homeschooled adolescents is needed.

Homeschooled adolescents were also less likely to report easier access to marijuana, cocaine, and crack and less likely to be approached by someone trying to sell drugs compared to non-homeschooled peers. Moreover, homeschooled adolescents were less likely to report using alcohol, marijuana, ecstasy and hallucinogens as well as less likely to report alcohol or marijuana abuse or dependence than their non-homeschooled peers.

While there is little research on parental behaviors and peer groups among homeschooled adolescents, particularly compared to non-homeschooled adolescents, differences in access, use and abuse of these substances may be a function of several factors. First, homeschooling parents may be more likely to homeschool because they want to tailor their child's socialization experiences, provide greater structure, and limit the amount of exposure to negative influences and increase positive supports and socialization experiences. Some reports suggest that parents choose to homeschool to provide more religious or moral instruction, but also increasingly because parents want to provide a safer environment for their adolescents where they will be less likely to be exposed to sex, drugs and violence and to strengthen parent–child bonds (Kunzman and Gaither, 2013; Ray, 2011). Indeed, as poor parental supervision and monitoring and greater exposure to substance using friends have been linked to substance use among adolescents (Kiesner et al., 2010), greater levels of parental involvement and supervision and more control over peer groups and contexts in which peers socialize could account for the lower access and use of substances among homeschooled youth compared to conventionally schooled youth. In fact, Groover and Endsley (1988) found homeschooled parents motivated to homeschool by personal beliefs were more authoritarian and restrictive of children's television watching than parents of non-homeschooled children. Future studies are needed to better examine whether the ideological reasons parents choose to homeschool and the assumed benefits of homeschooling hold for non-academic outcomes under close empirical examination. Moreover, future research is needed to parse out the potential effects of parental monitoring, peer group influences, and religious ties on substance access and use amongst homeschooled versus non-homeschooled adolescents. Also utilizing the NSDUH, Green-Hennessey found religious ties to moderate the relationship between schooling type and substance use disorder, and further research should consider the role of religion and other moderating variables on the variety of substance use behaviors.

### 4.1. Limitations

Several limitations should be kept in mind in the interpretation of our study results. First, self-report measures were necessarily relied upon. As such, the usual threats of over and under-reporting of behavior are present. Moreover, although the sample is large and nationally representative, causal determinations cannot be made due to the cross-sectional nature of the data source. It is also possible that – while beneficial in terms of maximizing the analytic sample and increasing statistical power – pooling responses from multiple survey years may have masked potential trend differences between 2002 and 2013 (Salas-Wright et al., 2015). The NSDUH also treats homeschooling as if it were a dichotomous construct (i.e., homeschool versus not homeschooled); however, this conceptualization overlooks the fact that increasingly varied models are currently being used such as virtual online charter schools and other non-traditional educational modalities. Further, the NSDUH estimate for homeschooled adolescents (0.68%) is below that of estimates made by the US Department of Education (2.2–3.4%). This may be due to limitations in the NSDUH sampling frame and should be highlighted as a potential limitation. Finally, we lack important details regarding homeschool experience and cannot assume uniformity in social network experiences that may serve as a pathway to initiation and ongoing use of substances.

### 4.2. Conclusions

Research on homeschooling, particularly related to non-academic outcomes, is sparse and much of the extant research is limited to small convenience samples and qualitative methods. This study contributes to the literature by examining homeschooled adolescents' views, access, use and abuse of tobacco, alcohol, marijuana and other illicit drugs compared to non-homeschooled adolescents using a large nationally representative sample. While causal relationships cannot be established, the significant differences between homeschooled versus non-homeschooled adolescents in regards to substance use is important and points to the need to more extensively examine the underlying mechanisms that may account for these differences. There are a number of theoretical mechanisms that could account for these differences, such as characteristics, values and beliefs of homeschooling families and adolescents, differences in the nature of the parent–child relationship, differences in peer group structure and context, and perhaps genetic differences. Future research could examine mediating and moderating factors that may account for these differences.

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## Role of contributors

M. Vaughn conceptualized the study, Salas-Wright led the statistical analyses, and M. Vaughn, Kremer, Maynard, Roberts, and S. Vaughn contributed writing. All authors have read the manuscript and approve of its submission to Drug and Alcohol Dependence.

## Conflict of interest

No conflict declared.

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