



Cigarette, alcohol, and marijuana use among adolescents in foster family homes

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ABSTRACT

Data from a cross-sectional study conducted in a random sample of children who were placed in foster family homes were used to examine the prevalence and associated factors of substance use (i.e., cigarette, alcohol, and marijuana), and to explore if adolescents in foster family homes had different rates of substance use than those in the general population matched on age, gender and race/ethnicity. Logistic regression models were used to determine factors associated with substance use and McNemar tests were used to compare prevalence rates of substance use. Substance use was common among adolescents in foster family homes. A higher number of placement settings were significantly associated with current cigarette use (odds ratio [OR], 1.32; 95% confidence interval [CI], 1.09–1.60), and being placed in special study homes (i.e., fictive kin) was significantly associated with current marijuana use (OR, 6.43; 95% CI, 1.40–29.52). Compared to adolescents in the general population, those in foster family homes had lower rates of current alcohol (9.1% vs. 38.3%, $p < 0.0001$) and marijuana (13.6% vs. 29.7%, $p = 0.005$) use. No significant difference was observed for current cigarette use (18.2% vs. 11.5%, $p = 0.08$). More research is needed to confirm the lower rate of current substance use in foster family homes than those matched in the general population, and to explore why adolescents in special study homes were more vulnerable to marijuana use.

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1. Introduction

Substance use including cigarette, alcohol and marijuana among adolescents is a serious concern due to its prevalence and associated negative consequences such as poor academic performance, unemployment in adulthood, physical and mental health problem as well as delinquency (Hassan *et al.*, 2009; Hodder *et al.*, 2011; Squeglia, Jacobus, & Tapert, 2009). According to results from the 2013 National Survey on Drug Use and Health, among adolescents aged 12–17 years, current use of tobacco, alcohol and marijuana was 8%, 12%, and 7%, respectively (Substance Abuse and Mental Health Services Administration [SAMHSA], 2014). In another national study, the Youth Risk Behavior Survey (YRBS), among high school students in the U.S., 41% had ever tried cigarette smoking, and 16% were current cigarette users; 66% had ever had at least one drink of alcohol during their life, and 35% were current alcohol users; 41% had ever used marijuana and 23% were current marijuana users (Kann *et al.*, 2014).

Compared to those in the general population, adolescents in foster care have been generally considered to be particularly vulnerable to substance use (Braciszewski & Stout, 2012; Gramkowski *et al.*, 2009; Pilowsky & Wu, 2006; Thompson & Auslander, 2007; Thornberry, Ireland, & Smith, 2001). For example, a study using data from the 2000 National Household on Drug Abuse found that adolescents with a history of foster care placement were almost twice as likely (34% vs. 18%) to use illicit drugs in the 12 months prior to the interview, when compared to those without a history of foster care placement (Pilowsky & Wu, 2006). In a nationally representative study of youth in child welfare, the National Survey on Child and Adolescent Well Being, avoiding foster care placement was associated with a 57% reduction of odds of illicit substance use (Traube, James, Zhang, & Landsverk, 2012).

Most previously published studies that have investigated substance use among adolescents in foster care, however, either focused on adolescents with a history of foster care or did not have a comparison group. Only a few studies have examined and compared substance use among adolescents currently placed in foster family homes (Kohlenberg, Nordlund, Lowin, & Treichler, 2002; McDonald, Mariscal, Yan, & Brook, 2014). Using the Communities That Care Normative database, McDonald and his colleagues compared the prevalence of drug and alcohol use and abuse among 1442 adolescents who were living with at least one foster parent with 282,826 non-foster adolescents

Abbreviations: CI, confidence interval; DCF, Department of Children and Families; FHQSS, Foster Home Quality and Satisfaction Survey; OR, odds ratio; SAMHSA, Substance Abuse and Mental Health Services Administration; SD, standard deviation; YRBS, Youth Risk Behavior Survey.

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(McDonald et al., 2014). They found that while the two groups of adolescents had a similar prevalence of alcohol use, the foster adolescents were more likely to use cigarettes (28% vs. 15%) and marijuana (20% vs. 12%) in the past 30 days. In a study conducted among 231 adolescents who were placed in foster family homes at the time of survey and a representative sample of 1259 adolescents living with their biological parents, adolescents in foster family homes had a lower rate of alcohol use during the past 30 days than those in the general population (13% vs. 19%); both groups of adolescents had a similar rate of marijuana use (Kohlenberg et al., 2002). The lower rate of current substance use is inconsistent with findings from the McDonald et al. study as well as other studies (mainly conducted among adolescents who were formerly in care) that demonstrated higher rates of use. Another study compared substance abuse/dependence in a sample of 188 adolescents to results from the National Comorbidity Survey (Pecora, Jensen, Romanelli, Jackson, & Ortiz, 2009a; Pecora, White, Jackson, & Wiggins, 2009b; White, Havalchak, Jackson, O'Brien, & Pecora, 2007). The study showed mixed results (e.g., foster youth having a higher rate of alcohol dependence but a lower rate of drug abuse than youth in the general population).

More research that uses a well-designed comparison group is needed to examine substance use among adolescents currently in foster care. In addition, it is surprising that very few studies have examined the relationship between foster care related factors (e.g., length of time in care and placement stability) and substance use, given the significant impact of foster care on adolescents who are placed in the system (Braciszewski & Stout, 2012). This relationship also needs to be further investigated and studied.

The present study specifically examined cigarette, alcohol and marijuana use in a random sample of adolescents who were placed in foster family homes. Cigarette, alcohol and marijuana are the most frequently used substances in adolescents, and adolescents who have not used these rarely use other drugs (Bernstein et al., 2003; Leslie, 2008; Tonmyr, Thornton, Draca, & Wekerle, 2010). It is for these reasons that the present study particularly examined the use of these three substances. Specifically, the present study aimed to answer the following questions: (1) what was the prevalence of cigarette, alcohol and marijuana use among adolescents in foster family homes? (2) were placement related factors associated with substance use? (3) did adolescents in foster family homes have different rates of substance use, compared to adolescents in the general population? The corresponding hypotheses were: (1) substance use including cigarette, alcohol and marijuana among adolescents in foster family homes was common; (2) placement related factors were associated with substance use; and (3) adolescents in foster family homes had a higher rate of substance use than those in the general population.

2. Methods

During the period from January to July of 2015, Connecticut Foster Home Quality and Satisfaction Survey (FHQSS), a cross-sectional study among a random sample of foster children aged 8 years and older was conducted to collect information regarding the quality of and satisfaction with services provided by the state child welfare agency and state funded community providers. This was done by using face-to-face interviews for all participants and supplemental self-administered questionnaires specifically for foster children aged 13 years and older that they filled out confidentially by themselves after their interview. The supplemental questionnaire sought responses about prosocial activities and risky behaviors including substance use. To ensure the confidentiality of the survey, the survey data could be identified only by a participant ID that was created specifically for this survey. The link between participant ID and participant's name was kept by a manager who did not have access to the survey data. This link was used to connect participants' related information (e.g., age, gender, race/ethnicity, history of child abuse and neglect as well as placement related information) and

their answers. One reason for a focus on youth in foster family homes, as opposed to foster youth in other living situations such as congregate care is because foster home placement is the preferred form of placement for children in out-of-home care. Moreover, given the recent interest in reducing the use of congregate care in child welfare, the proportion of children living in foster family homes continuously increases. Nationally, of children in foster care, children in congregate care decreased from 18% in 2004 to 14% in 2013 (U.S. Department of Health and Human Services, Administration on Children, Children's Bureau, 2015). In Connecticut, about 82% children in foster care live in foster family homes, 13% in congregate care and 5% in independent living units in 2015.

The study was reviewed and approved by the Connecticut Department of Children and Families' (DCF) Institutional Review Board. Written informed consent was obtained from foster youth aged 18 years and older; legal permission for foster children aged 8–17 years was obtained from an employee of the DCF who was assigned to the case as a case-worker, supervisor or manager, prior to the attainment of children's assent for participation.

2.1. Sample of foster children

A total number of 414 children were randomly selected from about 1200 children who were aged 8 years and older, and were placed in foster family homes (i.e., core [non-related, non-kin] foster care, relative care or special study [fictive kin] foster care) for at least 90 days. Of the 414 randomly selected children, 225 (54%) agreed and participated in the FHQSS. The main reasons for not participating in the survey included no response/unable to contact the selected children through their foster parent ($n = 68$), youth's refusal to participate ($n = 45$), case closed/youth moved ($n = 29$), mental health concern/cognitive limitation/non-verbal ($n = 21$), language barrier ($n = 9$), runaway ($n = 5$), and various other reasons ($n = 12$). Of the 225 children who participated in the FHQSS, 148 were aged 13 years and older and were offered the opportunity to participate in the supplemental survey. Of these 148 children aged 13 years and older, 147 took the supplemental self-administered survey that asked about substance use. There were no statistically significant differences in age, gender, race/ethnicity, type of placement, length of time in care and number of placement settings between adolescents aged 13 years and older at the time of sampling who participated in the survey and those who were invited but did not participate in the survey.

It should be noted here that different sample sizes were used to answer the three research questions in order to maximize statistical power. Answers to the first two research questions, ([1] what was the prevalence of cigarette, alcohol, and marijuana use among adolescents in foster family homes? [2] were placement related factors associated with substance use?), were based on information from the 147 adolescents who took the supplemental self-administered questionnaire, of whom 113 were high school students at the time of survey. Information from these 113 high school students in foster family homes was used to answer the third question, ([3] did adolescents in foster care have different rates of substance use, compared to adolescents in the general population?), because comparison data about students below 9th grade in the general population were not available.

2.2. Matched controls

To answer the third research question, ([3] did adolescents in foster care have different rates of substance use, compared to adolescents in the general population?), a matched group of non-foster care adolescents ($n = 113$) were randomly selected from the database of the 2013 Connecticut YRBS. YRBS was conducted among a random sample of 2405 high school students in Connecticut between February and June 2013 through an anonymous, self-administered questionnaire. Of the 2405 YRBS students, 35 reported living with foster parent and

thus were excluded from the random selection procedure. The two groups of high school students (foster home vs. non-foster home) were matched on age (by year), gender and race/ethnicity (non-Hispanic white, non-Hispanic black, any Hispanic and others). These three variables were selected for matching due to two reasons. First, variations of cigarette, alcohol and marijuana use have been identified across different age, gender and racial/ethnic groups for adolescents in the general population and foster care population (SAMHSA, 2014; Goncy & Mrug, 2013; Kann et al., 2014; McDonald et al., 2014). Second, demographic composition for foster care population differs from the general population. Without matching on these variables, the different substance use between youth in foster care and youth in the general population could be simply explained by different demographic composition. In observational studies, matching and regression are two primary methods for controlling confounding. Matching was used here because of two main reasons: (1) matching allows a direct comparison of prevalence rates rather than odds in logistic regression, and (2) it is difficult to control bias from the combination of unweighted data (FHQSS data) with weighted data (YRBS data) for regression analysis. Of the 113 pairs of high school students, only one adolescent (aged 13 years, boy, other race) in a foster care placement did not have an exact match in the YRBS database. This child was randomly matched to another child (14 years, boy, other race).

2.3. Measures

The supplemental questionnaire of FHQSS included questions about cigarette, alcohol and marijuana use extracted directly from Connecticut YRBS for high-school students that the State of Connecticut has conducted periodically for almost a decade. Using the exact questions allowed comparisons between students in foster family homes and students in the general population. Any respondents who ever tried cigarette smoking (even one or two puffs) were classified as having a history of cigarette use. Similarly, those who ever had a drink of beer, wine, or liquor were classified as having a history of alcohol use, and those who ever used marijuana were classified as having a history of marijuana use. Current cigarette, alcohol and marijuana use were defined as smoking cigarette(s), having at least one drink of alcohol, and using marijuana, at least one day during the past 30 days, respectively.

Four placement related factors were examined for their associations with substance use: type of placement, length of time in care, level of care and number of placement settings. Type of placement refers to the placement setting at the time of survey. In Connecticut, placement settings include core foster care, relative care, special study care, group home, residential care, shelter care, independent living, trial home visit, DCF facilities, safe home, and medical complex programs. Given that the present study focused on adolescents from foster family homes, three types of placement (i.e., core foster homes, relative foster homes, and special study foster homes) were included.

Core foster home refers to a family setting where care is provided by adults not related or kin to the adolescent and/or family members or not familiar and/or involved with the adolescent and/or the adolescent's family and who are licensed and monitored by the state child welfare agency. Relative foster home refers to a family setting where care is provided by paternal or maternal relatives when children are under the placement care and responsibility and/or custody of the state child welfare agency. Special study foster home refers to a family setting where care is provided by fictive kin, i.e., adults not related by blood but with whom the adolescent and/or the adolescent's family are familiar such as school teachers and coaches when the adolescent is under the placement care and responsibility and/or custody of the state child welfare agency.

Level of care refers to the continuum of care for family settings that spans regular foster homes and varying intensity of therapeutic foster homes. Therapeutic foster care is therefore a "higher" level of foster family care provided to children and adolescents with severe mental,

emotional, or behavioral health needs. Contracted private child placing agencies license and monitor therapeutic foster families and the children and youth and their foster families receive additional and more intensive clinical and other interventions and services. It was indicated whether adolescents were ever in therapeutic foster care.

Length of time in care refers to the length of time in months since children's most recent removal from their homes and entry/re-entry into foster care. Number of placement settings refers to the total number of settings in which the child has been placed since their most recent removal and entry/re-entry into foster care. The number of placement settings is a key indicator of placement stability (Akin, 2011). These placement related factors have been observed to be related to different outcomes (e.g., reunification, adoption, runaway, mental health and even early adult labor market participation and income) among children ever in foster care (Akin, 2011; Fallesen, 2013; Smith, 2003).

2.4. Statistical analysis

Logistic regression was used to determine factors associated with current cigarette, alcohol and marijuana use. Given the relatively small sample size, only variables with a p -value less than 0.20 in the simple logistic regression were entered into the multiple logistic regression and a backward selection procedure was then used to determine the final model by sequentially eliminating covariates that were not significant. A series of McNemar tests were conducted to compare prevalence rates of cigarette, alcohol and marijuana use between high school students in foster family homes and those in the general population matched on age, gender and race/ethnicity. McNemar test is a nonparametric statistical test similar to the chi-square test but designed for use with dependent data, and is the best known test to compare two proportions estimated from paired observations (Levin & Serlin, 2000; McNemar, 1947). The significance level was defined as $p < 0.05$ (2-tailed test). All statistical analyses were performed using SAS (version 9.4, SAS Institute Inc., Cary, NC).

3. Results

3.1. The results for research question #1: What was the prevalence of cigarette, alcohol and marijuana use among adolescents in foster family homes?

Of the 147 adolescents in foster family homes who took the supplemental self-administered questionnaire, the average age was 15.6 (standard deviation [SD] = 1.6, ranging from 13–18) years old, about half were male, and nearly two-fifths were non-Hispanic whites (Table 1). About three-fourths lived in core foster homes with an average length of 44.3 (SD = 34.9) months in care and average 2.9 (SD = 2.3) placement settings since their most recent removal.

The prevalence rates of having ever used cigarettes, alcohol and marijuana were 40.1%, 39.9%, and 38.8%, respectively; the prevalence rates of current use of cigarette, alcohol and marijuana were 15.3%, 7.0%, and 10.6%, respectively. The prevalence of having ever used cigarette, alcohol, or marijuana was 53.1%, and the prevalence of any current use of cigarette, alcohol, or marijuana was 19.3%. Of adolescents who had a history of cigarette use, 89.1% had ever smoked a whole cigarette. The proportion of missing data was low for each outcome, ranging from 2.0% to 5.4%.

3.2. The results for research question #2: Were placement related factors associated with substance use?

Table 2 shows that in the unadjusted models, adolescents at older age and with a higher number of placement settings were more likely to currently use cigarettes. In the final adjusted model, these two factors remained significant. With every increase in the number of placement

Table 1
Characteristics of adolescents in foster family homes and use of cigarettes, alcohol, and marijuana (N = 147).

Characteristics and use of substance	Mean (median, SD) or n/N (%)
Age	15.6 (16.0, 1.6)
Male gender	72/147 (49.0%)
Race/ethnicity	
Non-Hispanic white	56/147 (38.1%)
Non-Hispanic black	42/147 (28.6%)
Any Hispanic	34/147 (23.1%)
Other	15/147 (10.2%)
History of maltreatment	
Sexual abuse	18/147 (12.2%)
Physical abuse but no sexual abuse	19/147 (12.9%)
Neglect, no physical and sexual abuse	88/147 (59.9%)
No maltreatment	22/147 (15.0%)
Type of placement	
Core foster home	111/147 (75.5%)
Relative foster home	26/147 (17.7%)
Special study home	10/147 (6.8%)
Receiving therapeutic foster care service	75/147 (51.0%)
Length of time in care since most recent removal (months)	44.3 (31.1, 34.9)
Number of placement settings	2.9 (2.0, 2.3)
Any ever use of cigarettes, alcohol, or marijuana	77/145 (53.1%)
Cigarette use (ever)	57/142 (40.1%)
Alcohol use (ever)	57/143 (39.9%)
Marijuana use (ever)	54/139 (38.8%)
Any current use of cigarettes, alcohol, or marijuana	28/145 (19.3%)
Cigarette use (current)	22/144 (15.3%)
Alcohol use (current)	10/143 (7.0%)
Marijuana use (current)	15/141 (10.6%)

settings, the odds of current use of cigarette increased by 32% (odds ratio [OR], 1.32; 95% confidence interval [CI], 1.09–1.60, $p < 0.01$).

The number of current users of alcohol was too small (10 of 143) to reach any statistical significance, even for the effect of age on current alcohol use (OR, 1.71; 95% CI, 1.00–2.95; $p = 0.05$).

Table 3 shows that in the unadjusted models, older age, a higher number of placement settings and being in special study homes were significantly associated with current use of marijuana. In the final adjusted model, the odds of current use of marijuana among adolescents

Table 2
Odds ratios and 95% confidence intervals for factors associated with current use of cigarettes (N = 144).

Characteristics	Unadjusted OR (95% CI)	p value	Adjusted OR (95% CI)	p value
Age	2.06 (1.34–3.16)	<0.01	2.04 (1.32–3.15)	<0.01
Male gender	0.86 (0.35–2.14)	0.75	–	–
Race/ethnicity				
Non-Hispanic white	Reference group			
Non-Hispanic black	0.45 (0.13–1.56)	0.21		
Any Hispanic	1.12 (0.38–3.28)	0.84		
Other	0.31 (0.04–2.62)	0.28		
History of maltreatment				
Sexual abuse	1.45 (0.42–5.06)	0.56		
Physical abuse but no sexual abuse	0.28 (0.04–2.29)	0.24		
Neglect, no physical/sexual abuse	Reference group			
No maltreatment	0.80 (0.21–3.08)	0.75		
Type of placement				
Core foster home	Reference group			
Relative foster home	0.51 (0.11–2.36)	0.38		
Special study home	3.88 (0.98–15.28)	0.05		
Having therapeutic foster care service	0.97 (0.39–2.40)	0.94		
Months since most recent removal	1.01 (0.99–1.02)	0.35		
Number of placement settings	1.30 (1.10–1.55)	<0.01	1.32 (1.09–1.60)	<0.01

in special study homes were more than 6 times (OR, 6.43; 95% CI, 1.40–29.52; $p = 0.02$) of those in core foster homes. Adjusting for significant covariates, a higher number of placement settings were no longer significantly associated with current use of marijuana.

3.3. The results for research question #3: Did adolescents in foster family homes have different rates of substance use, compared to adolescents in the general population?

Given that data on cigarette, alcohol and marijuana use were not available for students below 9th grade in the general population, the present study compared substance use between 113 adolescents in foster family homes who were also high school students and 113 adolescents in the general population matched on age, gender and race/ethnicity. Of the 113 adolescents in foster family homes, 61 (54.0%) were female and 52 (46.0%) were male. The mean age was 16.2 (SD = 1.2) years, ranging from 13 to 18 years old. Their race/ethnicity composition was 40% non-Hispanic white ($n = 45$), 28% non-Hispanic black ($n = 32$), 20% any Hispanic origin ($n = 23$) and 12% other categories ($n = 13$) such as Asian and multiracial American.

Compared to matched high school students in the general population, high school students in foster family homes were less likely to currently use alcohol (9.1% vs. 38.3%, $p < 0.0001$) and marijuana (13.6% vs. 29.7%, $p = 0.005$), as well as less likely to have a lifetime history of alcohol use (47.3% vs. 61.9%, $p = 0.02$, Table 4). There were no statistically significant differences in the rates of current cigarette smoking (18.2% vs. 11.5%, $p = 0.08$) as well as a lifetime history of marijuana use (46.3% vs. 43.6%, $p = 0.52$) between the two groups. The lifetime history of cigarette use had not been collected in the Connecticut YRBS and thus was not able to be compared with adolescents in foster family homes.

4. Discussion

More than half of the adolescents in foster family homes had used cigarettes, alcohol or marijuana sometime during their life time, and nearly one fifth were current users. This prevalence of use is not unexpected based on previous research, though it is difficult to make more meaningful comparisons across studies because of differences in age,

Table 3
Odds ratios and 95% confidence intervals for factors associated with current use of marijuana (N = 141).

Characteristics	Unadjusted OR (95% CI)	p value	Adjusted OR (95% CI)	p value
Age	1.98 (1.20–3.25)	<0.01	1.91 (1.14–3.20)	0.01
Male gender	0.90 (0.31–2.64)	0.85	–	–
Race/ethnicity				
Non-Hispanic white	Reference group			
Non-Hispanic black	0.35 (0.07–1.80)	0.21		
Any Hispanic	1.24 (0.36–4.30)	0.73		
Other	0.48 (0.05–4.24)	0.51		
History of maltreatment				
Sexual abuse	1.81 (0.44–7.53)	0.41		
Physical abuse but no sexual abuse	0.50 (0.06–4.19)	0.52		
Neglect, no physical/sexual abuse	Reference group			
No maltreatment	0.89 (0.18–4.46)	0.89		
Type of placement				
Core foster home	Reference group		Reference group	
Relative foster home	0.42 (0.05–3.46)	0.42	0.76 (0.09–3.20)	0.80
Special study home	6.47 (1.56–26.83)	0.01	6.43 (1.40–29.52)	0.02
Having therapeutic foster care service	0.82 (0.28–2.40)	0.72	–	–
Months since most recent removal	1.01 (1.00–1.03)	0.07	–	–
Number of placement settings	1.24 (1.01–1.52)	0.04	–	–

Table 4

Comparisons of cigarette, alcohol and marijuana use between a random sample of high school adolescents in foster family homes and a matched group of general high school adolescents ($N = 113$ pairs).

Substance use	Foster home	Non-foster home	McNemar's statistic (S), DF, p -value
Cigarette smoking			
Ever	49/110 (44.5%)	Not available	$S = 3.00$, $DF = 1$, $p = 0.08$
Current	20/110 (18.2%)	13/113 (11.5%)	
Alcohol drinking			
Ever	52/110 (47.3%)	70/113 (61.9%)	$S = 5.12$, $DF = 1$, $p = 0.02$
Current	10/110 (9.1%)	41/107 (38.3%)	$S = 21.43$, $DF = 1$, $p < 0.0001$
Marijuana use			
Ever	50/108 (46.3%)	48/110 (43.6%)	$S = 0.42$, $DF = 1$, $p = 0.52$
Current	15/110 (13.6%)	33/111 (29.7%)	$S = 8.00$, $DF = 1$, $p = 0.005$

gender and race/ethnicity distributions for each study. An unexpected but interesting finding is that adolescents in special study (fictive kin) homes were more likely to currently use marijuana than those in core (non-related, non-kin) foster homes. One of the primary purposes for placing youth in special study foster homes (care provided by fictive kin, i.e., adults involved with or familiar to the child and/or his or her family but not related by blood) is to support youth engagement and listening to youth's voices regarding where and with whom they would choose to live and maintain connections, when relative foster care is not available or not in the best interest of the child. Without further research, it is difficult to assess the underlying causes for the observed difference, though several possibilities could be considered. For example, the Brook et al. work showed that characteristics of foster youth's peer climate were the strongest agents of risk and protection for substance use (Brook, Rifkenbark, Boulton, Little, & McDonald, 2014). Adolescents in special study foster homes usually live in the same community and tend to maintain pre-foster care placement connections with their peers as well as other risky contexts, which may facilitate their access to and use of marijuana. Whether adolescents in special study homes receive a different level of monitoring by their foster parents, whether special study foster homes have more unmet needs compared to core foster care homes, and whether training requirements vary for special study foster homes as opposed to core foster homes also must be examined. It should be noted that the present study only included 10 adolescents in special study foster homes and thus the observed association should be explored further. A more in-depth look at marijuana use with a larger sample size of these adolescents is needed.

The present study is one of the few studies that have specifically examined the role of placement-related factors on adolescents' substance use. In addition to the association between being placed in special study homes and current marijuana use, the present study demonstrates that adolescents with a higher number of placement settings (indicator of placement instability) were more likely to use cigarettes. This is consistent with previous research that suggests placement-related factors may play a role in substance use among adolescents (Aarons et al., 2008; Guibord, Bell, Romano, & Rouillard, 2011; Stott, 2012). As shown in this study, placement instability is common among adolescents in foster care (Kim, Pears, & Fisher, 2012; Wulczyn, Kogan, & Harden, 2003). A longitudinal study using a sample of 729 children who entered continuous foster care in the National Survey of Child and Adolescent Well-Being found that placement instability could increase the risk of behavior problems by as high as 63% (Rubin, O'Reilly, Luan, & Localio, 2007). Adolescents with placement instability may use substances to cope with feelings of disconnection and hopelessness during different placements (Stott, 2012). Evidence from a pretest–posttest randomized control trial conducted among 121 children who were in foster care and identified as having a serious emotional disturbance within six months of entering foster care has suggested that the increased stability could lead to improved social-emotional well-being (Akin, Byers, Lloyd, & McDonald, 2015). The maintenance of placement stability among children in foster care has long been a central focus of child welfare agencies and different approaches have been used

to reduce placement instability (Blakey et al., 2012). When a placement change is unavoidable, child welfare agencies should provide services to address the detrimental effect of such a change on the overall well-being of adolescents including substance use.

A novel finding of the present study is that adolescents in foster family homes had lower prevalence rates of current substance use than those in the general population. This finding seems contradictory to the prevailing belief regarding the vulnerability of substance use among adolescents with a history of foster care, for which possible explanations have been proposed. For instance, biological parents of adolescents with a history of foster care are more likely to use substance, and parental use of substance could result in adolescent substance use (Chassin, Pillow, Curran, Molina, & Barrera, 1993; Pilowsky & Wu, 2006). In addition, adolescents in foster care may also cope with their traumatic experiences through substance use (Afifi, Henriksen, Asmundson, & Sareen, 2012; Tonmyr et al., 2010). Adolescents with a history of maltreatment have been found to perceive more benefits (e.g., reducing tension, increasing feelings of power, feeling good about self and having fun) from substance use than those without this history (Tonmyr et al., 2010). The status of substance use during their care in foster family homes, however, is likely the result of a balance between risk (e.g., previous traumatic experiences) and protective (e.g., foster care system including foster parents) influences (Brook et al., 2014). The child welfare agency has the responsibility to place children with foster parents who can provide safe and nurturing homes, as well as to supervise those placements. Protective influences of the foster care system may include the following aspects: (1) increased monitoring from foster parents (Stattin & Kerr, 2000; Steinberg, Fletcher, & Darling, 1994), (2) increased consultant/treatment for substance abuse and other mental health problems, and (3) improved nurturing environment (e.g., drug-free) of foster families (White et al., 2007). Therefore, more substance use is possible after adolescents leave the foster care system due to the absence of protective influences of foster care. This possibility is supported by a study in which youth who reunified with their biological families after placement in foster care showed more substance use than youth who did not reunify (Taussig, Clyman, & Landsverk, 2001). These protective influences of the foster care system may also explain the finding of lower substance use in adolescents currently in foster family homes than those in the matched general population.

Although the present study has important strengths such as the use of a random sample of adolescents currently in foster care and a group of matched controls from a random sample of the general population, several limitations should be considered in interpreting the findings of the study. First and foremost, the measures of cigarette, alcohol and marijuana use are self-reported and thus may be subject to recall bias and social desirability bias. For example, adolescents may not be able to recall substance use that occasionally occurred years ago and thus history of lifetime substance use may be underestimated. The current substance use is unlikely subject to recall bias since it was defined as any use during the past 30 days. It may, however, be vulnerable to social desirability bias because adolescent substance use is viewed as socially

proscribed behavior. In the present study, social desirability bias should have been reduced because a self-administered questionnaire was used in both FHQSS and Connecticut YRBS. One concern remains about the possibility of differential social desirability bias between adolescents in foster care and those in the general population. Unless objective testing is applied, it is unlikely to completely rule out social desirability bias for self-reported substance use. Secondly, the relatively small sample size may have resulted in a failure to detect a difference in the prevalence of cigarette smoking between the two groups of adolescents. It is possible that given a larger sample size, adolescents in foster family homes may demonstrate a statistically significant higher level of cigarette smoking than those in the general population. Thirdly, due to the unavailability of the information, the comparisons have not controlled for the effects of environmental factors such as community characteristics and school contexts which have been found to affect adolescent substance use (Mayberry, Espelage, & Koenig, 2009). However, we would expect the observed difference for alcohol and marijuana use between youth in foster care and the matched youth in the general population to be larger because, if environmental effects had been taken into consideration, the matched youth in the general population would be more likely from the disadvantaged communities. Other limitations include the somewhat limited generalizability of the results and the stringent definition of the history of cigarette use. The FHQSS was conducted in foster family homes in Connecticut, and thus the results should not be generalized to other placement settings (e.g., congregate care or independent living) or to other states or to the United States as a whole. Although the definition of the history of cigarette use in the present study captures early experimental use of cigarettes in adolescents and has been used in some national surveys (Arrazola et al., 2014; Centers for Disease Control and Prevention, 1998), it is probably too stringent to place these data in the context of the larger national data that have been collected on cigarette use patterns in high school students.

In conclusion, this study demonstrates that cigarette, alcohol and marijuana use was common in a representative sample of adolescents in foster family homes. Adolescents with a higher number of placement settings were more likely to currently use cigarettes, and those in special study homes were more likely to use marijuana. Compared to a group of matched adolescents in the general population, those in foster family homes had lower rates of current alcohol and marijuana use. More research is needed to explore why adolescents in special study homes were more vulnerable to marijuana and to confirm the lower rate of current substance use.

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