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Did the dependent coverage expansion increase risky substance use among young adults?

Joshua Breslau¹, Hao Yu¹, Bing Han², Rosalie L. Pacula², Rachel M. Burns¹, and Bradley D. Stein¹

¹RAND Corporation, 4570 Fifth Avenue, Pittsburgh, PA 15213, USA

²RAND Corporation, 1776 Main Street, Santa Monica, CA 90401, USA

Abstract

Background—The dependent coverage expansion (DCE) enacted through the Affordable Care Act increased health insurance coverage among young adults. Increasing insurance coverage in this age group has the potential for unintended consequences on risky substance use.

Methods—Repeated cross-sectional surveys were used to compare change in substance use during the period the DCE was implemented in the 19–25 year old target age group (Pre-DCE n=15,772, Post-DCE n=22,719) with contemporaneous change in a slightly older age group that was not targeted by the policy (Pre-DCE=19,851, Post-DCE n=28,157). Outcomes include 11 measures of alcohol, illicit drug and cigarette use. Statistical controls were included for demographic and socioeconomic factors and for early initiation of substance use to adjust for historical trends in developmental trajectories.

Results—Risky substance use decreased in young adults relative to the older age group over the period that the DCE was implemented. However, statistical adjustment for initiation of substance use prior to age 18, which is prior to exposure to the DCE, accounted for the differences between the age groups. In adjusted models, associations between the DCE and substance use outcomes range from 0.96 to 1.08 with p-values ranging from .330 to .963.

Correspondence: Joshua Breslau, 4570 Fifth Avenue, Pittsburgh, PA 15213, jbreslau@rand.org, 412-683-2300.

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Contributors

Joshua Breslau: Conceived of Study, designed and led statistical analysis, drafted manuscript.

Hao Yu: Health policy expert. Contributed to design of statistical analysis, interpretation of findings and editing of manuscript.

Bing Han: Methodological expert. Contributed to design of statistical analysis, interpretation of findings and editing of technical components of manuscript.

Rosalie Pacula: Health economics expert. Contributed to conceptualization of research question and interpretation of findings with respect to health economics literature.

Rachel Burns: Statistical analyst. Contributed to design of analysis, definition of measures, and drafting of methods section of the manuscript.

Bradley Stein: Psychiatrist and health policy expert: contributed to conceptualization of study and drafting of manuscript.

All authors approved of the final manuscript before submission

Conflict of Interest

No conflict declared.

Conclusions—Historical trends in initiation of substance use prior to age 18, not the DCE, account for change in risky substance use among 19 to 25 year olds relative to 26 to 34 year olds. The evidence does not support the suggestion that health insurance coverage would increase risky substance use among young adults.

Keywords

Health Insurance Coverage; Young Adults; Substance Use; Affordable Care Act; Moral Hazard

1. Introduction

In an effort to increase health insurance coverage among young adults, a group that historically has had low rates of coverage and low rates of medical care utilization (Callahan and Cooper, 2005; Collins et al., 2012; Mulye et al., 2009), the Patient Protection and Affordable Care Act (ACA) required that private insurers allow dependents to remain covered through age 25 on all policies that include dependent care. This dependent care expansion (DCE), which was implemented in September of 2010 as the first major component of the ACA to take effect, remains highly popular. Evidence suggests that it was successful in increasing health insurance coverage in the targeted 18 to 25 year old age group (Sommers and Kronick, 2012; Wallace and Sommers, 2015). However, the ultimate public health impact of the DCE will depend on further consequences of increasing health insurance coverage in this population, about which little is known (Breslau et al., 2017). In particular, concern has been raised regarding the potential influence of health insurance coverage on substance use (Barbaresco et al., 2015). Given the potential consequences of risky substance use for young adults (Keng and Huffman, 2010), an increase in these behaviors could offset positive impacts of insurance coverage on access to health care.

The concern regarding the potential impact of the DCE on substance use is based on evidence of a phenomenon known as *ex ante moral hazard*, i.e., relative disregard for health risks due to anticipated mitigation of their impact by health insurance (de Preux, 2011; Ehrlich and Becker, 1972; Simon et al., 2017; Stanciole, 2008). For instance, previously uninsured individuals are more likely to smoke and consume alcohol after receiving health insurance coverage through Medicare when they turn 65 (Dave and Kaestner, 2009). In the young adult age group, there is evidence that losing health insurance at age 19, which was more common prior to the ACA, is associated with a decrease in risky alcohol consumption (Yoruk, 2015). However, there are few studies examining whether gaining or maintaining insurance coverage is associated with an increase in risky use of alcohol or if the association holds true for a broader range of substance use behaviors. We are aware of only one study that examines this question, a comparison of young adults in the age range impacted by the DCE with a slightly older comparison group using phone interview data from the Behavioral Risk Factor Surveillance System (BRFSS) (Barbaresco et al., 2015). That study found no evidence of an effect of the DCE on current smoking or past-month alcohol use (personal communication, Courtemanche, 11/14/2016).

This study aims to test whether the DCE had an adverse impact on risky substance use behavior, examining a broader range of outcomes than has been examined in prior studies of

the effects of insurance. In addition, we examine a potential alternative explanation for apparent effects of insurance in the young adult age group. Specifically, the years preceding the DCE saw a secular decrease in substance use among adolescents (Giovino et al., 2013; Grucza et al., 2016). Since early initiation of substance use is associated with persistence of use into adulthood and development of substance use disorder (Behrendt et al., 2009; Brook et al., 2002; McCambridge et al., 2011), this secular trend is likely to have altered trajectories of substance use over time in younger relative to older birth cohorts. Prior studies of the DCE and other potential causes of insurance impacts on substance use have not taken such life course patterns of substance use into account.

2. Methods

2.1. Sample

Data come from the National Survey of Drug Use and Health (NSDUH), an annual cross-sectional survey conducted by the Substance Abuse and Mental Health Services Administration (Substance Abuse and Mental Health Services Administration, 2016). The NSDUH sample is based on a multi-stage area probability sample of households and group living quarters and is designed to be representative of the non-Active Duty Military general population of the U.S. at the state level. Interviews are conducted in respondents' homes using computer assisted interviewing methods (Center for Behavioral Health Statistics and Quality, 2015). Data from six consecutive years of the survey, covering 2008 through 2013 were analyzed. This analysis of publically accessible data was reviewed and approved by RAND IRB.

2.2. Assessments

2.2.1. Substance Use Outcomes—A total of 11 substance use outcomes are examined, covering use of alcohol, illicit drugs and cigarettes. For alcohol use we examine any past month use, past month heavy drinking (Five or more drinks on the same occasion on each of 5 or more days in the past 30 days), past month binge drinking (Five or more drinks on the same occasion), and past-year alcohol use disorder (defined by DSM-IV criteria)(American Psychiatric Association, 1994). For illicit drug use we examine past month use of any illicit drug, past month use of marijuana, past month use of an illicit drug other than marijuana, and past year illicit drug use disorder (defined by DSM-IV criteria)(American Psychiatric Association, 1994). For cigarette use we examine any past month use, daily use in the past month and nicotine dependence in the past year. Nicotine dependence was assessed by the Nicotine Dependence Symptom Scale(Shiffman et al., 2004) (NDSS) or the Fagerstrom Test of Nicotine Dependence(Heatherton et al., 1991).

2.2.2. Demographic and Socioeconomic Characteristics—To adjust for differences in the demographic composition of the population groups, statistical adjustments were made for the following demographic and socioeconomic characteristics: sex, age, race/ethnicity, language of interview (Spanish vs. English), marital status, household size, urbanicity, income, employment status and educational attainment.

2.2.3. Substance Use Prior To Age 18—Respondents are asked the age at which they first used each substance. Binary indicators were constructed for first use of alcohol, illicit drugs and cigarettes before age 18, to identify those individuals who used substances prior to any potential impacts of the DCE.

2.3. Time Period

The timing of NSDUH interviews is available by quarter. Since the ACA's DCE took effect during September of 2010, the pre-DCE period was defined as the first quarter of 2008 through the third quarter of 2010 and the post-DCE period was defined as the fourth quarter of 2010 through the fourth quarter of 2013.

2.4. Statistical Analysis

Following prior studies of the impact of the DCE (Breslau et al., 2017; French et al., 2016; Sommers et al., 2013), we examined its impact on substance use outcomes using a difference-in-differences (DD) model. The DD model is specified using repeated cross-sectional data to compare change over the time in the 19 to 25 age group with change over the same period in the 26 to 34 age group. The older group provides a control for the temporal trends that would have occurred to the younger group in the absence of the intervention, i.e., the DCE. Although the prevalence of substance use is likely to vary across these age groups, the DD model remains valid, provided that trends in the two age groups would have been parallel in the absence of the intervention. The parallel trends assumption was tested using 'placebo tests' as described below (Slusky, 2015).

The DD model was implemented in a series of logistic regression models in which age (18–25 vs. 26–34), time period (pre- vs post- DCE) and the interaction between them are predictors of each substance use outcome. A statistically significant interaction term indicates that change over time in the target age group differs from contemporaneous change in the control group. Three models were specified for each outcome. Model 1 includes no other adjustment. Model 2 includes demographic and socioeconomic characteristics, and Model 3 includes indicators for initiation of substance use prior to age 18.

Three approaches to testing the robustness of the results were taken. First, to test the assumption that temporal trends in the two age groups were parallel prior to the DCE, a set of 'placebo' models were run using an alternative date, 2008, as the intervention date (Slusky, 2015). Second, to test the sensitivity of the results to the modeling strategy, a second series of models was run using a linear (OLS) regression model in place of the logistic regression model. All models were fitted in SAS Software, version 9.4, using survey adjusted procedures (PROC SURVEYREG and PROC SURVEYLOGISTIC) to adjust for the informative survey designs in NSDUH (SAS Institute Inc, 2014). Third, given the staged implementation of the DCE, with some companies extending coverage prior to the statutory date, we re-ran the analyses omitting data from calendar year 2010. Fourth, subgroup (Domain) analyses (Heeringa et al., 2010)(p.113), with stratification by race/ethnicity and educational attainment, were conducted to test whether changes in demographic composition may confound the results.

3. Results

3.1. Sample Characteristics

Demographic and socioeconomic characteristics of the sample are shown in Table 1 by age group and time period. As expected, differences across time within age groups are small while differences across age group are quite large for some time-varying characteristics. For instance, there is a slight decrease in the proportion of the 19–25 year-old sample that is married between the pre- and post-DCE periods, from 13.4% to 11.8%. The corresponding proportions of the 26–34 year old sample that is married are 49.6% and 46.3%. Figure 1 shows more detailed time trends for the two age groups in use of alcohol, illicit drugs and tobacco prior to age 18, a covariate of particular interest. For all three substances, the prevalence of use prior to age 18 appears to have been decreasing during this time period more quickly among the younger age group than among the older age group.

3.2. Unadjusted Difference in Differences Estimates

Table 2 shows the unadjusted time trends in the outcomes by age group. In the 18–25 age group the prevalence of most of the substance use outcomes is lower in the post-DCE than in the pre-DCE period with the exception of past month drug use which increased by 0.2% and past-month marijuana only which increased by 1.4%. In the 26–34 age group the pattern is similar, but the differences are of smaller magnitude and for two of the outcomes, past month drug use and past month marijuana only, the prevalence increased over time to a greater degree than it did among the younger age group, 1.8% and 1.9% respectively. The unadjusted difference in difference estimates, obtained by subtracting the difference in the older age group from that in the younger age group, are negative, indicating a decrease among the younger age group relative to the older age group, for all outcomes.

3.3. Adjusted Difference in Differences Estimates

The pattern of decreases in prevalence of the outcomes in the younger group relative to the older group is also found in unadjusted logistic regression estimates of the impact of the DCE (Table 3, **Model 1**). In this model, the odds ratios are less than one, indicating a reduction in the target group relative to controls, for all 11 outcomes, ranging from .87 to .96, with 8 reaching statistical significance at the $p=.05$ level. The three odds ratios that are not significantly different from 1 are for associations of the DCE with disorders of use of each substance. Model 2, which adjusted for demographic and socioeconomic characteristics, produced odds ratios slightly closer to 1, ranging from .87 to .96; 3 remain statistically significant at the $p=.05$ level (Table 3, **Model 2**). However, Model 3, in which we also adjust for initiation of substance use prior to age 18, results in meaningfully different findings, with odds ratios that are very close to or larger than 1, ranging from .94 to 1.08 (Table 3, **Model 3**), none of which approach statistical significance.

3.4. Robustness Checks

Findings from the logistic regression models were consistent with findings from robustness checks using linear models. Coefficients in the linear models did not differ in direction and differed in statistical significance in four cases. In three of those four cases, a coefficient

from Model 1 or Model 2 that was not statistically significant in the logistic model was statistically significant in the linear model. In remaining discrepant case, past month marijuana use, the coefficient in the linear model was not statistically significant where the coefficient from the logistic model was.

Placebo tests, conducted using a time point during the pre-DCE period, returned no statistically significant coefficients for any of the outcomes for any of the models. Results of models run without date from calendar year 2010 were similar to those reported based on the complete dataset (available on request). Domain analyses found similar results across race/ethnic groups (Whites, Blacks, and Hispanics) and levels of educational attainment (available on request).

4. Discussion

A growing body of research demonstrates that ACA's DCE resulted in an increase in insurance coverage among young adults age 19 to 25 (Breslau et al., 2017). That increase in coverage provides an opportunity to examine the cumulative public health impact of extending insurance coverage to young adults. An accounting of the impact of the policy should include its effects on both positive outcomes, such as health care utilization (Shane et al., 2016), and negative outcomes, such as risky substance use behaviors, which are examined in this study. Prior research suggests that insurance coverage may lead to an increase in risky substance use, due, it is thought, to a tendency for individuals to take on more risk when they are protected from its potential adverse consequences. There is evidence for this effect on health behaviors among older adults (Dave and Kaestner, 2009), but evidence regarding young adults is mixed (Barbaresco et al., 2015; Yoruk, 2015). The impact of health insurance coverage on risky substance use among young adults is a particular concern because of the high prevalence of substance use in this age group and the impact that risky substance use may have on injury, accidents and violence in the short term (Taylor et al., 2010; Zeisser et al., 2013) and on health and educational attainment in the long term (Hall, 2015; Moss et al., 2014).

Results from this study suggest that the increase in insurance coverage among young adults resulting from the DCE did not have an adverse impact on use of alcohol, illicit drugs or cigarettes or on disorders of use of these substances. Our final models, which include statistical adjustment for demographic and socioeconomic characteristics as well as substance use prior to age 18, found no associations between the policy and substance use; the estimated odds ratios were tightly clustered around 1 and none reached statistical significance. These findings confirm and extend those of a prior study using data from the BRFSS, by examining additional outcomes and using more robust data on substance use outcomes; in contrast to the BRFSS, the NSDUH uses in-home computer assisted interview methods rather than telephone interviews resulting in higher and likely more accurate prevalence estimates (Johnson, 2014; Miller et al., 2004). Contrary to the theory of ex ante moral hazard, risky substance use does not appear to be responsive to health insurance coverage in this age group.

The DCE may not have had an effect on risky substance use among young adults, despite the increase in health insurance coverage, because of the complex nature of these behaviors. Substance use is affected by a combination of environmental and genetic factors (Kendler et al., 2003; McGue et al., 2000) that may not be responsive to deliberative decision making of the type that would be affected by health insurance coverage. While the theory of ex ante moral hazard suggests that individuals respond to the mitigation of risk that insurance affords, evidence suggest that risk perception is not a strong determinant of decisions regarding substance use among young adults, which may be more heuristic than deliberative (Gerrard et al., 2008; Reyna and Farley, 2006). If this is the case, then the mitigation of risk by insurance may not have an impact on behavior. Ex ante moral hazard may have impacts on behaviors that involve more deliberative decision processes.

It is important to note the way in which the negative result regarding the impact of the DCE emerged. In the initial models, which used the standard DD model that has been widely used to estimate impacts of the DCE (Breslau et al., 2017), there was an apparent *decrease* in risky substance use and substance use disorders as a result of the DCE. For instance, in unadjusted comparisons, the prevalence of heavy drinking decreased among the target group by 2% more than it did among the control group. An effect of this magnitude would be about the same as that found for zero tolerance policies, which establish very low legal blood alcohol limits for individuals under age 21 (Carpenter, 2004). Initial DD models, adjusting for demographic covariates also found substantial effects, with odds ratios ranging from 0.84 to 0.92, 8 of 11 of which were statistically significant, some highly significant. In the absence of unmeasured influences that are differential across the age groups, the DD model provides a valid estimate of the causal effect of the DCE (Abadie, 2005). Adjustment for demographic and socioeconomic factors which are unlikely to have been influenced by the DCE attenuates the estimated effects slightly, suggesting that there are some trends in these characteristics that have differential effects across the groups.

The critical analytic step in the analysis was the inclusion of substance use prior to age 18 as a predictor. With this addition to the model, the effect estimates are substantially attenuated, with none of the estimates approaching statistical significance and four of the 11 estimates equal to or greater than 1. Substance use prior to age 18 is of interest because it occurs prior to any exposure to the DCE, it shows different historical trajectories between the groups being compared, as seen in Figure 1, and it is known to be associated with higher likelihood of substance use behaviors later in life (McCambridge et al., 2011). In other words, the DD model was apparently confounded by the life course effects of the historical decrease across birth cohorts in use of substances prior to age 18. This finding provides an example of how the DD model can be biased without sufficient adjustment for prior differences in exposure to factors that influence developmental trajectories.

A potential limitation of this study is the fact that prior to the ACA's DCE some states had rules requiring coverage for dependents beyond age 18 (Cantor et al., 2012), and we did not have access to state identifiers to adjust for these pre-ACA DCE laws. However, the ACA's DCE was substantially more powerful than the prior state DCEs because it did not allow exceptions, such as for married dependents, and it applied to large employer based plans that are exempt from such state-level legislation. Notably, studies of the state level DCE laws

have found mixed results while studies of the ACA's DCE have uniformly reported increases in insurance coverage, even when the state DCEs were ignored (Breslau et al., 2017).

The impacts of health insurance on behavior can be complex due to the way that insurance alters the consequences that action may have for individuals. For young adults in particular, substance use is a concern because of its high prevalence and potential for multiple adverse sequelae. In fact, given the generally good physical health of this population, an increase in risky substance use could potentially outweigh the positive public health impact of increasing health care utilization. The findings of this study add to evidence suggesting that risky substance use in this population is not responsive to health insurance coverage.

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Highlights

- Literature suggests that health insurance may increase risky substance use.
- A provision of the Affordable Care Act (ACA) increased coverage among young adults.
- We tested the impact of this ACA provision on risky substance use.
- Evidence suggests that coverage did not result in an increase in substance use.

Figure 1.
Prevalence of initiation of alcohol, cigarettes and illicit substances prior to age 18, by age group

Table 1

Sample Characteristics

	18–25		26–34	
	Pre-DCE	Post-DCE	Pre-DCE	Post-DCE
	n=15,772	n=22,719	n=19,851	n=28,157
	%	%	%	%
Sex				
Male	50.1	49.8	50.2	49.1
Race/Ethnicity				
White	61.1	57.5	59.5	58.0
Black	14.1	13.9	12.9	12.5
Native	1.0	1.1	0.8	1.0
Asian	4.5	5.2	5.7	6.5
Multiracial	1.3	2.0	1.1	1.4
Hispanic	18.0	20.2	19.9	20.6
Language of Interview				
Spanish	3.9	3.0	6.7	6.2
Marital Status				
Married	13.4	11.8	49.6	46.3
Divorced/Separated/Widowed	2.1	1.9	9.5	9.3
Never Been Married	84.5	86.3	40.9	44.4
Education				
Less than high school	13.5	11.8	13.2	13.3
High school graduate	32.2	31.6	26.7	24.8
Some college	37.9	39.9	26.2	26.5
College graduate	16.5	16.8	33.9	35.5
Household Size				
One	5.7	5.1	8.2	7.9
Two	23.5	21.1	23.8	24.1
Three	26.2	26.3	22.5	22.8
Four	22.7	23.9	23.2	22.8
Five	11.7	13.0	12.8	12.7
Six or more	10.2	10.7	9.5	9.6
Income				
Living in poverty	23.5	27.9	14.1	17.0
Income up to 2× poverty	24.4	24.9	21.8	22.7
Income LT 75K/Student in dorm	32.5	27.6	36.6	33.2
Income 75K or greater	19.6	19.6	27.5	27.0
Employment				
Employed full time	44.1	42.0	66.9	65.4

	18–25		26–34	
	Pre-DCE	Post-DCE	Pre-DCE	Post-DCE
	n=15,772	n=22,719	n=19,851	n=28,157
	%	%	%	%
Employed part time	25.9	26.3	11.8	12.9
Unemployed	11.0	11.7	7.1	6.7
Other (includes not in labor force)	19.0	20.0	14.2	14.9
Urbanicity				
Large Metro	52.4	52.3	54.9	55.8
Small Metro	32.4	33.7	30.7	30.9
Non-metro, Small CBSA	10.5	9.1	9.0	8.4
Non-metro, Non-CBSA	4.7	4.9	5.3	5.0

Table 2

Substance Use Outcomes

Substance Use Outcomes	18-25				26-34					
	Pre-DCE		Post-DCE		Difference					
	n	%	n	%	n	%	n	%	Difference	DD
Alcohol										
Past Month Alcohol Use	10310	65.4	14493	63.8	12666	63.8	18136	64.4	0.6	-2.2
Heavy Drinking	2403	15.2	2999	13.2	2064	10.4	2885	10.2	-0.2	-1.9
Binge Drinking	6895	43.7	9427	41.5	7251	36.5	10158	36.1	-0.5	-1.8
Past Year Alcohol Disorder	2731	17.3	3345	14.7	2338	11.8	3024	10.7	-1.0	-1.6
Illicit Drugs										
Past Month Drug Use	3321	21.1	4820	21.2	2421	12.2	3938	14.0	1.8	-1.6
Past Month Marijuana Only	2019	12.8	3222	14.2	1386	7.0	2501	8.9	1.9	-0.5
Past Month Other Illicit Drug	1302	8.3	1598	7.0	1035	5.2	1437	5.1	-0.1	-1.2
Past Year Drug Disorder	1207	7.7	1689	7.4	811	4.1	1140	4.0	0.0	-0.2
Cigarettes										
Past Month Cigarettes	5762	36.5	7570	33.3	6732	33.9	9183	32.6	-1.3	-1.9
Past Month Daily Smoking	2753	17.5	3442	15.2	3928	19.8	5199	18.5	-1.3	-1.1
Past Year Nicotine Dependence	2561	16.2	4640	14.2	3549	17.9	4640	16.5	-1.4	-0.6

DD=Difference in Differences=(Difference between pre- and post-DCE prevalence among 19–25 year-olds) – (Difference between pre- and post-DCE prevalence among 26–34 year-olds). Past month marijuana only and past month other illicit drug are exhaustive and mutually exclusive subsets of past month drug use.

Table 3

Difference in Differences Estimates of the Impact of the DCE on Substance Use[/]

Substance Use Outcome	Model 1			Model 2			Model 3		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
ALCOHOL									
Past Month Alcohol	0.89	0.82 0.95	0.001	0.90	0.83 0.98	0.012	0.96	0.88 1.04	0.330
Heavy Drinking	0.86	0.75 0.98	0.025	0.88	0.77 1.00	0.047	0.94	0.83 1.07	0.371
Binge Drinking	0.92	0.85 0.99	0.019	0.93	0.87 1.00	0.066	1.00	0.93 1.07	0.963
Past Year Alcohol Disorder	0.90	0.80 1.00	0.058	0.92	0.82 1.03	0.160	0.99	0.88 1.11	0.820
ILLCIT DRUGS									
Past Month Drug Use	0.86	0.79 0.93	0.000	0.88	0.81 0.95	0.001	0.97	0.89 1.07	0.604
Past Month Marijuana	0.87	0.77 0.99	0.030	0.89	0.79 1.01	0.068	0.98	0.85 1.13	0.773
Past Month Other Illicit Drug	0.84	0.73 0.97	0.018	0.87	0.75 1.00	0.054	0.96	0.82 1.11	0.575
Past Year Drug Disorder	0.92	0.77 1.11	0.386	0.96	0.79 1.16	0.647	1.08	0.88 1.33	0.454
CIGARETTES									
Past Month Cigarettes	0.92	0.85 0.99	0.024	0.93	0.86 1.01	0.091	1.03	0.94 1.13	0.565
Past Month Daily Smoking	0.89	0.81 0.97	0.013	0.91	0.82 1.02	0.097	0.99	0.88 1.12	0.878
Past Year Nicotine Dependence	0.92	0.84 1.01	0.092	0.96	0.87 1.07	0.474	1.05	0.94 1.18	0.374

[/] Odds ratios represent change in the 29–25 year old group relative to change in the 26–34 year old group. Model 1 includes no covariates other than age group and time period and their interaction. Model 2 includes statistical adjustment for demographic and socioeconomic characteristics, and Model 3 includes additional adjustment for initiation of alcohol, illicit drugs, and cigarettes prior to age 18. Past month marijuana only and past month other illicit drug are exhaustive and mutually exclusive subsets of past month drug use.