Published in final edited form as:
J Adolesc. 2012 October ; 35(5): 1393–1397. doi:10.1016/j.adolescence.2012.03.001.

Brief report: Pregnant by age 15 years and substance use initiation among US adolescent girls

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Abstract

We examined substance use onset and associations with pregnancy by age 15 years. Participants were girls ages 15 years or younger (weighted $n = 8319$) from the 1999–2003 Youth Risk Behavior Surveillance System (YRBS). Multivariable logistic regression examined pregnancy as a function of substance use onset (i.e., age 10 years or younger, 11–12, 13–14, and age 15 years) for alcohol, cigarettes and marijuana, controlling for race/ethnicity and metropolitan location. Of girls pregnant by age 15 years (3% of the sample, weighted $n = 243$), 16% had smoked marijuana by age 10 years and over 20% had smoked cigarettes and initiated alcohol use by age 10 years. In the multivariable analysis, marijuana use by age 14 years and/or cigarette smoking by age 12 years clearly distinguished girls who became pregnant by age 15 years and is perhaps due to a common underlying risk factor.

Keywords

Teenage pregnancy; Adolescent risk behaviors; Sexual intercourse; Substance use

Introduction

The rate of girls between the ages of 15–17 years who become pregnant is 38.9 per 1000 (Kost, 2010). Teenage pregnancies are associated with adverse health and social consequences for mother and child, in general, but the consequences are compounded when the pregnancy occurs at a very early age (15 years or earlier) (Fraser, Brockert, & Ward, 1995; Papamicheal, Pillai, & Yoong, 2009). Associations between substance use behaviors at a young age and heightened impulsivity (Colder & Chassin, 1997), impaired affect regulation (Cooper, Agocha, & Sheldon, 2000), and poor judgment (Giancola, Martin, Tarter, Pelham, & Moss, 1996; Odgers et al., 2008) may also heighten the risk for very early

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Conflicts of interest Dr. L Bierut is listed as an inventor on a patent “Markers of Addiction” (US 20070258898), covering the use of certain SNPs in determining the diagnosis, prognosis, and treatment of addiction. Dr. Bierut acted as a consultant for Pfizer, Inc. in 2008. All remaining authors do not have a financial interest/arrangement or affiliation with any organizations that could be perceived as real or apparent conflict of interest in the context of the subject of this article.

pregnancy (by age 15 years). Identifying substance use-related risk factors that contribute to increased risk of very early pregnancy could help to clarify the etiology of these highly correlated occurrences. Accordingly, in the present study, we examined onset of substance use across multiple substances (alcohol, cigarettes, and marijuana) and associations with likelihood for teenage pregnancy by age 15 years.

Methods

Data source and participants

The present study utilizes 1999–2003 data (three years: 1999, 2001, and 2003) from the National Youth Risk Behavior Survey (YRBS), a biennial survey established by the Centers for Disease Control and Prevention to measure health-risk behaviors (National School-based Youth Risk Behavior Survey. Public-use Data Documentation (1999–2003)). For each survey period, the YRBS utilizes a three-stage cluster sampling design to produce a representative sample of high school students attending public, Catholic, and other private schools in the United States. Additional details on YRBS sampling procedures are available elsewhere (Grunbaum et al., 2004). Questions about adolescent pregnancy were not asked after 2003. All participants were about the same age and therefore had the same length of time to initiate substance use and/or engage in risky sexual behaviors; thus, no participants were excluded based on substance use or sexually active status.

Measures and analysis

The dichotomous dependent variable was based on a positive response (i.e., 1 or more times) to the question “How many times have you been pregnant or gotten someone pregnant?” Age of pregnancy was not queried in the YRBS; therefore, we limited our analysis to girls who were 15 years old and younger at the time of survey. The independent variable of interest included age of substance initiation. Responses were collapsed into age 10 or younger, 11–12, 13–14, 15 years of age, or never.

Additional confounding variables included race/ethnicity, age and metropolitan location. Metropolitan location was determined by locations of the participants’ school and served as an indicator of risk behaviors that might occur in different metropolitan locations (Levine & Coupey, 2003).

Our sample included a weighted N of 8319 girls age 15 years and younger. 1814 had missing data for one or more of the variables included in the analysis; approximately half of these (966) had missing data for age of alcohol initiation. Participants with missing data were more likely to be African-American (18% of participants with missing data versus 13% of participants with complete data, $p = .028$). Missing data were multiply imputed with a multivariate sequential regression approach with 10 imputations using IVEware version 0.2 (©2011 University of Michigan). The multiply imputed data were analyzed usingS AS-callable SUDAAN version 9.0.1 (Shah, Branwell, & Bieler, 2002), taking into account all stages of clustering (year, stratum, and primary sampling unit). Sample weights were also applied to all analyses.

Multivariable logistic regression was used to examine associations between having been pregnant and substance use initiation. Independent variables were forced into the model: substance use initiation, race/ethnicity, metropolitan status, and survey year. Models were fit for multiply imputed data and compared with results from complete case analysis (weighted $N = 6505$). Main results presented are from multiply imputed data. Any differences observed when analyzing complete cases only are noted.

Results

Table 1 describes our sample. Most of the participants were either 14 (31%) or 15 (68%) years old; less than 1% of the participants were 12 or 13 years old. Three percent (weighted $n = 243$) of the girls in our sample had experienced a pregnancy by age 15. Thirty percent of girls with a history of pregnancy by age 15 years had smoked marijuana by age 12 years. About half of girls with a history of pregnancy by age 15 years had also smoked cigarettes and initiated alcohol use by age 12 years.

As seen in Table 2, in multivariable analysis, marijuana use and cigarette smoking behaviors were significantly associated with experiencing pregnancy be age 15. Specifically, marijuana initiation by age 14 years increased the likelihood of experiencing a pregnancy by age 15 (odds ratios [OR] ranged from 3.0 to 9.7). Girls who initiated cigarette smoking at age 12 or younger were also significantly more likely to have experienced a pregnancy by age 15 (OR ranged from 3.5 to 4.1). Associations between initiation of alcohol use and very early teenage pregnancy trended but did not reach significance in the multivariable model.

African American girls were also significantly more likely to have become pregnant by age 15 when compared against Caucasians. No significant associations were found between metropolitan location and very early teenage pregnancy in the multivariable model. The model had good discrimination (c-statistic = 0.808). When running the model on only cases with complete data ($N = 6505$), the overall results were similar to the model with multiply imputed data. The only notabledifferences were that the odds ratio for African American race was slightly lower (OR 3.1) and the odds ratios for initiation of marijuana use were stronger and significant for initiation at age 15 in addition to the younger ages of initiation (ORs ranged from 2.8 to 11.7) (model c-statistic = 0.809, Hosmer–Lemeshow chi square = 9.03, $p = .340$).

Discussion

While a relatively low percentage of girls had ever been pregnant by age 15 (only 3% of the sample), the rates of marijuana use and cigarette smoking were remarkably high for young girls with a history of pregnancy. In the multivariable analysis, marijuana use and very early cigarette smoking clearly distinguished an increased likelihood of pregnancy by age 15 years. Furthermore, the likelihood of pregnancy by age 15 years was highest for girls who initiated marijuana use at age 10 years or younger (nearly 10 times more likely than non-initiators). Alcohol onset was relatively common among all the participants in the sample despite their young age and trended in the significant direction as a risk factor of very early teenage pregnancy. Therefore, marijuana use by age 14 years and/or cigarette smoking by age 12 years best characterized young girls who became pregnancy by age 15 years. This is cause for concern given the detrimental health consequences for offspring that stem from maternal smoking behaviors (Agrawal et al., 2008; Cornelius, Goldschmidt, DeGenna, & Day, 2007).

Problem behavior theory has been used extensively to guide research on the nature and development of alcohol abuse, drug misuse, and other problem behaviors (e.g., Goodson, Evans, & Edmundson, 1997; Kirby, 2002). According to this perspective, adolescent problem behaviors like substance use and risky sexual behaviors are intercorrelated because they have common causes or influences (Jessor, Van Den Bos, Vanderryn, Costa, & Turbin, 1995). Accordingly, the associations in the present study could be due to a common underlying risk factor such as impulsivity or self-control, family environment, and/or genetic influences (Kelly et al., 2011; Lynskey, Fergusson, & Horwood, 1998; Moffitt et al., 2011).

The findings of this study were limited by several factors. YRBS is cross-sectional and causation cannot be determined. YRBS omits potential explanatory variables and is a self-report, school-based survey which excluded high school dropouts for whom adolescent pregnancy rates may be higher. Because YRBS stopped asking about pregnancy after 2003, the pooled data is dated (i.e., from 1999 to 2003); still, YRBS provided the best opportunity for statistical precision than current, smaller datasets. Lastly, the length of recall may have impacted measurement accuracy; nonetheless, our use of girls ages 15 and younger yielded a relatively narrow interval between the age of substance initiation and the age at interview to help reduce the effects of recall bias on our findings.

Despite the limitations of this study, the findings have relevant implications. We studied a relatively large sample of girls and found that marijuana use by age 14 years and/or cigarette smoking by age 12 years clearly distinguished young girls who experienced pregnancy by age 15 years. The design of the study precludes any interpretations concerning the processes by which substance use influence teen pregnancy takes place. Still, it is important to monitor these associations and we advise YRBS to reinstate a question on teenage pregnancy in their survey. Nevertheless, the present study may primarily be seen as a starting point for future studies on the processes by which substance use influences teen pregnancy. Research that further delineates the mechanisms of these processes could lead to more effective interventions.

Acknowledgments

This publication was made possible by funding from the KL2 RR024994 – ICTS Multidisciplinary Clinical Research Career Development Program and Grant Number UL1 RR024992 from the National Center for Research Resources (NCRR), a component of the National Institutes of Health (NIH) and NIH Roadmap for Medical Research. Its contents are solely the responsibility of the authors and do not necessarily represent the official view of NCRR or NIH. This publication was also supported in part by an NIH Career Development Award awarded to Dr. Cavazos-Rehg (NIDA, K01DA025733). This publication was also supported in part by an NIH Midcareer Investigator Award awarded to Dr. Bierut (K02 DA021237). This publication was also made possible in part by NIDA grant 5 T32 DA07313-09 (Drug Abuse Comorbidity, Prevention & Biostatistics) awarded to Dr. Cottler.

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Table 1

Characteristics of girls ages 15 years and younger, 1999–2003 YRBS

	Total weighted *N* = 8319		Never pregnant 97.1% weighted *N* = 8076		Pregnant 2.9% weighted *N* = 243	
	%	95% CI	%	95% CI	%	95% CI
Alcohol, age of initiation, years old						
Never	28.7	26.6–31.0	29.5	27.3–31.7	4.7	2.3–9.4
15	6.8	6.0–7.8	6.9	6.0–7.8	4.6	1.9–10.4
13–14	32.7	30.4–35.1	32.4	30.1–34.8	41.4	29.2–54.7
11–12	16.6	15.3–18.0	16.4	15.0–17.9	23.7	14.7–35.9
≤10	15.2	13.7–16.8	14.9	13.4–16.5	25.7	17.1–36.6
Cigarettes, age of initiation, years old						
Never	57.6	55.3–59.9	58.8	56.5–61.0	18.9	8.5–37.1
15	3.5	2.8–4.3	3.5	2.8–4.3	4.2	0.3–35.4
13–14	18.5	17.1–20.1	18.4	17.0–19.9	21.3	11.3–36.3
11–12	12.6	11.2–14.2	12.0	10.6–13.6	32.6	21.6–45.9
≤10	7.8	6.7–9.0	7.3	6.3–8.5	23.1	14.8–34.1
Marijuana, age of initiation, years old						
Never	70.5	68.3–72.6	71.8	69.6–74.0	26.8	15.6–42.1
15	4.4	3.6–5.4	4.3	3.5–5.3	5.8	2.9–11.5
13–14	16.5	15.3–17.7	15.9	14.6–17.2	36.9	27.6–47.2
11–12	6.1	5.2–7.2	5.9	5.0–7.0	14.3	8.8–22.4
≤10	2.5	2.0–3.2	2.1	1.6–2.7	16.2	10.3–24.5
Age, years old						
15	68.2	66.1–70.2	67.8	65.8–69.8	81.0	72.0–87.6
≤14	31.8	29.8–33.8	32.2	30.2–34.2	19.0	12.4–28.0
Race						
Caucasian	61.2	56.9–65.5	61.8	57.3–66.1	42.8	31.8–54.6
African American	14.1	12.0–16.5	13.6	11.4–16.0	31.3	20.2–45.2
Hispanic[a]	14.0	12.0–16.3	13.9	11.9–16.2	16.6	10.7–25.0
Other	10.7	8.3–13.7	10.7	8.3–13.8	9.2	5.0–16.4
Metropolitan location						

	Total weighted *N* = 8319		Never pregnant 97.1% weighted *N* = 8076		Pregnant 2.9% weighted *N* = 243	
	%	95% CI	%	95% CI	%	95% CI
Rural	15.0	10.7–20.5	15.1	10.8–20.6	11.1	5.2–22.3
Suburban	55.8	49.4–62.0	56.0	49.6–62.2	50.3	36.2–64.4
Urban	29.2	24.0–35.1	29.0	23.8–34.7	38.6	26.5–52.3

Abbreviations: CI, confidence interval.

[a]Includes multi-racial Hispanic.

Table 2

Examining associations with becoming pregnant by age 15 years.[a]

Variable	Unadjusted univariable model				Adjusted multivariable model[b]			
	β	SE	OR	95% CI	β	SE	OR	95% CI
Alcohol, age of initiation, years old								
Never	Ref.				Ref.			
15	1.42	0.54	4.1	1.4–12.1	0.69	0.60	2.0	0.6–6.6
13–14	2.08	0.44	8.0	3.4–19.1	1.12	0.61	3.1	0.9–10.3
11–12	2.20	0.44	9.1	3.8–21.6	0.90	0.53	2.5	0.9–7.1
≤ 10	2.38	0.38	10.8	5.1–23.0	0.86	0.57	2.4	0.8–7.3
Cigarettes, age of initiation, years old								
Never	Ref.				Ref.			
15	1.13	0.95	3.1	0.4–23.4	0.69	1.01	2.0	0.2–17.5
13–14	1.29	0.53	3.6	1.2–11.1	0.47	0.62	1.6	0.4–5.9
11–12	2.15	0.47	8.6	3.3–22.2	1.42	0.47	4.1	1.6–11.1
≤ 10	2.30	0.45	10.0	4.1–24.6	1.26	0.54	3.5	1.2–10.7
Marijuana, age of initiation, years old								
Never	Ref.					Ref.		
15	1.28	0.46	3.6	1.4–9.0	0.56	0.53	1.8	0.6–5.1
13–14	1.83	0.37	6.2	3.0–12.9	1.10	0.39	3.0	1.4–6.5
11–12	1.87	0.45	6.5	2.7–15.8	0.93	0.41	2.5	1.1–5.7
≤ 10	3.04	0.41	20.9	9.3–46.8	2.27	0.38	9.7	4.6–20.6
Race								
Caucasian	Ref.				Ref.			
African American	1.20	0.33	3.3	1.7–6.5	1.48	0.38	4.4	2.1–9.2
Hispanic[c]	0.54	0.29	1.7	1.0–3.1	0.54	0.29	1.7	0.97–3.1
Other	0.22	0.35	1.2	0.6–2.5	0.17	0.35	1.2	0.6–2.4
Age, years old								
15	Ref.					Ref.		
≤14	−0.71	0.25	0.5	0.3–0.8	−0.63	0.26	0.5	0.3–0.9
Metropolitan location								

J Adolesc. Author manuscript; available in PMC 2012 October 01.

Variable	Unadjusted univariable model				Adjusted multivariable model[b]			
	β	SE	OR	95% CI	β	SE	OR	95% CI
Rural	Ref.					Ref.		
Suburban	0.20	0.38	1.2	0.6–2.6	0.15	0.38	1.2	0.6–2.5
Urban	0.60	0.36	1.8	0.9–3.7	0.20	0.38	1.2	0.6–2.6
Year								
1999	Ref.				Ref.			
2001	−0.43	0.29	0.7	0.4–1.2	−0.43	0.33	0.7	0.3–1.2
2003	−0.49	0.33	0.6	0.3–1.2	−0.43	0.34	0.7	0.3–1.3

Abbreviations: SE, standard error; OR, odds ratio; CI, confidence interval.

[a] Weighted *N* = 243 girls who have been pregnant, 8076 who have never been pregnant.

[b] Multivariable model controls for all variables listed in this table.

[c] Includes multi-racial Hispanic.