Association between adolescent substance use and obesity in young adulthood: A group-based dual trajectory analysis

David Y.C. Huang *, H. Isabella Lanza, M. Douglas Anglin

UCLA Integrated Substance Abuse Programs, Semel Institute for Neuroscience and Human Behavior, 11075 Santa Monica Blvd., Suite 200, Los Angeles, CA 90025, USA

HIGHLIGHTS

• Adolescent substance use is related to obesity risk in young adulthood.
• The High-decreasing smoking trajectory is associated with the High obesity risk.
• The Increasing marijuana trajectory is associated with the Increased obesity risk.
• The associations differ based on the type of substance use and patterns of use.

ARTICLE INFO

ABSTRACT

Purpose: This study investigated whether and how trajectories of substance use in adolescence were associated with obesity trajectories in young adulthood. We hypothesized that: (1) exposure to persistent substance use throughout adolescence may heighten obesity risk in young adulthood; and (2) such associations may differ once gender, ethnicity, socioeconomic status, and obesity status in adolescence, are considered.
Methods: The study included 5141 adolescents from the child sample of the 1979 National Longitudinal Survey of Youth and utilized biennial data across the 12 assessments (1986–2008) to examine trajectories of substance use behaviors (i.e., cigarette smoking, alcohol use, and marijuana use) from ages 12 to 18 and obesity trajectories from ages 20 to 24. Group-based dual trajectory modeling was applied to examine sequential associations of trajectories of each type of substance use behavior with obesity trajectories.
Results: Three distinctive trajectory patterns were respectively identified for cigarette smoking, alcohol use, and marijuana use from ages 12 to 18, as well as for obesity status (BMI ≥ 30) from ages 20 to 24. Taking into account gender, ethnicity, socioeconomic status, and obesity status in adolescence, adolescents with the most problematic smoking trajectory (High-decreasing) were more likely to exhibit a High-obesity trajectory from ages 20 to 24. Also, adolescents with an Increasing marijuana use trajectory were more likely to exhibit an Increased obesity trajectory in young adulthood.
Conclusions: The current study demonstrates that adolescent substance use is associated with subsequent obesity in young adulthood. The associations appear to differ based on the type of substance use and patterns of use.

1. Introduction

Substance use during adolescence contributes to a variety of adverse consequences (e.g., impaired physical heath and psychosocial maladjustment) in adolescence and such negative impacts usually persist throughout subsequent life stages (e.g., Jeynes, 2002; Oesterle et al., 2004). Obesity among adolescents and adults is also a major health concern. Currently, 34% of U.S. adults are obese (Flegal, Carroll, Ogden, & Curtin, 2010). Obesity also is associated with myriad negative physical outcomes, such as cardiovascular problems, diabetes, and hypertension (American Diabetes Association, 2000; Must et al., 1999), as well as poorer psychosocial health (Pearce, Boergers, & Prinstein, 2002; Strauss & Pollack, 2003; Sweeting, Wright, & Minnis, 2005). Extensive research examining risk factors and related consequences of each of these two important public health problems has been separately conducted. In addition to these separate studies, recent research has shifted to examining possible interrelationships between substance use and obesity (e.g., Pasch, Nelson, Lytle, Moe, & Perry, 2008). Substance use may be associated with the development of other detrimental lifestyles such as an unhealthy diet and lack of physical activity, which may heighten the risk of obesity (Pasch, Velazquez, Cance, Moe, & Lytle, 2012). For example, smoking, poor food choice, and sedentary activity patterns have been found to be clustered among adolescents (Lytle, Kelder, Perry, & Klepp, 1995); also, adolescent cigarette smoking

* Corresponding author. Tel.: +1 310 267 5288; fax: +1 310 312 0538.
E-mail addresses: yhuang@ucla.edu (D.Y.C. Huang), hilanza@ucla.edu (H.I. Lanza), doug_anglin@hotmail.com (M.D. Anglin).

has been linked to a subsequent increase in body fat (Pasch et al., 2012). However, research on the relationship between different types of substance use and obesity is still limited. In particular, longitudinal studies examining the consequences of adolescent substance use on later obesity status in young adulthood are lacking. It is currently unknown whether certain patterns of substance use behavior in adolescence poses a greater, lower, or insignificant risk to the development of obesity in young adulthood. Thus, a better understanding of the interrelationships of adolescent substance use with subsequent risk of obesity is warranted.

Recently, growing attention has been given to the role of substance use on obesity in adolescence (e.g., Pasch et al., 2008). An association between substance use (i.e., cigarette, alcohol, and marijuana use) and obesity has been reported in cross-sectional studies (e.g., Dhariwal, Rasmussen, & Holstein, 2010; Farhat, Iannotti, & Morton-Simons, 2010; Fonseca, Matos, Guerra, & Pedro, 2009; Leatherdale, Wong, Manske, & Colditz, 2008; Liu et al., 2010). Obese teens were more likely to engage in daily alcohol use than their healthy weight peers (Fonseca et al., 2009). Frequent drinking and smoking as well as marijuana use were significantly associated with obesity among girls, and such relationships were differentiated by younger (age < 15) and older (age ≥ 15) age groups (Farhat et al., 2010). However, cross-sectional studies on associations between substance use and obesity among adults have reported inconsistent findings. Obesity was associated with either lower risk (Simon et al., 2006) or insignificant risk of substance use disorder among adults (Scott, McGee, Wells, & Oakley Browne, 2008). The associations between substance use and obesity among adults may differ by gender or by type of substance. One study (Barry & Petry, 2009) has reported that obesity was associated with alcohol dependence, differing by gender, but was not associated with drug use disorders. Other studies have shown lower obesity prevalence in marijuana users compared to non-users (Le Strat & Le Foll, 2011; Smit & Crespo, 2001; Warren, Frost-Pineda, & Gold, 2005). It has also been reported that alcohol use contributes to obesity risk in different ways (e.g., Wannamethee, Shaper, & Whincup, 2005; Yeomans, 2010). Moderate alcohol intake may be associated with reduced risk of becoming obese, particularly among women, but higher alcohol use (e.g., binge-drinking) may increase obesity risk (Arif & Rohrer, 2005; Tolstrup et al., 2008), particularly in men (Schroder et al., 2007). In general, the major limitation of cross-sectional studies examining substance use and obesity is that baseline weight has not been taken into account (Kvaavik, Tell, & Klepp, 2003). On the other hand, a longitudinal study is more likely to take baseline weight into account and to elucidate the role of substance use on obesity among different genders and ethnicities.

Longitudinal studies examining the association between substance use and obesity over time are limited and reveal mixed findings. A recent longitudinal study that examined two samples of adolescents found that substance use contributed to subsequent body composition; alcohol use predicted decreased BMI and cigarette smoking predicted an increase in body fat percentage 2 years later (Pasch et al., 2012). Another longitudinal study on adolescents (Cooper, Klesges, Robinson, & Zbikowski, 2003) indicated that although smoking initiation predicted an increase in Body Mass Index (BMI) 2 years later, smoking was not predictive of adolescent BMI change at a 3-year follow-up and BMI changes over the 3 years were similar between smokers and non-smokers. Also, the association between weight gain and smoking may differ by ethnicity. One longitudinal study, adjusting for age and baseline body weight, reported that weight gain was similar between smokers and non-smokers among Whites, but was lower in smokers than non-smokers among African Americans (Klesges et al., 1998). Furthermore, a longitudinal study on a cohort of young adults aged 18 to 30 years indicated no relationship between marijuana use and BMI 15 years later (Rodondi, Pletcher, Liu, Hulley, & Sidney, 2006). The limited longitudinal research examining substance use on obesity status suggests that significant associations exist, but inconsistent findings demonstrate a need for additional studies to clarify the underlying mechanisms of these associations.

Prior longitudinal work examining the relationship between substance use and obesity has generally focused on multiple years within one developmental period (adolescence or adulthood), but has neglected the transitional period between adolescence and young adulthood. To date, only two studies have followed adolescents into young adulthood to assess the relationship between substance use and obesity. One study reported an increased risk of overweight status for adolescents who stopped smoking during the transition into adulthood (Kvaavik et al., 2003). Another study reported that adolescent chronic heavy drinkers were more likely to be overweight/obese in early adulthood than non-drinkers (Oesterle et al., 2004). These studies indicate the need to examine the relationship between substance use and obesity across the two critical developmental periods (i.e., from adolescence to young adulthood), a time when adolescents are gaining additional responsibility over their health behaviors and a period that appears to have a long-lasting impact on their adult health outcomes.

The present study seeks to advance prior research by examining the sequential association of substance use behaviors with obesity from adolescence to young adulthood. By focusing on the heterogeneity of trajectories of substance use among adolescents and the ways in which those patterns influence the development of obesity across subsequent life stages, this study specifically investigated whether and how trajectories of each type of substance use (i.e., cigarette smoking, alcohol use, marijuana use) from ages 12 to 18 were respectively associated with the development and maintenance of obesity from ages 20 to 24. We hypothesized that: (1) exposure to persistent substance use through adolescence may heighten the risk of developing obesity in young adulthood and (2) such associations may differ when influences of gender, ethnicity, socioeconomic status, and obesity status in adolescence are examined simultaneously.

2. Method

2.1. Participants

The study utilized the subset of the child sample of the 1979 National Longitudinal Survey of Youth (NLSY79; U.S. Department of Labor, Bureau of Labor Statistics, 2011). The original NLSY79 sample consisted of 12,686 young men and women who were from 14 to 21 years old in 1979. These youths were surveyed annually from 1979 to 1994 and biennially from 1996 to present. An additional child survey that longitudinally tracks all children born to female NLSY79 respondents was started in 1986. Comprehensive assessments on children's health, abilities, behavior problems, school and social experiences, home environment, and family background have been conducted biennially since 1986. A total of 11,495 children were included by 2008. Data from 12 assessments (1986–2008) were examined in the present study. To ensure there was sufficient data to examine the children's substance use behaviors from ages 12 to 18 and obesity status from ages 20 to 24, this study examined 5141 participants (2568 males and 2573 females) who completed 8 or more waves of surveys from 1986 to 2008 and provided weight, height, and substance use information across assessments. Of the 5141 participants, 50.1% were female; 41.7% were White, 34.9% African American, 21.6% Hispanic, and 1.8% of other ethnic groups.

2.2. Measures

In addition to demographics, the following measures were examined in the study.

2.2.1. Total family income

Starting in 1994, children aged 15 and older reported their family's total income from all resources during the past year, including full or part-time jobs, temporary or seasonal work, services in the military, a farm, a business, and welfare. Average annual family income from years 1994 to 2008 was computed and categorized as