Drug and Alcohol Dependence 167 (2016) 15–22

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Birth order and hospitalization for alcohol and narcotics use in Sweden

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ARTICLE INFO

Article history:
Received 4 April 2016
Received in revised form 21 June 2016
Accepted 22 June 2016
Available online 29 July 2016

Keywords:
Adolescence
Alcohol
Birth order
Fixed effects
Hospitalization
Narcotics
Sweden

ABSTRACT

Background: Previous studies have shown that birth order is an important predictor of later life health as well as socioeconomic attainment. In this study, we examine the relationship between birth order and hospitalization for alcohol and narcotics use in Sweden.
Methods: We study the relationship between birth order and hospitalization related to alcohol and narcotics use before and after the age of 20 using Swedish register data for cohorts born 1987–1994. We apply Cox proportional hazard models and use sibling fixed effects, eliminating confounding by factors shared by the siblings.
Results: Before age 20 we find that later born siblings are hospitalized for alcohol use at a higher rate than first-borns, and there is a monotonic increase in the hazard of hospitalization with increasing birth order. Second-borns are hospitalized at a rate 47% higher than first-borns, and third-borns at a rate 65% higher. Similar patterns are observed for hospitalization for narcotics use. After age 20 the pattern is similar, but the association is weaker. These patterns are consistent across various sibling group sizes.
Conclusions: Later born siblings are more likely to be hospitalized for both alcohol and narcotics use in Sweden. These birth order effects are substantial in size, and larger than the estimated sex differences for the risk of hospitalization related to alcohol and drug use before age 20, and previous estimates for socioeconomic status differences in alcohol and drug abuse.

1. Introduction

Alcohol and narcotics abuse are serious disorders that can blight an individual's life, negatively affecting health, social relationships, and socioeconomic trajectories. The most important psychosocial risk factors for adolescent alcohol initiation are having approval from parents and social peers, having role models for alcohol and drug use, an adolescent's own history of delinquent behaviour, as well as genetic factors (Donovan, 2004; Goldman et al., 2005). Another important factor is age, and the earlier the age of alcohol initiation, the greater the risk of alcohol abuse later in life (Hawkins et al., 1997; Stueve and O'Donnell, 2005; Hingson et al., 2006), though there may be discontinuities in alcohol consumption behaviour between adolescence and early adulthood (Norström and Pape, 2012). Studies generally indicate that there are no consistent differences in the risk of alcohol or other substance abuse by background socioeconomic status in adolescence (Hanson and Chen, 2007).

In this study, we address a factor that has received little attention in the literature on alcohol and substance abuse, which is birth order. Given the importance of peers for alcohol and illicit drug initiation, and the importance of age at initiation for later abuse problems, birth order has the potential to play a very important role in the development of alcohol and drug abuse. Through older siblings later born children may be exposed to alcohol and other substances at younger ages than they otherwise would be. We examine the relationship between birth order and hospitalization for alcohol and non-alcohol substance use for males and females using Swedish register data, and compare siblings within the same family to minimize residual confounding. We also study hospitalization before and after age 20 separately as this is the age at which

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http://dx.doi.org/10.1016/j.drugalcdep.2016.06.029

individuals can legally purchase alcohol in Sweden (Systembolaget, 2001).

Both observational and experimental research has shown that peer influence is an important factor for the uptake or continuation of various behaviours (Christakis and Fowler, 2008; Rosenquist et al., 2010; Centola, 2010, 2011; Leonardi-Bee et al., 2011). Adolescents with older siblings who use alcohol, cigarettes, or illicit drugs are more likely to be exposed to these substances at a younger age (Blane and Barry, 1973), and later born siblings in particular are more likely to initiate developmentally inappropriate activities, such as alcohol consumption and sexual activity, at younger ages (Bard and Rodgers, 2003; Rodgers and Rowe, 1988). Studies have indicated that younger siblings are more likely to begin smoking if an older sibling already smokes, but not the other way around (Harakeha et al., 2007). In addition to modelling these behaviours, older siblings may facilitate access to these substances for younger siblings when it would otherwise be difficult for them to obtain those substances independently. Sibling group size may also play a role; parental control may be weaker in larger sibling groups, and later borns in large sibling groups in particular may be supervised less.

Previous research has also shown that, relative to first and earlier born siblings, later borns have worse health and socioeconomic outcomes in adulthood, including lower cognitive ability (Bjerkedal et al., 2007), lower educational attainment (Black et al., 2005), lower physical fitness (Barclay and Myrskylä, 2014), and higher mortality from external causes in the form of accidents, suicides, and events of undetermined intent (Bjørngaard et al., 2013; Rostila et al., 2014; Barclay and Kolk, 2015). If birth order is related to alcohol and drug abuse, this abuse may mediate the relationship between birth order and both health and socioeconomic attainment later in life given that individuals with alcohol and substance abuse issues perform worse in intelligence tests (Brown et al., 2000), achieve lower educational attainment (King et al., 2006), have worse physical fitness in early life (Marti et al., 1988), are much more likely to die in car accidents (Mura et al., 2003; Connor et al., 2004), and are at a higher risk of suicide (Rossow and Amundsen, 1995).

A review of previous research examining the relationship between birth order and alcohol and drug use found that later borns are overrepresented with abuse problems (Blane and Barry, 1973). However, these previous studies have had important limitations that restrict the degree to which it is possible to draw inferences about the causal nature of the relationship between birth order and alcohol and drug use. Many previous studies on this topic have been limited by using non-representative samples, and none have adequately accounted for potential confounding factors that might bias the results (Ernst and Angst, 1983). In this study, we improve on previous research by using Swedish population register data on complete birth cohorts of individuals born 1987–1994. Furthermore, we are the first to apply a sibling fixed effect approach to analyze this research question, which minimises residual confounding from unmeasured time-invariant factors that are shared amongst siblings, such as parenting style, household religiosity, and parental patterns of alcohol and drug use. Such factors are commonly unobserved or unmeasured, and if the analyses are not adjusted for these variables then there is a strong potential for bias in the results.

2. Methods

2.1. Data

We use Swedish register data on men and women born between 1987 and 1994. The Swedish Multi-generational Register (Statistics Sweden, 2011) allows us to link these index individuals to their parents and siblings, including siblings born before 1987 and after 1994, meaning that family size and birth order are calculated from the full sibling group. Family size and birth order was based on the full fertility history of mothers. The Medical Birth Register (Swedish National Board of Health and Welfare, 2003) was used to identify birth order, as well as twins or other multiple births. The Medical Birth Register also provides information on birth weight. To identify hospitalization attributable to alcohol or narcotics use, we use the Inpatient Register (Ludvigsson et al., 2011), which provides coverage over the period 1987–2013. External reviews of the Inpatient Register suggest that 85–95% of diagnoses are valid (Ludvigsson et al., 2011). We study hospitalization for alcohol or narcotics related events before the age of 20, and after the age of 20. The diagnostic categories for alcohol-related hospitalizations are 291, 303, 305.0, 357.5, 425.5, 535.3, 571, E860, E980 + 980 from ICD-9, and E24.4, F10, G31.2, G62.1, G72.1, I42.6, K29.2, K70, K86.0, O35.4, T51, Y90, Y91, Z50.2, Z71.4, Z72.1 from ICD-10. The diagnostic categories for narcotics hospitalizations are 292, 304, 965.0, 968.5, 969.6, 969.7 from ICD-9, and F11–F16, F18, F19, O35.5-T40 (except T40.4), T43.6, Z50.3, Z71.5 from ICD-10. The follow-up is from birth to age 20 in the analysis of hospitalizations up to age 20, and up to age 26 in the analysis of hospitalizations after age 20. Individuals hospitalized before age 20 are excluded in the analysis of hospitalization after the age of 20. We also conducted sensitivity checks that did not exclude individuals who were hospitalized before age 20.

2.2. Ethical approval

This study was approved by the Ethical Review Board, Stockholm.

2.3. Statistical analyses

To analyze the relationship between birth order and hospitalization for alcohol and narcotics use we apply Cox proportional hazard models (Cox, 1972). The failure event is the first hospitalization of the index person. The baseline hazard for hospitalization before age 20 is time since birth, and for hospitalization after age 20 is time since turning age 20. For each of our outcomes, we run two different models. The first is a regular Cox proportional hazard model on the full population. The second model uses sibling fixed effects to estimate the hazards of hospitalization based upon a within-family comparison. By comparing siblings in the same family we are able to adjust for all time invariant observed and unmeasured factors within the family that are shared by siblings. This includes completed family size, as well as parental socioeconomic status and parenting style to the extent that they remain constant over time. However, we are not able to adjust for a time-varying measure of parental socioeconomic status. Due to its ability to minimize confounding from unobserved or unmeasured variables, we consider the sibling fixed effects approach to be superior to the regular Cox proportional hazard model for addressing our research question. These sibling fixed effect analyses are based upon stratified Cox models where siblings share the same baseline hazard (Allison, 2009). The group variable by which the analyses are stratified is the shared mother ID. These sibling fixed effects analyses are based upon sibling groups with variance in the outcome, meaning that there must be at least two siblings in the family, and at least one of the siblings has to have been hospitalized. In the very rare cases where all of the siblings have been hospitalized, these sibling groups remain in the analysis if they are discordant on time to hospitalization. These analyses were performed using Stata 12 (StataCorp, 2011).

In each of our analyses we adjust for sex, maternal and paternal age at the time of birth using 5-year categories, and birth