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Alcohol use and change over time in firearm safety among families with young children

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ABSTRACT

Background: Improperly stored firearms pose a clear health risk to children. Previous research concurrently links alcohol use with lower levels of firearm safety. The objectives of this study were to assess (1) how families move from unsafe to safer firearm storage practices and (2) how parental drinking was associated with moving away from unsafe firearm storage practices.

Methods: This study used data from the Early Childhood Longitudinal Study-Birth Cohort, 2003 when children were two years old and again when they were four years old. Parents were asked about firearm storage practices, alcohol consumption, and information to measure other confounding variables. Their responses were used to identify families who engaged in unsafe firearm storage practices ($n = 650$) during the initial testing period and to assess how alcohol consumption and other variables were associated with moving to safer firearm storage practices at the second testing period.

Results: Families grew more likely to adopt safer firearm storage practices as their children aged, compared with continuing unsafe practices. Multivariate logistic regressions indicated that parental drinking, however, reduced the likelihood that parents moved to safer storage practices, controlling for covariates. Other families- and community-level variables, in particular, family structure, were also associated with the likelihood of moving to safer firearm storage behaviors.

Conclusions: Families with higher levels of alcohol use may need additional assistance in addressing firearm safety. The findings call for future research to better understand how physicians can counsel at-risk families to help them store firearms more securely.

1. Introduction

In the U.S., firearms can be found in a fourth to a third of families with children, and, in approximately 28–33% of these firearm-owning families (7–11% of all families), firearms are stored unlocked or loaded (DuRant et al., 2007; Okoro et al., 2005; Schuster et al., 2000; Stennies et al., 1999). American Academy of Pediatrics (2012) recommends that parents with young children keep firearms locked and unloaded, with ammunition stored and locked separately, and the NRA recommends that owners take precautions to keep firearms away from unauthorized users (National Rifle Association, 2018). These guidelines reflect the well-documented dangers that improperly stored firearms pose to children (Fowler et al., 2017; Hemenway and Solnick, 2015), and the underscore the importance of identifying the factors associated with safe firearm storage practices in general and moving to adopt such practices in particular. Although some research points to the concurrent

correlate of firearm safety behaviors (e.g., Martin-Storey et al., 2015; Okoro et al., 2005), no research to date has explored what kinds of factors are associated with improvement in firearm safety over time. Moving from safe to unsafe firearm storage practices, however, ultimately reflects a series of decisions and actions within the family.

Heavy alcohol use is associated with reduced safety in general (Committee on Substance Abuse, 1998), and it may be an actionable lever on which primary care health care providers can address the delicate issue of unsafe firearm storage. Using a nationally representative sample (the Early Childhood Longitudinal Study-Birth Cohort, or ECLS-B), this study sought to identify general trends in firearm storage safety and explore how alcohol use might be associated with parents of young children moving from unsafe to safe firearm storage strategies.

Research points to the particularly problematic link between heavy alcohol use and firearms. Heavy alcohol use is associated with an

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increased likelihood of firearms-related arrests, homicides, and suicides (Branas et al., 2016; Wintemute et al., 2017). These findings likely reflect the role of alcohol in exacerbating conflict, impairing judgment, and subsequently augmenting the probability of serious injury across a variety of contexts (Boden et al., 2012; Heinz et al., 2011). Within the home environment, higher levels of alcohol use are associated with greater risk for child injury more generally (Bijur et al., 1992; Phelan et al., 2007). Indeed, this greater likelihood of general pediatric injury associated with parental alcohol use likely reflects the role of parental supervision (which can be impaired by alcohol use: e.g., Harvey et al., 2011; Latendresse et al., 2003) in childhood injury prevention (Damashek and Kuhn, 2012; Schnitzer et al., 2014). Furthermore, research has concurrently linked alcohol use to lower levels of firearm safety (Martin-Storey et al., 2015; Wintemute, 2011). Although existing research has not isolated the mechanisms that link alcohol use to lower levels of firearm safety, there is a well-documented influence of alcohol on the cognitive processes associated with decision making (George et al., 2005; Montgomery et al., 2011), evidence of links among alcohol use, impulsivity, and injury more generally (Cherpitel, 1993), and the association between alcohol use and higher levels of family stress (Grekin et al., 2005). These factors, in turn, may negatively influence the organizational processes that support firearm safety, making alcohol use a plausible contributing explanation for unsafe firearm behaviors. Ultimately, existing research suggests several mechanisms for why alcohol use may be negatively associated with family firearm safety and indicates an urgent need for more information about how alcohol use is associated with a change in firearm safety over time.

Moving beyond extant cross-sectional research to explore these questions longitudinally is important for understanding how alcohol use hampers firearm safety in families with young children. First, cross-sectional research cannot account for the developmental change over time in the threat firearm pose to children. Physically, children's capacity to injure themselves or others with an unsecured firearm increases over time (Naureckas et al., 1995), while the likelihood that parents will store firearms securely diminishes (Schuster et al., 2000; Johnson et al., 2006). These changes reflect parents' unrealistic perceptions about children's firearm safety capacities (Baxley and Miller, 2006; Connor and Wesolowski, 2003; Farah et al., 1999). Indeed, although cross-sectional research suggests that parents of older children may be less likely to secure firearms for younger children, no existing research has specifically explored patterns of change among families with firearms. On the one hand, changes in the development of the child may prompt families to move towards safer firearm storage strategies (e.g., Naurekas et al., 1995). On the other hand, over-estimation of children's capacities to act responsibly in the presence of firearms (e.g., Baxley and Miller, 2006) may impede parents from moving to safer firearm storage practices. Second, family level (i.e., parental depression, white race/ethnicity, family structure, having some college experience, and lower incomes) and environmental factors (i.e., those factors reflective of a more general firearm culture) are associated with both firearm ownership (Okoro et al., 2005; Martin-Storey et al., 2015; Morrissey, 2016; Schwebel et al., 2014) and alcohol use (Cherpitel, 1999; Grant et al., 2004; Sullivan et al., 2005). Exploring how alcohol use is associated with not just unsafe firearm storage but also with the deterioration of safety over time is an opportunity to go beyond identifying the common correlates of firearm storage and alcohol use and provides insight into the mechanisms explaining this association.

1.1. Aims and hypotheses

Unintentional firearm deaths are a concerning and avoidable cause of morbidity and mortality among young children (Fowler et al., 2017). For this reason, early childhood is an important developmental period for an understanding change in firearm safety more generally, and how this change is influenced by parental alcohol use more specifically.

Using longitudinal data from ECLS-B, the objectives of this study were to assess (1) how families moved from unsafe to safer firearm storage practices over time and (2) how parental drinking was associated with moving away from unsafe firearm storage practices. We hypothesized that the majority of families with unsafely stored firearms would move to safer firearm storage practices over time and that higher alcohol use would reduce the likelihood that individuals would move to safer firearm storage practices. Understanding if and how parental alcohol use is associated with a change in firearm storage provides important information for primary care providers in identifying and counseling at-risk families.

2. Material and methods

2.1. Sample

ECLS-B is a nationally-representative sample of U.S. children born in 2001. It followed 10,600 children from birth through kindergarten (Snow et al., 2009). In-home interviews were conducted with parents when the focal child was 9-months, 2-years, and 4-years old, and at kindergarten entry, with information collected on the child and parents, as well as in other settings. This study used the 2-year and 4-year interviews in which parents reported on firearm practices. Children who were not living with their mothers at the 2-year and 4-year interview were excluded from the analytical sample ($n = 300$). Children of mothers 15 years or younger ($n = 50$) were also excluded from the analytic sample because this group was not generalizable at the population level. An additional 2100 children were excluded because their families did not participate in either or both of the 2-year and 4-year interviews. The final sample consisted of 650 cases in which parents reported owning firearms but did not keep them stored in a locked cabinet (i.e., unsafe firearm owners) at the 2-year interview. This selection excluded the 7450 cases where families reported not owning firearms or owning firearms and storing them in a locked cabinet during the first assessment period. Despite its age, ECLS-B remains the best available data source for this study because it is the only study of which we are aware that provides nationally-representative, longitudinal data on firearm safety practices from families that also includes detailed information about alcohol consumption.

Descriptive statistics for the sample are presented in Table 1. Within the analytical sample, the majority (91.9%) had a family in which the male partner had always been in the home, or moved into the home, with 4.2% never having had a male partner in the home and 3.9% had a male partner move out of the home. The majority of families could be described as middle class, with 39.1% reporting incomes ranging between \$50,001–\$100,000 and 32.6% reporting incomes between \$25,000 and \$50,000. The largest group of participants reported: 1) maternal education of a high school diploma or GED (34.1%) or some college experience or an associate's degree (34.1%); 2) a race/ethnicity of non-Hispanic White (88.6%); 3) living in urban areas (48.3%), with the remaining 35.7% in rural areas and 16.3% in urban clusters; and 4) living in the South (40.3%) followed by the Midwest (28.2%) and the West (22.83%). These descriptive statistics are in line with previous work looking at the demographic factors associated with firearm ownership (Okoro et al., 2005; Schuster et al., 2000).

2.2. Measures

2.2.1. Firearm ownership and safety

Two questions from the 2- and 4- year interviews assessed parents' firearm behaviors. Parents (among our analytical sample, always the mother) were asked: "do you have a gun in your home?" If parents responded affirmatively, they were asked: "do you keep all guns in a locked cabinet?" These two questions were used to identify parents at the 2-year interview who owned a firearm and did not keep the firearm stored safely. Parents were subsequently assigned to two groups at the

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