HHS Public Access

Author manuscript

Matern Child Health J. Author manuscript; available in PMC 2017 August 04.

Published in final edited form as:

Matern Child Health J. 2015 January ; 19(1): 17–24. doi:10.1007/s10995-014-1490-3.

Family Process Correlates of Firearm Ownership and Firearm Storage Among Families with Young Children

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Abstract

To understand how family relations and dynamics were associated with firearm ownership among US families with 4-year-olds and with firearm storage among those families with firearms, controlling for sociodemographic characteristics of families and states. With representative data from the Early Childhood Longitudinal Study-Birth Cohort (n = 8,100), logistic regression models employed a set of family process variables (e.g., parenting practices, parental stress, maternal depression, and safety behaviors) as (1) predictors of firearm ownership among all families and, (2) as predictors of safe firearm storage among firearm owning families. An estimated 22 % of families with pre-kindergarten age children reported having firearms in their households. Among firearm owning families, 69 % of families kept firearms in a locked cabinet. Comparing families who did and did not report owning firearms, those who did were more likely to report spanking their children. Firearm owning parents who reported higher levels of parenting stress and lower likelihood that their child always wore a helmet when bicycling were also more likely to report unsafe firearm storage practices. Family processes differentiated both firearm owners from non-firearm owners and firearms owners who locked up their firearms from firearm owners who did not. These findings suggest that firearm ownership and firearm safety behaviors likely arise from a more general family context related to child health and safety.

Keywords

Firearm storage; Disciplinary practices; Family safety behavior; Early childhood; Parenting stress

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Conflict of interest The authors have no conflicts of interest or relevant financial relationships related to this manuscript to report.

Introduction

The American Academy of Pediatrics strongly recommends that parents who own firearms keep them locked and unloaded, with ammunition stored separately and also locked [1]. For a variety of reasons, including self-defense [2], not all families follow these recommendations. Depending on how household firearm ownership is defined, between 1.6 and 2.6 million US children live in homes with unlocked firearms [3, 4]. Recent developments in ecological systems theory suggest that family processes—or, the psychosocial dynamics of daily family life in the household—are important determinants of child health, particularly those processes that are linked with family stress and disorganization [5]. This study extends existing work by postulating that firearm ownership and safety will be tied to such health-related family processes above and beyond the well-documented family demographic and state-level characteristics associated with firearm ownership.

Ecological perspectives on child health and development—which highlight the overlapping settings in which children live—are useful for identifying the risk factors in children's exposure to unsafe firearm practices [6, 7]. In particular, an ecological approach can extend the existing literature by exploring the association between family processes and firearm ownership, especially when employing nationally representative data. Firearm ownership, and particularly firearm storage, can be thought of as a natural outcome of family processes. From this perspective, firearm storage is likely one dimension of the constellation of family safety behaviors commonly addressed by pediatricians, including motor vehicle safety, the use of helmets while bicycling or skating, and poison storage [8, 9]. Existing research has linked family processes to other indices of family safety behavior, including propensity for child injury [10]. More broadly, understanding how both adherence to different measures of family safety as well as more general family processes (e.g., parenting) are associated with firearm ownership and safety may identify family contexts that promote recommended firearm safety practices [11–13]. Ultimately, factors such as parenting stress, maternal depression, and corporal punishment may reflect patterns of family disorganization that can potentially alter firearm storage behavior.

Of course, any links among family processes, firearm ownership, and firearm storage are embedded in the larger ecological context of firearm ownership that extends beyond the household. Indeed, previous work not accounting for the broader sociodemographic correlates of firearm ownership has failed to link firearm storage with other safety behaviors [2]. First, states differ widely in patterns of firearm ownership and rates of firearm mortality [3, 14, 15]. Living in rural areas and in the South are associated with higher rates of firearm ownership and less safe firearm storage [4, 16–18], reflecting regional variation in attitudes toward and uses for firearms. Second, stratification systems dividing the population into subgroups that differ in economic and political influence reflect a more abstract ecological context that may be confounded with any observed associations between family processes and firearm storage. For example, socioeconomic stratification—based on income and educational attainment—is closely associated with firearm ownership, although not necessarily with storage practices [4, 18–20]. Racial/ethnic stratification is another example, with non-Hispanic White families more likely to own firearms than other racial/ethnic

groups [4]. Finally, having an adult male residing in the home is associated with higher rates of firearm ownership as well as many family processes [21, 22]. Exploring the association between family processes and firearm ownership without accounting for regional and sociodemographic factors, therefore, runs the risk of confounding the role of these family processes with the structural factors of the individual's broader ecological context.

Exploring how family processes were associated with firearm ownership and storage allowed for a better understanding of which children are at risk for exposure to conditions that are most likely to result in unintentional firearm-related injuries. Employing a nationally representative sample of a birth cohort of young children and their families, this study had two goals. The first was to examine how family processes distinguished firearm owners from non-firearm owners. The second was to explore how these processes differentiated firearm-owning families that did and did not store their firearms safely. We anticipated that family processes would not consistently differentiate between families with and without firearms but that family processes previously linked with more problematic child outcomes would be more common among families that did not report locking their firearms compared to those that did.

Methods

Data and Sample

The Early Childhood Longitudinal Study-Birth Cohort (ECLS-B) is a nationally representative panel study of US children born in 2001, designed to examine children's early development and school readiness in the context of their home and educational experiences. The data collection was approved by state institutional review boards, and permission for secondary analysis of the data under a security plan approved by the National Center for Education Statistics (which runs ECLS-B), was granted by the review board of the authors' university.

ECLS-B is representative of children born in the US in 2001 to mothers aged 15 years and older, who were not adopted at or shortly after birth and did not die by 9 months. Over 10,600 parents of these children were interviewed 9 months after birth. Follow-up interviews, in which parents and caregivers answered questions about health, family, and child care experiences (among other topics) were conducted when the child was 2, 4, and 5 years old (with a purposeful reduction in the sample size at the last wave). Participants received modest monetary compensation for their participation. More detailed descriptions of this study have appeared in previously published reports [23]. Here, we used only data at the pre-kindergarten (age 4) wave—an interview in 2005 when parents were asked about their firearm ownership and safety practices. The analytical sample included approximately 8,100 pre-kindergarten-aged children. It was restricted to children of mothers over age 15 when the child was born and to families in which the child was living with her or his biological mother at the pre-kindergarten interview.

Dependent Variable

Interviews included questions on firearms along with other safety-related questions. Parents were asked if they owned a firearm. If they responded affirmatively, they were asked a follow up question about whether all the firearms were stored in locked cabinets. Note that a locked cabinet does not refer explicitly to a firearm cabinet but instead more generically to keeping firearms locked and in a secure place.

Family Processes

Family processes, as defined above, were assessed by two sets of variables. The first included four measures that assessed general family processes. First, the parenting stress scale consisted of five items that addressed parenting difficulties (e.g., "I feel trapped by my responsibilities as a parent", "I often feel tired, worn out, or exhausted from raising a family"). Parents could respond to the statements on a scale ranging from 1 (strongly disagree) to 4 (strongly agree), with higher scores indicating higher levels of stress. These items were averaged into a scale with a Cronbach's alpha of 0.78. Second, parents were also asked whether they spanked their child in the past week (1) or not (0), a measure employed in previous studies with ECLS-B [24]. Third, to assess cognitively supportive parenting practices, the Two-Bag Task, a previously validated observational measure of parental emotional supportiveness, was employed [25]. This scale was based on coder observations of an activity in which the parents and children are presented with two numbered bags, each containing appropriate play items. The parents and children must play with these items in order, and parents are rated on sensitivity, intrusiveness, stimulation, positive regard, negative regard and detachment. Fourth, maternal depression, a correlate of parental efficacy in past studies [26], was measured with a modified version of the Center for Epidemiologic Studies-Depression (CES-D) Scale. It included 12 items in which mothers reported feeling anxious, bothered, or sad, and it had a Cronbach's alpha of 0.86 [27, 28]. Mothers responded on a scale from 1 (rarely or never) to 4 (most or all days a week), with higher scores indicating greater maternal depression. We took the mean of these 12 items.

The second set of questions addressed family processes related to safety behavior. Parents were asked (1) whether the target child always wore a helmet when riding a bicycle or skates, (2) whether the target child always traveled in a car seat when in a car, (3) whether the target child always traveled in the back seat of the car, and (4) whether the home had working smoke detectors. These items were coded as present (1) or absent (0).

Control Variables

A number of covariates were measured to better specify the associations between family process factors and the firearms-related outcomes. The first set assessed basic family characteristics, including the mother's age at the child's birth, her race/ethnicity (dummy variables for non-Hispanic White, non-Hispanic Black, Hispanic, or "other" race), and her highest educational attainment (dummy variables for less than high school diploma/GED, a high school diploma/GED, some college experience/associate's degree, or a college degree or higher). Family structure was measured by three dummy variables (married biological parents, cohabiting/step parents, or single mother), and annual household income by four dummy variables ($0–$25,000, $25,001–$50,000, $50,001–$100,000, or $100,001 or more).

Child's gender (1 = female, 0 = male) and the number of siblings in the home (a continuous count) were included because of their potential overlap with parenting styles and/or propensity to alter firearm safety practices. Finally, a scale measured how important parents reported their religious beliefs were to how they raised their children. Parents who reported not having any religious beliefs were coded as 1, with the majority of parents coded between 2 (not important at all) through 5 (very important). This scale was included because of the associations among religiosity, firearm ownership, and parental discipline [29, 30].

The second set of controls related to larger ecological factors associated with firearm ownership. Neighborhood urbanicity was measured by three dummy variables (urbanized area, less densely populated urban cluster, or rural area), per the US Census Bureau criteria [31]. Region of residence, a possible marker of "firearm culture" more generally, was measured by four dummy variables (Northeast, South, Midwest, and South) [14]. Firearm-relevant state-level characteristics were captured by two continuous measures. First, state mortality rates due to firearm-related injuries were measured using data from the Center for Disease Control and Prevention, which detailed the age-adjusted number of deaths per 100,000 people within each state in 2005 [32]. Second, 2002 state-level estimates of the prevalence of household firearms were identified through data published by Okoro et al. [3].

Analytical Plan

As a first step, bivariate analyses were conducted (1) to compare families with and without firearms on the family process and control variables and (2) to compare families with firearms that did and did not report locking up their firearms on family process and control variables. In the second step, multivariate analyses were employed, with logistic regressions examining (1) the associations between the family process variables and firearm ownership, controlling for sociodemographic and state-level variables and, (2) the associations between family process variables and firearm storage among firearm owners, again controlling for sociodemographic and state-level variables. All analyses were conducted in Stata, employing the *svy* commands, which permit the use of sample weights, and created estimates using a robust standard error. Another advantage of Stata is the suite of *mi* commands, which were used to conduct multiple imputation for missing data within the full set of variables [33]. In total, 1.0 % of the data were imputed, as list wise deletion would have resulted in the loss of 19 % of the sample overall, and is not recommended for this kind of data set [34]. All analyses were performed with both the imputed and non-imputed data, to check for robustness (results from non-imputed analyses available on request). Sample weights were used in all analyses to account for the complex survey design and differential attrition across waves.

Results

Overall, 21.9 % of families with pre-kindergarten age children in 2005 had firearms in their households. Of parents who reported owning firearms, an estimated 68.7 % reported keeping their firearms in a locked cabinet. Overall, approximately 6.9 % of parents reported having unlocked firearms in their homes.

Two sets of descriptive statistics are presented in Table 1. The first two columns compare firearm owners to non-firearm owners. The second two columns compare firearm owners who did and did not lock their firearms. Starting with the first column, firearm owners reported lower levels of parenting stress, higher levels of responsive parenting, a greater likelihood of spanking a child in the past week, and lower levels of maternal depression than parents who did not own firearms. They were also more likely to report that the child always rode in a car seat, that the child always rode in the back seat of the car, and that they had a working smoke detector in the house. Beyond these family process variables, firearm-owning families were more likely to live in rural or less densely populated urban areas, in the South or Midwest, and in states with higher rates of firearm ownership and firearm-related mortality. Mothers in these families were also older when they had their first child, were more likely to be non-His-panic White, were more educated, were more likely to be partnered with their child's other biological parent, and had higher overall household incomes.

The second two columns of Table 1 compared firearm owners who did and did not lock up their firearms. These descriptive statistics revealed that firearm owners who did not report locking up their firearms also reported more sensitive and responsive parenting and a lower likelihood of having a child that always wore a helmet than those that did. Firearm owners who did not lock their firearms were also more likely than those who did to live in the Midwest (and less likely to live in the Northeast) and in states with higher rates of firearm ownership and firearm-related mortality. They were also more likely than firearm owners who locked up their firearms to be non-Hispanic Whites (and less likely to be Hispanic White), more likely to have some college education (and less likely to have just a high school degree), and more likely to have a household income between $50,001 and 100,000 a year (and less likely to be in a household making over $100,000 a year).

Next, Table 2 presents the results of the logistic regressions, which highlight the family process factors that differentiated firearm owners from non-firearm owners (presented in the first two columns) and differentiated firearm owners who did and did not lock up their firearms (presented in the second two columns), controlling for sociodemographic and state-level variables. Starting with the first column, the significant odds ratio indicated that parents with firearms were 41 % more likely to report spanking their children than those without firearms. No other significant associations were observed for the family process variables, although, as anticipated, a number of the family, neighborhood, and state controls differentiated between families with and without firearms, including family structure, maternal education, family income, race/ethnicity, urbanicity, and state rates of firearm ownership.

Turning to the second set of columns in Table 2, parents who did not lock up their firearms reported higher levels of parenting stress (a 33 % increase in the likelihood of reporting unlocked firearms in the home for each additional point on the parenting stress scale), whereas having a child who always wore a helmet was associated with a 35 % decrease in the likelihood of having an unlocked firearm in the home among firearm owners. Lower maternal age at the focal child's birth, being non-Hispanic Black, and reporting an annual

household income over $100,000 were also associated with a decreased likelihood of having unlocked firearms in the home.

Discussion

This study explored two related hypotheses regarding the family processes associated with (1) firearm ownership and (2) firearm storage among firearm owners. Largely confirming the first hypothesis, firearm owners were more likely than other parents to report spanking their children, controlling for well-established socio-demographic and state-level factors associated with firearm ownership, but the two groups of parents did not differ significantly on any of the other family process variables. Partially confirming the second hypothesis, parents who owned firearms but did not lock them up were more likely than other firearm owners to report parenting stress, and they were less likely to report that their children always wore helmets. Again, these family processes were associated with firearm safety behaviors above and beyond sociodemographic and state-level variables.

Bivariate analyses generally suggested higher levels of functioning among families with firearms compared to families who did not report having firearms. After controlling for demographic and state-level variables, however, the likelihood of spanking a child was the only family process variable that differentiated between families with and without firearms. This finding may reflect the existence of some underlying parenting ethos associated with both firearm ownership and attitudes about discipline that can be examined in future research [35, 36].

Significant differences were also observed across families who did and did not lock their firearms. In line with work suggesting that family stress is an important correlate of child health, parents who reported not locking their firearms reported higher levels of parental stress than those who did [37, 38]. These findings suggest that firearm safety behaviors among firearm owners may be one of many health behaviors impeded by family stress.

We did not find a statistically significant association between car seat safety and firearm storage, although contrary to previous research, a significant association was found between helmet usage and safer firearm storage behaviors [2]. This difference could be a product of the larger, nationally representative dataset used in this study. The importance of helmet usage in identifying firearm-owning families who did not follow common safety precautions for firearms likely reflects the greater variation in helmet usage compared to the other safety behaviors measured.

Exploring the role of family processes in firearm ownership and unsafe firearm storage among families of young children provides a unique opportunity to identify children who may be at risk. Some limitations, however, must be acknowledged.

First, this study relied on self-reported firearm ownership of one family member. Although some work supports the validity of self-reported firearm ownership [39], women, who were the primary respondents in this study, tend to under-report firearm ownership and over-report the safe storage of firearms in their households [40].

Second, the questions used to address firearm ownership were somewhat limited. Although participants were asked specifically whether they kept their firearms in locked cabinets (although not explicitly in firearm cabinets), they were not asked about the types of firearms they owned or the purpose of having those firearms. Storage devices may be expensive or unwieldy for low-income families or families living in smaller dwellings. Future research may clarify the socioeconomic findings by asking about alternative forms of firearm storage. Third, as is frequently the case with longitudinal studies, a number of families left the study in the 4 years of data collection following the initial recruitment at the birth of the child. Despite using sample weights that were recalculated for each data collection, this limitation should be kept in mind when interpreting the current findings.

Fourth, participants in this study reflected a representative sample of children living with their mothers, where the mothers were above the age of 15 during the initial period of data collection. It excludes children who lived exclusively with their fathers. The conclusions drawn from these findings, then, cannot not be extended to these other kinds of families. Fifth and finally, these data were correlational. Consequently, causal directions in associations between ecological factors and firearm ownership and storage behaviors cannot be established.

Conclusions

Firearm storage has been repeatedly highlighted as an important safety issue for families. These findings indicate that firearm storage, like other family health behaviors, is associated with more general family processes. From a practical standpoint, this association would suggest that some of the family processes that put children at risk for other negative health outcomes are also associated with problematic firearm storage practices. Our findings also indicate that there is a select group of people in specific geographic areas that are most at risk for unsafe storage practices. Moreover, the policy climate around firearm legislation, as demonstrated by the events following the Sandy Hook massacre, has highlighted the difficulties in passing major federal legislation targeting these safety behaviors. These two things indicate that efforts aimed at increasing safe storage behaviors in homes with children may be best placed in state-level policy initiatives and in programs in communities most at-risk (e.g., families reporting higher levels of parenting stress).

Acknowledgments

The first author was funded by a postdoctoral research fellowship from the Social Sciences and Humanities Research Council of Canada. The second author’s current research is based upon work support by the NICHD Ruth L. Kirchstein National Research Service Award under Grant No. T32 HD007081-35. The third author was funded by grant R01 HD055359-01 from NICHD. None of these funding agencies played a role in design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript. Ms. Prickett had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Table 1

Descriptive statistics for families with pre-kindergarten-aged children by firearm ownership and safety practices (n = 8,100)

	Do not own firearms (%)	Own firearms (%)	Own Firearms	
			Locked (%)	Unlocked (%)
Family processes				
Spanked child in past week	32.0	40.6[a]	39.1	44.0
Sensitive and responsive parenting (1–7)	4.3	4.5[a]	4.5	4.6[b]
Parenting stress (1–4)	2.0	1.9[a]	1.9	2.0
Child always wears a helmet	32.7	31.0	33.9	24.9[b]
Child always rides in car seat	81.5	85.2[a]	85.2	85.2
Child always rides in back of car	91.3	90.2	91.0	88.7
Working smoke detectors in home	87.9	89.6[a]	90.0	88.8
Maternal depression scale (1–4)	1.5	1.4[a]	1.4	1.4
Neighborhood and state-level factors				
Urbanicity				
Rural area	10.6	33.6[a]	32.7	38.2
Urban area, inside an urbanized area	10.6	18.5[a]	17.9	20.1
Urban area, inside an urban cluster	78.8	47.9[a]	50.5	41.8
Region				
Northeast	17.7	10.2[a]	11.9	6.6[b]
South	35.7	46.5[a]	47.0	45.7
Midwest	22.1	24.0[a]	22.0	28.3[b]
West	24.5	19.3[a]	19.2	19.5
State mortality rate due to firearm-related injuries	10.0	11.2[a]	11.1	11.5[b]
State firearm ownership rates	31.4	38.9[a]	38.1	40.5[b]
Sociodemographic characteristics				
Maternal age at birth (years)	27.2	28.3[a]	28.0	28.9[b]
Maternal race/ethnicity				
Non-Hispanic White	49.6	84.9[a]	83.1	88.9[b]
Non-Hispanic Black	16.7	4.4[a]	5.4	2.1[b]
Hispanic White	27.4	6.5[a]	7.4	4.6[b]
Other race	6.3	4.2[a]	4.2	4.3
Maternal education				
No high school diploma/GED	23.9	9.1[a]	9.9	7.4
High school diploma/GED	31.3	30.9	32.2	28.3[b]
Some college/associate's degree	22.6	32.5[a]	31.2	34.9[b]

	Do not own firearms (%)	Own firearms (%)	Own Firearms	
			Locked (%)	Unlocked (%)
College or more	22.2	27.6[a]	26.8	29.4
Family structure				
Married biological parents	61.6	82.9[a]	82.7	83.9
Cohabiting/step parents	15.4	7.4[a]	7.3	7.0
Single mother	23.0	9.8[a]	10.0	9.1
Importance of religion in raising child	4.0	4.1[a]	4.1	4.1
Household income				
$0–$25,000	34.7	13.6[a]	12.8	14.8
$25,001–$50,000	27.8	29.6	29.2	30.7
$50,001–$100,000	23.5	39.1[a]	38.9	39.4[b]
$100,001 or more	14.0	17.8[a]	19.0	15.1[b]
Proportion of sample	78.2	21.9	15.0	6.9
Sample *n*	6,100	1,800	1,200	550

Frequencies were weighted. Unweighted *N*s rounded to nearest 50th per NCES guidelines Chi^2 tests for dummy variables, two-sample *t* tests for scales

[a]Significantly different from non-firearm owners ($p < 0.05$),

[b]significantly different from locked firearm owners ($p < 0.05$)

Table 2

Logistic regressions predicting firearm ownership and safety practices among families with pre-kindergarten-aged children

	Firearm ownership among total sample		Unlocked firearm among firearm owners	
	OR	**(95 % CI)**	**OR**	**95 % CI**
Family processes				
Spanked child in past week	1.41***	(1.18, 1.69)	1.10	(0.81, 1.49)
Sensitive and responsive parenting (1–7)	1.10	(0.97, 1.24)	1.16	(0.96, 1.40)
Parenting stress (1–4)	0.98	(0.84, 1.13)	1.33*	(1.01, 1.74)
Child always wears helmet on bikes	0.85	(0.70, 1.04)	0.65*	(0.46, 0.92)
Child always rides in car seat	1.20	(0.94, 1.53)	1.18	(0.76, 1.83)
Child always rides in back of car	0.78	(0.57, 1.06)	0.96	(0.57, 1.60)
Working smoke detectors in home	1.13	(0.83, 1.53)	0.79	(0.50, 1.25)
Maternal depression scale (1–4)	0.89	(0.71, 1.12)	0.91	(0.63, 1.31)
Neighborhood and state-level factors				
Urbanicity (ref: rural)				
Urban area, inside an urbanized area	0.28***	(0.22, 0.35)	0.74	(0.52, 1.05)
Urban area, inside an urban cluster	0.62***	(0.47, 0.81)	0.87	(0.59, 1.30)
Region (ref: Northeast)				
South	1.06	(0.71, 1.59)	1.37	(0.62, 3.06)
Midwest	0.82	(0.58, 1.16)	1.84	(0.93, 3.63)
West	1.15	(0.78, 1.68)	1.65	(0.78, 3.49)
State firearm-related mortality	1.01	(0.97, 1.06)	1.01	(0.94, 1.09)
State firearm ownership rates	1.04***	(1.02, 1.05)	1.01	(0.99, 1.03)
Sociodemographic characteristics				
Maternal age at birth (years)	1.01	(0.99, 1.03)	1.04**	(1.01, 1.07)
Maternal race/ethnicity (ref: non-Hisp White)				
Non-Hispanic Black	0.33***	(0.24, 0.45)	0.40*	(0.19, 0.85)
Hispanic White	0.34***	(0.25, 0.46)	0.73	(0.39, 1.38)
Other race	0.54***	(0.40, 0.71)	1.11	(0.63, 1.93)
Maternal ed. (ref: less than high school/GED)				
High school diploma/GED	1.43*	(1.04, 1.95)	1.26	(0.66, 2.41)
Some college/associate's degree	1.57**	(1.12, 2.19)	1.73	(0.89, 3.36)
College or more	1.10	(0.75, 1.59)	1.65	(0.81, 3.37)
Family structure (ref: married bio parents)				
Cohabiting/step parents	0.77	(0.58, 1.02)	1.12	(0.69, 1.96)
Single mother	0.33***	(0.24, 0.45)	0.88	(0.47, 1.66)
Importance of religion in raising child	0.99	(0.92, 1.07)	0.94	(0.82, 1.08)
Household income (ref: $25,000 or less)				

	Firearm ownership among total sample		Unlocked firearm among firearm owners	
	OR	**(95 % CI)**	**OR**	**95 % CI**
$25,001–$50,000	2.04***	(1.57, 2.64)	0.83	(0.51, 1.34)
$50,001–$100,000	2.78***	(2.07, 3.72)	0.72	(0.43, 1.21)
$100,001 or more	2.52***	(1.77, 3.59)	0.50*	(0.27, 0.93)
Constant	0.06***	(0.23, 0.16)	0.04***	(0.01, 0.24)
Pseudo R^2	0.21		0.04	
n	8,100		1,700	

Unweighted *N*s rounded to nearest 50th per NCES guidelines. Additional controls not presented: family does not own a car, child does not ride bicycle/skates, child's gender, number of siblings in the household

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$