Nonfatal Injuries Among US Children With Disabling Conditions

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Objectives. We investigated the risk of nonfatal injury in US children with disabilities. Disability was defined as a long-term reduction in the ability to conduct social role activities, such as school or play, because of a chronic physical or mental condition.

Methods. Among 57 909 children aged 5–17 years who participated in the 2000–2002 National Health Interview Survey, we identified 312 children with vision/hearing disabilities, 711 with mental retardation, 603 with attention-deficit/hyperactivity disorder (ADD/HD), and 403 with chronic asthma. We compared nonfatal injuries in the past 3 months between children with disabling conditions and those without using injury rates and logistic regression analyses.

Results. Compared with children without a disability, a higher percentage of children with disabilities reported nonfatal injuries (4.2% for vision disability, 3.2% for mental retardation, 4.5% for attention-deficit/hyperactivity disorder, and 5.7% for asthma vs 2.5% for healthy children). After we controlled for confounding effects of sociodemographic variables, children with disabilities, with the exception of mental retardation, had a statistically significantly higher injury risk than those without disabling conditions.

Conclusions. Children with a disabling condition from vision/hearing disability, ADD/HD, or chronic asthma had a significantly higher risk for nonfatal injuries compared with children without a disabling condition. These data underscore the need to promote injury control and prevention programs targeting children with disabilities. (*Am J Public Health.* 2005;95:1970–1975. doi:10.2105/AJPH.2004.057505)

Disability ranks as a major public health problem affecting an estimated 54 million people, or nearly 20% of the population, in the United States.[1–5] Studies have estimated that among school-age children,[5–17] 5.5% have school-related disabilities and an additional 2.0% have limitations in nonschool activities.[6] National data indicate that from 1990 to 1994, disability rates increased by 33% among girls and 40% among boys aged younger than 18 years.[7] Many factors have caused these dramatic increases, including biomedical advances enabling more children to survive and more disabled children to live longer, epidemics of chronic conditions as a result of changes in children's lifestyles (e.g., overweight and asthma), more early detection of chronic diseases, and improved awareness of disabilities.[4]

Disabled persons are believed to face a higher injury risk than their healthy counterparts because of their deficiencies in gait/motor control, impairments in mental processing, and the potential side effects of medications used to treat their condition(s).[8–14] In recent years, injury risk and injury prevention among disabled children has received attention from the public health community. Attention-deficit/hyperactivity disorder (ADD/HD) has been associated with an elevated risk of general injury, burn injury, traumatic brain injury, and automobile injury events.[12,14–19] Children with mental or developmental disabilities were also found to be significantly more likely to experience a nonfatal injury than their peers without disabilities.[8,10,11,20] Furthermore, 1 study found that injuries suffered by disabled children tended to be more severe compared with injuries among children with no disability.[9]

Although injury risk among children with disabilities has been investigated by these studies, the problem of nonfatal injury risk and injury prevention in this vulnerable population has not been researched to the extent that the magnitude of the problem requires. Legood et al. investigated visual impairment and injury risk and concluded that sound epidemiological study of injury risk among individuals with visual impairment has never been done.[21] Sherrard et al. also recognized in a recent literature review that not enough injury studies have included people with an intellectual disability.[22]

Using nationally representative data from the 2000–2002 National Health Interview Survey (NHIS), we sought to provide a current profile of nonfatal injuries among children with disabling conditions.

METHODS

Data Source and Sample Design

The data presented here were derived from the 2000–2002 NHIS, a continuing nationwide household survey completed annually by the US Census Bureau for the National Center for Health Statistics.[23] This national survey provides health information on a nationally representative sample of the noninstitutionalized civilian population in the United States. Data are obtained through a complex survey design involving stratification, clustering, and oversampling of certain population subgroups (e.g., racial/ethnic minorities) to ensure a sufficient sample size for each subgroup. Because the NHIS sampling plan is designed to be representative of the US noninstitutionalized population, the results presented here are potentially more accurately generalized than local survey results.

All interviews were completed face-to-face in the respondent's household. A knowledgeable adult family member, usually the mother, answered questions for children aged younger than 17 years; children aged older than 17 years are permitted to respond themselves. This study combined data from the 2000, 2001, and 2002 Family Core questionnaires on 57 909 children aged 5–17 years. There were no changes in questionnaire design or weighting structures across

these years, so using annualized estimates from the combined years presented no statistical or analytic problems.

Measuring Disability

We used the concepts of the World Health Organization–approved International Classification of Functioning, Disability, and Health—to measure disabilities in our study.[24] Children with a disability were defined as children who were limited in or unable to perform age-appropriate social activities because of a chronic physical or mental condition. The determination of the disabling conditions was a 2-step process. Parents were first asked whether their child's age-appropriate activity was limited by a physical, mental, or emotional problem. Next, the condition was defined as a disability if it (1) caused the child to require the help of another person with personal care needs (e.g., eating, bathing, dressing), or (2) caused the child to receive special education or early intervention services. A variable indicating length of the disability was used to ensure that the child had the disabling condition for at least 1 full year before the interview so the injury of interest did not cause or contribute to the disabling condition. We further identified children with disabling conditions of interest from the respondents' answers to the question "What conditions or health problems cause your child's limitations?" "Vision or hearing problems" represented children who had a hearing problem or a vision problem. "Mental retardation/other developmental disabilities" represented children with mental retardation or other developmental disabilities. "ADD/HD" included children who had attention-deficit disorder or attention-deficit disorder with hyperactivity. We created a category for "asthma" to include children with limitations because of chronic asthma. Injuries among children with asthma were also studied previously.[20] On the basis of disabling conditions studied by other investigators and the sample size in the NHIS data, we focused on these 4 conditions and excluded 3197 children with other disabling conditions. Children with more than 1 of these disabling conditions were also excluded from the study to avoid confusion.

Children without disabling limitations from any above conditions or health problems were designated as "no disability" and therefore were used as the "healthy" children in our study.

Injury Definition

Of special interest in this study were the nonfatal injuries occurred among children aged 5–17 years. A portion of the NHIS Family Core questionnaire reviews any injury serious enough to require medical attention in the 3 months immediately preceding the interview. The interview is conducted year-round, thereby eliminating a seasonal influence on the 3-month recall. For each injury, detailed information is collected on the cause of injury, the activity in which the child was participating when injured, and the location of injury. However, there were not enough injury cases in each disability group in the 2000–2002 NHIS data to afford statistically meaningful results on injury characteristics; therefore, results regarding cause of injury and activity when injured are not presented here.

Statistical Analysis

Data analyses were conducted with SAS statistical software (SAS Institute Inc., Cary, NC)[25] and SUDAAN software (Research Triangle Institute, Research Triangle Park, NC).[26] Data were first prepared in SAS, but standard errors and test statistics were derived in SAS-callable SUDAAN procedures to account for the complex sample design and weighting structure of the NHIS. Statistical weights were used in the NHIS to adjust for survey nonresponse, oversampling, and distribution of US census population by age, gender, and race; therefore, estimates presented in this report reflect national totals of the US civilian noninstitutionalized population.[23]

We first studied the distribution of children with disabling conditions (vision/hearing disabilities, mental retardation or other developmental disabilities, ADD/HD, and chronic asthma) and healthy children with regard to gender, age, race, parent's highest level of education, family poverty status, health insurance coverage, and family size. Then, the percentages of children who had injuries that occurred during the 3-month period before the interview were calculated and compared between these 2 groups. We used χ^2 statistics to determine whether differences between children with and those without disabling conditions were statistically significant. Finally, we used odds ratios (ORs) and the associated 95% confidence intervals (CIs) from univariate and multivariate logistic regression analyses to assess the impact of having disabling conditions on nonfatal injury risk through control for confounding effects of the above sociodemographic variables. In all analyses, all comparisons with a 2-sided P value less than .05 were considered statistically significant unless specified otherwise.

RESULTS

Social and Demographic Characteristics of Children with Disabling Conditions

During the 3-year period from 2000 to 2002, a total of 57 909 children aged 5–17 years participated in the NHIS. On the basis of the reports in this survey, estimates of the total number of US children aged 5–17 years with specific disabling conditions were 828 056 children with vision/hearing disabilities (0.55% of the total population aged 5–17 years), 1 076 411 children with chronic asthma (0.71%), 1 932 850 children with mental retardation (1.28%), and 1 756 921 children with ADD/HD (1.16%). Table 1 shows the distribution of children with disabling conditions and healthy children with regard to gender, age, race, parent's highest level of education, family poverty status, health insurance coverage, and family size. Compared with healthy children, children with disabling conditions were more likely to be male (57.1% for asthma, 58.5% for vision/hearing disabilities, 62.0% for mental retardation, and 77.2% for ADD/HD vs 49.9% for healthy children), in families with fewer family members (1–3 family members; 32.9% for asthma, 26.1% for vision/hearing disabilities, 27.8% for mental retardation, and 29.9% for ADD/HD vs 21.7% for healthy children), and in poverty status (not poor; 49.5% for asthma, 52.4% for vision/hearing disabilities, 54.0% for mental retardation, and 54.7% for ADD/HD vs 63.9% for healthy children). Children with disabling conditions were more likely to have health insurance, but their parents were less likely to have a bachelor's degree or higher level of education. The difference between children with

TABLE 1—Weighted Percentages and Standard Errors for Selected Demographic Variables, by Disabling Conditions, Among Children Aged 5–17 Years

	Healthy Group (n = 55880)	Asthma (n = 403)	Vision/Hearing Disability (n = 312)	Mental Retardation (n = 711)	ADD/HD (n = 603)
Gender					
Boys	49.9 (0.25)	57.1 (2.63)**	58.5 (3.02)**	62.0 (1.98)**	77.2 (1.80)**
Girls	50.1 (0.25)	42.9 (2.63)	41.5 (3.02)	38.0 (1.98)	22.8 (1.80)
Age, y					
5–9	38.5 (0.25)	37.2 (2.71)	41.4 (2.94)	30.3 (1.79)**	26.5 (1.94)**
10–13	31.1 (0.22)	35.8 (2.77)	33.5 (2.77)	36.9 (1.97)	41.3 (2.02)
14–17	30.4 (0.24)	27.0 (2.45)	25.1 (2.65)	32.8 (1.92)	32.2 (2.17)
Race[a]					
White	79.1 (0.47)	72.8 (2.61)**	82.5 (2.37)**	79.3 (1.80)**	78.9 (2.06)**
African American	15.9 (0.42)	23.6 (2.43)	16.4 (2.32)	18.3 (1.68)	18.7 (1.93)
Asian	4.1 (0.20)	1.4 (0.78)	0.2 (0.96)	1.2 (0.47)	1.0 (0.42)
American Indian	0.9 (0.20)	2.2 (0.95)	0.9 (0.58)	1.2 (0.46)	1.4 (0.90)
Parent's education[b]					
Less than high school	20.2 (0.37)	20.5 (2.32)**	25.1 (2.68)**	25.3 (1.86)**	19.9 (1.84)**
High school or GED	34.0 (0.37)	39.4 (2.74)	33.0 (2.78)	35.2 (2.18)	39.1 (2.26)
Some college	28.2 (0.33)	30.3 (2.65)	31.6 (2.89)	26.2 (1.93)	30.6 (2.19)
Bachelor's degree or higher	17.6 (0.36)	9.8 (1.93)	10.3 (2.04)	13.3 (1.66)	10.4 (1.60)
Family poverty status[c]					
Poor	15.1 (0.34)	25.3 (2.80)**	20.6 (2.93)**	22.6 (2.12)**	19.4 (1.94)**
Near poor	21.0 (0.37)	25.2 (2.59)	27.0 (3.51)	23.4 (2.01)	25.9 (2.13)
Not poor	63.9 (0.50)	49.5 (3.39)	52.4 (3.59)	54.0 (2.45)	54.7 (2.43)
Health insurance					
No	12.2 (0.25)	12.1 (1.98)	8.5 (1.87)*	8.9 (1.20)**	6.3 (1.24)**
Yes	87.8 (0.25)	87.9 (1.98)	91.5 (1.87)	91.1 (1.20)	93.7 (1.24)
Family size					
1–3	21.7 (0.27)	32.9 (2.61)**	26.1 (2.78)	27.8 (1.77)**	29.9 (2.11)**
4–5	59.6 (0.36)	51.8 (2.81)	56.7 (3.33)	56.5 (2.02)	52.7 (2.26)
≥6	18.7 (0.35)	15.3 (2.05)	17.2 (2.33)	15.7 (1.58)	17.4 (1.97)

Note. GED = general equivalency diploma. Data based on the US National Health Interview Survey, 2000–2002.[23] Standard errors are in parentheses.
[a]Self-reported single race by the respondent.
[b]The education level of the parent with the higher level of education, regardless of that parent's age.
[c]Poverty status was based on family income and family size according to poverty thresholds defined by the US Census Bureau. "Poor" persons were defined as below the poverty threshold. "Near poor" persons were defined as having incomes of 100% to <200% of the poverty threshold. "Not poor" persons had incomes that are ≥200% of the poverty threshold.
*$P \leq .05$, **$P \leq .01$ for χ^2 test of difference on distribution of demographics between cases with chronic asthma or disability and the healthy group.

and without disabling conditions with regard to these socioeconomic characteristics was statistically significant ($P \leq .05$).

Rate of Injury

The percentage of individuals who were injured at least once in the past 3 months before the interview was calculated for children with and without disabling conditions by sociodemographic characteristics (Table 2). As expected, children with disabling conditions had a higher injury rate than children without disabling conditions (4.2% among children with vision disability, 3.2% among children with mental retardation, 4.5% among children with ADD/HD, 5.7% among children with asthma vs 2.5% among healthy children). In particular, children with asthma and with ADD/HD were significantly more likely than healthy children to experience an injury ($P \leq .01$ and $P \leq .05$, respectively).

With a few exceptions, the percentage of children with disabling conditions in each group of the sociodemographic variables who experienced an injury was higher than the percentage of healthy children who experienced an injury (Table 2).

Odds Ratios of Injury

Table 3 shows the results of the univariate and multivariate logistic regression analyses of the association between disabling conditions and nonfatal injury risk. ORs and the 95% CIs are reported for each disabling condition by sociodemographic characteristic.

Results from the univariate analyses indicate that disabling conditions have a significant association with the risk of nonfatal injury. Compared with healthy children, those with asthma, vision/hearing disability, or ADD/HD had significantly higher injury risk (OR = 2.39, 95% CI = 1.50, 3.82, $P < .01$ for asthma; OR = 1.74, 95% CI = 1.03, 2.95, $P < .05$ for vision/hearing disability; OR = 1.88, 95% CI = 1.22, 2.89, $P < .01$ for ADD/HD).

After adjusting for the sociodemographic variables, asthma, vision/hearing disability, or ADD/HD was still a statistically significant predictor of nonfatal injuries in the 3 months before the interview (OR = 2.18, 95% CI = 1.16, 4.10, $P < .01$ for asthma; OR = 1.68, 95% CI = 0.96, 2.96, $P = .07$ for vision/hearing disability; OR = 1.65, 95% CI = 1.04, 2.61, $P < .05$ for ADD/HD).

In the multivariate logistic models, sociodemographic status (as indicated by gender, age, race, parent's education, no health insurance, and family size) was an important predictor of nonfatal injury, but the effects of these variables differed. Whites, older age groups, and boys were significantly more likely than their counterparts to have nonfatal injuries (OR > 1.00; $P < .01$). However, children whose parents had fewer years of education and those who lived in households with a bigger family size were less likely to have nonfatal injuries. Children who were not covered by any health insurance were also less likely than those who had health insurance to suffer nonfatal injuries in the 3 months before the interview ($P < .01$).

TABLE 2—Weighted Percentages and Standard Errors for Selected Demographic Variables, by Disabling Conditions, Among Children Aged 5–17 Years With Medically Attended Injuries During the 3 Months Preceding the National Health Interview Survey (NHIS) Interview

	Healthy Group, % (SE)	Asthma, % (SE)	Vision/Hearing Disability, % (SE)	Mental Retardation, % (SE)	ADD/HD, % (SE)
All subjects	2.5 (0.08)	5.7 (1.28)**	4.2 (1.05)	3.2 (0.78)	4.5 (0.93)*
Gender					
Boys	2.8 (0.10)	4.8 (1.48)**	5.1 (1.42)	3.1 (0.95)	4.5 (1.01)
Girls	2.1 (0.11)	6.8 (2.07)*	2.9 (1.46)	3.5 (1.34)	4.4 (1.94)
Age, y					
5–9	1.9 (0.11)	3.8 (1.50)	1.9 (1.15)	1.9 (1.05)	2.6 (1.33)
10–13	2.3 (0.12)	9.6 (2.80)**	9.3 (2.6)**	3.5 (1.24)	3.4 (1.30)
14–17	3.3 (0.16)	3.1 (1.83)	1.1 (1.10)	4.2 (1.62)	7.4 (2.07)*
Race[a]					
White	2.9 (0.10)	7.2 (1.75)**	3.8 (1.37)	4.1 (1.01)	5.6 (1.21)*
African American	1.2 (0.12)	1.7 (1.29)	7.9 (4.96)	0.6 (0.59)	1.5 (1.02)
Parent's education[b]					
Less than high school	1.5 (0.14)	4.4 (2.35)	7.1 (3.45)	0.6 (0.65)	10.1 (2.88)*
High school or GED	2.6 (0.13)	5.9 (2.3)	2.5 (1.78)	2.0 (0.99)	4.3 (1.77)
Some college	2.7 (0.17)	4.8 (2.28)	2.4 (1.68)	5.2 (2.02)	2.6 (1.23)
Bachelor's degree or higher	3.2 (0.22)	11.1 (5.06)	10.5 (7.23)	5.1 (2.80)	3.0 (2.17)
Family poverty status[c]					
Poor	1.8 (0.19)	1.1 (1.07)	3.3 (2.58)	0.6 (0.56)*	7.5 (2.77)*
Near poor	2.3 (0.17)	9.3 (4.05)	6.3 (3.15)	2.7 (1.43)	4.8 (2.08)
Not poor	3.0 (0.13)	5.9 (2.09)	3.4 (1.99)	4.7 (1.46)	3.3 (1.29)
Health insurance					
No	1.5 (0.15)	17.1 (7.75)*	. . .[d]	2.8 (1.94)	. . .[d]
Yes	2.6 (0.08)	4.2 (1.12)	4.6 (1.17)	3.3 (0.83)	4.8 (1.00)*
Family size					
1–3	2.7 (0.17)	5.9 (2.25)	6.8 (3.42)	6.7 (2.14)	4.4 (1.63)
4–5	2.6 (0.10)	6.0 (1.85)	3.1 (1.41)	1.9 (0.79)	4.5 (1.36)
≥6	1.7 (0.15)	4.2 (2.63)	3.9 (2.80)	1.8 (1.30)	4.8 (2.13)

Note. GED = general education diploma. Data based on the US NHIS, 2000–2002.[23]
[a]Self-reported single race by the respondent. Other race categories were excluded because of the small sample size.
[b]The education level of the parent with the higher level of education, regardless of that parent's age.
[c]Poverty status was based on family income and family size according to poverty thresholds defined by the US Census Bureau. "Poor" persons were defined as below the poverty threshold. "Near poor" persons were defined as having incomes of 100% to <200% of the poverty threshold. "Not poor" persons had incomes that are ≥200% of the poverty threshold.
[d]Unable to estimate because of the small sample size.
*$P \leq .05$, **$P \leq .01$ for χ^2 test of difference on injury percentage between cases with chronic asthma or disability and the healthy group.

DISCUSSION

The NHIS provides new evidence on the nonfatal injury risk among children with disabling conditions. Our analysis of the 2000–2002 NHIS data demonstrates that children with a disabling condition from vision/hearing disability, ADD/HD, or chronic asthma had a significantly higher risk for nonfatal injuries compared with children without a disabling condition. This association was strong and remained statistically significant after we controlled for sociodemographic variables.

Our results corroborate previous findings on the elevated injury risk among children with ADD/HD and among those with developmental disabilities.[12,14–20] Previous studies documented a high injury risk among children with ADD/HD.[12–14,16,19] Research also has shown that ADD/HD adolescents aged 12–18 years were more likely than children without ADD/HD to be injured in an automobile crash and more likely to be at fault in the crash.[17] The mechanism underlying the high injury risk among youth with ADD/HD has been attributed to injury risk perception and increased incidence of high-risk behavior.[15,16,18] Farmer and Peterson observed that children with ADD/HD anticipated less severe consequences of risky behavior and reported fewer injury prevention methods than their healthy peers.[15] A study of preschoolers also showed that children with ADD/HD exhibited significantly more risky behaviors at home and in public settings than preschoolers without ADD/HD.[18] In another study, adolescents with ADD/HD, particularly those with oppositional defiant disorder, have been shown to use proper driving skills less frequently than children without ADD/HD.[17] These risk-taking behaviors offer a plausible explanation for the increased injury risk reported here as well as in previous studies.

Research on injury risk among individuals with mental retardation or other developmental disabilities has found conflicting results.[8,10,20,27] A large Australian study found that individuals aged 5–29 years with an intellectual disability had 8 times the injury mortality and 2 times the injury morbidity of their counterparts.[10] A US study using 1988 NHIS data also found that children with developmental disabilities had higher injury rates than children without disabling conditions.[20] However, a study among hospital emergency room patients showed that individuals with mental retardation had a significantly lower proportion of emergency room visits related to injuries (26.5% vs 30.4%) and were less likely to have multiple emergency room visits for injuries (OR=0.26; 95% CI=0.10, 0.69).[27] Another study conducted among students in special education programs also found that students with mental/emotional disabilities were at a lower risk of injury than children without these disorders.[8] Our results showed no statistically significant difference in the incidence of nonfatal injuries between children with mental retardation or other developmental disabilities and those without such conditions. Researchers suggest that possible decreased exposure to injury

TABLE 3—Results of Weighted Logistic Regression Analyses (Odds Ratios [ORs] and 95% Confidence Intervals [CIs]), by Disabling Conditions, Among Children Aged 5–17 Years With Medically Attended Injuries During the 3 Months Preceding the National Health Interview Survey (NHIS) Interview

	Asthma, OR (95% CI)	Vision/Hearing Disability, OR (95% CI)	Mental Retardation, OR (95% CI)	ADD/HD, OR (95% CI)
Univariate model	2.39 (1.50, 3.82)***	1.74 (1.03, 2.95)**	1.33 (0.82, 2.17)	1.88 (1.22, 2.89)***
Multivariate model				
Chronic asthma or disability				
Yes	2.18 (1.16, 4.10)***	1.68 (0.96, 2.96)*	1.16 (0.66, 2.05)	1.65 (1.04, 2.61)**
No	Reference	Reference	Reference	Reference
Gender				
Boys	1.34 (1.16, 1.54)***	1.34 (1.16, 1.54)***	1.33 (1.16, 1.53)***	1.33 (1.15, 1.53)***
Girls	Reference	Reference	Reference	Reference
Age, y				
5–9	Reference	Reference	Reference	Reference
10–13	1.22 (1.02, 1.45)**	1.22 (1.03, 1.46)**	1.21 (1.01, 1.44)**	1.19 (1.00, 1.43)**
14–17	1.83 (1.55, 2.16)***	1.83 (1.55, 2.17)***	1.84 (1.56, 2.18)***	1.87 (1.59, 2.21)***
Race[b]				
White	2.12 (1.66, 2.71)***	1.99 (1.56, 2.54)***	2.12 (1.66, 2.70)***	2.10 (1.65, 2.69)***
African American	Reference	Reference	Reference	Reference
Parent's education[c]				
Less than high school	0.59 (0.44, 0.80)***	0.62 (0.47, 0.83)***	0.60 (0.45, 0.81)***	0.65 (0.49, 0.87)***
High school or GED	0.88 (0.72, 1.07)	0.87 (0.72, 1.06)	0.87 (0.71, 1.06)	0.87 (0.71, 1.07)
Some college	0.89 (0.71, 1.11)	0.88 (0.71, 1.10)	0.90 (0.72, 1.13)	0.89 (0.71, 1.11)
Bachelor's degree or higher	Reference	Reference	Reference	Reference
Family poverty status[d]				
Poor	0.96 (0.74, 1.24)	0.97 (0.74, 1.26)	0.95 (0.73, 1.23)	1.01 (0.79, 1.31)
Near poor	1.07 (0.87, 1.32)	1.06 (0.86, 1.31)	1.05 (0.85, 1.29)	1.07 (0.87, 1.31)
Not poor	Reference	Reference	Reference	Reference
Health insurance				
No	0.71 (0.53, 0.94)***	0.65 (0.48, 0.88)***	0.66 (0.49, 0.90)***	0.63 0.46, 0.85)***
Yes	Reference	Reference	Reference	Reference
Family size				
1–3	Reference	Reference	Reference	Reference
4–5	0.87 (0.73, 1.03)	0.85 (0.72, 1.01)*	0.84 (0.71, 0.99)**	0.87 (0.73, 1.04)
≥6	0.65 (0.49, 0.84)***	0.64 (0.49, 0.84)***	0.63 (0.49, 0.83)***	0.65 (0.50, 0.85)***

Note. GED = general education diploma. Data based on the US NHIS, 2000–2002.[23]
[a]Self-reported single race by the respondent. Other race categories were excluded because of small sample size.
[b]The education level of the parent with the higher level of education regardless of that parent's age.
[c]Poverty status was based on family income and family size according to poverty thresholds defined by the US Census Bureau. "Poor" persons were defined as below the poverty threshold. "Near poor" persons were defined as having incomes of 100% to <200% of the poverty threshold. "Not poor" persons had incomes that are ≥200% of the poverty threshold.
*$P < .1$, **$P \leq .05$, ***$P \leq .01$ for the Wald F test on null hypothesis: $\beta = 0$.

risk environments could explain a low injury risk among children with mental retardation or other developmental disabilities.[8,27] However, as Sherrard et al. suggested,[22] the problem of injury risk and injury prevention for children with intellectual disability has not been investigated to the extent that the magnitude of the problem requires in the United States. More studies are needed.

Our results regarding a significantly higher injury risk among children with chronic asthma did not support the conclusions made by a previous study using 1988 NHIS data.[20] In that study, children aged 0–5 years with chronic asthma were found to have a lower injury rate than healthy children; however, children aged 6–17 years with chronic asthma had an injury rate similar to their controls. The reason for the discrepancy between the 2 studies is unclear. It is possible that revision of the NHIS variables might have influenced how respondents answered questions related to nonfatal injuries. The 1988 NHIS collected information about injuries that occurred in the 12 months before the interview, whereas the NHIS after 2000 changed to medically attended injuries that occurred in the 3 months before the interview. According to some investigators,[28] self-reported survey information is more accurate for injuries that occurred in the recent past (e.g., within 3 months). It is also possible that parents of children with chronic asthma were more likely than parents of healthy children to seek medical help for injuries that occurred to their children. The 1993 study cited 2 previous studies[29,30] to support the authors' hypothesis that parents offer overprotection to children with chronic illness, which decreases injury risk among these children. We were unable to validate this hypothesis in our study because of the lack of specific information in the NHIS on the parents' overprotection.

Because our results were on the basis of aggregating multiple years of a large national probability sample, we were able to develop statistically reliable estimates of the injury rates among children with and without disabling conditions in several categories that would not be possible with small samples. In addition, because the NHIS sample is designed to be representative of the US noninstitutionalized civilians, the results presented here are more generalizable than the results of localized surveys. Nevertheless, several limitations should be considered in interpreting the results of our study. First, because only medically attended injuries that occurred in the 3 months before the interview were asked, our results may not be representative of injuries for which no medical treatment was sought. Second, we would have liked to analyze and compare the characteristics of injuries (e.g., cause of injury, activity in which the child was participating when injured, and location of injury) between children with and without disabling conditions. However, the

relatively small sample size of children with disabling conditions and large variations in injury causes and injury places precluded this level of meaningful analysis. Third, there is a potential for recall bias that any study relying on retrospective data from respondents may suffer. Previous studies[31,32] indicate that recall bias was more likely to occur for the 12-month recall period than for the 3-month recall period. The recall bias might be a problem in our study if injury-reporting behaviors of parents of children with disabling conditions were significantly different than those of parents of healthy children. More research is needed to understand how disability status or chronic illness conditions influence recall bias in injury reporting.

In summary, our analysis indicates that children with disabling conditions experience a substantial added burden of nonfatal injuries. Because millions of children in the United States have disabling conditions, these results provide convincing evidences to support the *Healthy People 2010* goals to promote injury control and prevention programs targeting children with disabilities.[1] ■

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This article was accepted November 17, 2004.

Contributors

H. Xiang and L. Stallones designed this study. H. Xiang conducted the data analysis and finished the first draft of the article. S. Hostetler participated in the data analysis and editing. L. Stallones, G. Chen, and K. Kelleher critically reviewed the article.

Acknowledgments

This work was supported by the National Center for Injury Control and Prevention, the Centers for Disease Control and Prevention (grant R49/CCR811509, L. Stallones; grant R49CE00241-01, H. Xiang), and the Ohio Department of Public Safety (H. Xiang).

Note. The views expressed here are those of the authors and do not necessarily reflect the official views of the Centers for Disease Control and Prevention or the Ohio Department of Public Safety.

Human Participant Protection

Our study was approved by the institutional review board of the Columbus Children's Research Institute and Children's Hospital.

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