Injuries Among US Children With Different Types of Disabilities

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Objectives. We sought to determine whether risk of injury differs among children on the basis of the type of disability, and whether the characteristics of injury episodes differ by disability status.

Methods. We used nationally representative data from the 1997–2005 National Health Interview Survey to compare medically attended injuries among children aged 0 to 17 years who had and did not have a disability. Characteristics of injury episodes were compared by disability status. We calculated prevalence and risk of injury by type of disability.

Results. Children who had a single disability had a significantly higher prevalence of injury than children without a disability (3.8% vs 2.5%; $P < .01$). Characteristics of injury episodes did not differ significantly by disability status ($P > .05$). After we controlled for sociodemographic variables, we found that only children with emotional or behavioral problems had a significantly higher risk of injury compared with children without a disability (prevalence ratio = 1.50; 95% confidence interval = 1.15, 1.97; $P < .01$).

Conclusions. Children with certain types of disabilities are at a significantly higher risk of injuries than are children without disabilities, but the characteristics of injuries are similar. (*Am J Public Health.* 2008;98:1510–1516. doi:10.2105/AJPH.2006.097097)

Disability is a major public health problem that affects approximately 20% of the US population, including children younger than 18 years.[1–3] It is estimated that 5.8% to 18.0% of children in the United States have a chronic physical, developmental, behavioral, or emotional disability.[1,4–7] In addition, children who have disabilities use many more health care services and, thus, have much higher health care expenses than do their peers who do not have disabilities.[4]

Health promotion for children who have disabilities, especially to prevent secondary health conditions, is important.[8,9] Recently, injury prevention among children with disabilities has received increased attention. Many researchers have reported that children with disabilities have a higher risk of injury than do children without disabilities.[2,5,10–14] However, previous studies are limited because they examine only 1 type of disability or they do not distinguish between types of disabilities.[10–12,14] In addition, the few studies that did distinguish between types of disabilities were focused only on 1 setting and on 1 type of injury.[5,13]

The epidemiology of injury among children with disabilities has not been adequately studied.[11,15–17] The knowledge base about injury risk among children with disabilities is lacking a study using a large nationally representative dataset that compares the injury risk between children with different types of disabilities while controlling for sociodemographic characteristics. In addition, information about the characteristics of injury episodes among children with and without disabilities is limited.

In our recent publication about injuries among children with disabilities,[2] we found that injury risk among children with chronic asthma, vision or hearing problems, mental retardation, and attention deficit disorder (ADD) or attention deficit hyperactivity disorder (ADHD) was significantly higher than among children without disabilities. However, we included a limited number of types of disabilities and we did not analyze the characteristics of injury episodes. In this study, we added more years from the same nationally representative survey to increase our sample size and facilitate analysis of the injury risk of children who have different types of disabilities. In addition, we compare the characteristics of injury episodes among children who have a single disability and children without a disability.

We hypothesized that the risk of injury is higher among children who have a single disability than among children without a disability but that injury risk differs by type of disability. Additionally, we hypothesized that the characteristics of injury episodes are different among children who have a single disability and children without a disability. Our data could contribute to the development of disability-specific injury prevention interventions that take into consideration the unique limitations of children who have different types of disabilities.

METHODS

Data Source

The data we present were pooled from the 1997–2005 National Health Interview Survey (NHIS), which is a multipurpose health survey completed annually by the US Census Bureau for the National Center for Health Statistics.[18] This cross-sectional, national household survey provides health information on a nationally representative sample of the noninstitutionalized, civilian population in the United States. Data were 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. NHIS data have been used widely by the Department of Health and Human Services and by researchers in the United States to monitor trends in illness, injury, and disability, and to track progress toward achieving national health objectives.

NHIS data are collected through computer-assisted personal interviews with all members of households 17 years or older who are at home at the time of the interview (since 2004, interviews have been conducted with respondents 18 years or older). For children and adults not at home during the interview, information is provided by a knowledgeable adult family member who resides in the household. During the years

1997 to 2005, 340 349 households were surveyed and 879 342 persons were interviewed.[18–26] The overall response rate among eligible households for the 9-year period averaged 89%.

Variables

Respondents were asked a series of questions to determine whether the child in question was limited in any way when engaging in several age-appropriate activities. Examples included the following: whether the child was limited in kind or amount of play activities, whether the child received Special Education or Early Intervention Services, whether the child needed help with personal care needs such as bathing and feeding, whether the child had difficulty walking without special equipment, whether the child was limited because of difficulty remembering or periods of confusion, and whether the child was limited because of a physical, mental, or emotional problem. Responses to these questions were recoded into 1 variable, which indicated whether the child was limited in any of these ways.

Disability was defined as a "yes" response for the variable that indicated the child was limited in any way. If it was reported that the child was limited, the respondent was asked to report what condition or health problem caused the child's limitation. Respondents were given 13 fixed condition categories and 2 verbatim response fields to report what condition caused the limitation. The specific disabilities included in our study were the same as the 13 fixed-condition categories. We separated children who had multiple reported disabilities from children who had a single reported disability and excluded them from analysis. In addition, we excluded children who had an injury less than 1 year before the interview that resulted in a disability to ensure that, for our analysis, the child's disability presented before the injury episode occurred.

A portion of the NHIS Family Core questionnaire asks the respondent to report any injury or poisoning episode that happened to any family member during the 3 months before the interview and that was serious enough to require medical attention. Interviews are conducted year-round, thereby eliminating a seasonal influence on the 3-month recall. For our analysis, an injury episode was defined as a traumatic event in which the person was injured 1 or more times from an external cause (e.g., a fall, a motor vehicle crash, or ingestion of a harmful substance).[18] Respondents were allowed to record up to 10 injury and poisoning episodes; we analyzed both the number of injured children and the number of injury episodes for these children.

Statistical Analysis

Data analyses were conducted using SAS and SUDAAN statistical software.[27,28] Data first were prepared in SAS, and then weighted injury prevalence (%), 95% confidence intervals (CIs), prevalence ratios (PRs), and 2-sided *P* values were derived using SUDAAN procedures to account for the complex sample design and weighting structure of the NHIS. The weights used in NHIS data analyses represent the inverse of the sampling probability for each observation, adjusted for nonresponse and other factors.[18] The numbers presented in our study represent estimates of values for the US civilian, noninstitutionalized population.

Analyses were done to compare the prevalence of injuries between children who had a single disability and children without a disability by gender, age, parent's education, poverty status, and family size. We selected these sociodemographic variables because they significantly affect injury risk among children and because they are commonly controlled for in injury research. We used the χ^2 test to determine the association between disability status and injury status by each sociodemographic characteristic. Analyses also were done to compare the characteristics of injury episodes among children who had a disability and children who did not have a disability, including type, cause, activity at time of injury, and location of injury episode. We also used the χ^2 test to test the association between injury episode characteristic and disability status.

We calculated prevalence of injury for each type of disability. We used the χ^2 test to determine the association between each type of disability (i.e., presence of disability vs absence of disability) and injury status. We calculated PRs and 95% CIs in multivariate Cox proportional hazard regression models to determine the risk of injury for children who had each type of disability compared with children without a disability, and we controlled for each sociodemographic variable. By assuming a constant risk period (i.e., equal follow-up time for all respondents), the Cox model can be used to calculate PRs and 95% CIs for a cross-sectional study.[29]

RESULTS

A total of 246 955 children aged 0 to 17 years were included in the 1997–2005 survey. After excluding respondents with multiple disabilities, unknown disability type, injuries that caused a disability less than 1 year before the interview, and respondents with missing weighting variables, we analyzed 242 796 children aged 0 to 17 years. Our sample included 229 544 children without a disability and 13 252 children who had a single disability; 5692 injured children, including 464 injured children who had a single disability; and 5955 injury episodes, including 496 injury episodes among children who had a single disability.

Table 1 shows the prevalence of at least 1 injury during the 3 months before the interview, by selected sociodemographic characteristics, among children who had a single disability and children without a disability. The prevalence of injury among children with a single disability was significantly higher than that among children without a disability (3.8%; 95% CI=3.4, 4.1 vs 2.5%; 95% CI=2.5, 2.6, respectively; $P<.001$). For most categories of gender, age, parent's education, poverty status, and family size, children with a single disability had a significantly higher prevalence of injury than children without a disability ($P\leq.01$). However, for children aged 0 to 4 years, the prevalence of injury did not differ significantly by disability status ($P>.05$).

Table 2 presents a comparison of the characteristics of injury episodes among children who had a single disability and those without a disability. The characteristics of injury episodes did not differ significantly between children without a disability and children with a single disability ($P>.05$). For each characteristic, the responses with the highest percentages were the same for both groups.

TABLE 1—Prevalence of a Medically Attended Injury During the 3 Months Before Interview Among US Children With No Disability and Children with a Single Disability, by Sociodemographic Characteristics: National Health Interview Survey, 1997–2005

Selected Characteristics	No Disability (n = 229 544), Weighted % (95% CI)	Single Disability (n = 13 252), Weighted % (95% CI)	P[a]
Total	2.5 (2.5, 2.6)	3.8 (3.4, 4.1)	< .001
Gender			
Boy	3.0 (2.9, 3.1)	4.1 (3.7, 4.6)	< .001
Girl	2.1 (2.0, 2.2)	3.2 (2.6, 3.8)	< .001
Age, y			
0–4	2.1 (2.0, 2.3)	2.8 (2.1, 3.7)	.09
5–11	2.1 (2.0, 2.2)	3.5 (3.0, 4.0)	< .001
12–17	3.4 (3.2, 3.5)	4.4 (3.9, 5.0)	< .001
Parent's education[b]			
Less than high school	1.4 (1.2, 1.5)	2.6 (1.8, 3.6)	< .01
High school diploma/GED	2.1 (1.9, 2.2)	3.3 (2.7, 4.1)	< .001
Some college/associate's degree	2.9 (2.8, 3.1)	3.9 (3.3, 4.6)	< .01
Undergraduate degree or higher	3.0 (2.8, 3.1)	4.1 (3.4, 5.0)	< .01
Poverty status[c]			
Poor	2.0 (1.8, 2.2)	3.5 (2.8, 4.3)	< .001
Near poor	2.4 (2.3, 2.6)	3.6 (2.8, 4.6)	.01
Not poor	3.1 (3.0, 3.2)	4.3 (3.8, 5.0)	< .001
Family size			
1–3	2.9 (2.7, 3.0)	3.9 (3.3, 4.6)	< .01
4–5	2.6 (2.5, 2.7)	3.9 (3.4, 4.4)	< .001
6 or more	1.9 (1.7, 2.0)	3.3 (2.6, 4.2)	< .001

Note. CI = confidence interval; GED = general equivalency degree.
[a]*P* value derived from χ^2 analysis between disability status and injury status, by selected characteristic.
[b]Parent's education represents the highest level of education achieved by either the child's mother or father. Respondents from 1997 are not included in analysis.
[c]Poverty status was on the basis of family income and family size using the US Census Bureau's poverty thresholds for the previous calendar year. "Poor" was defined as below the poverty threshold, "near poor" to income of 100% to less than 200% of the poverty threshold, and "not poor" to income that is 200% of the poverty threshold or greater.

For type of injury episode, both groups reported open wounds, sprains or strains, and fractures most frequently. The most frequent causes of injury episodes for both groups were fall, struck by or against a person or object, transportation related, or other. Most often, children in both groups were involved in a leisure activity or sports-related activity at the time of the injury. For both groups, most of the injury episodes occurred inside or outside the home or at school.

Table 3 presents the prevalence of injury by specific type of disability for children who had a single disability. When compared with children without a disability, type of disability and type of injury were significantly associated for children who had a bone, joint, or muscle problem (5.7%; 95% CI=3.5, 9.4; *P*=.03); for children with an "other" impairment (4.7%; 95% CI=3.3, 6.6; *P*=.01); for children with an other emotional or behavioral problem (4.5%; 95% CI=3.7, 5.5; *P*<.001); for children with ADD or ADHD (4.4%; 95% CI=3.2, 6.1; *P*=.01); for children with an asthma or breathing problem (4.1%; 95% CI=3.1, 5.5; *P*=.01) and for children with mental retardation (1.1%; 95% CI=0.4, 3.5; *P*=.04). Although not statistically significant, the prevalence of injury for children who had a vision problem (5.1%; 95% CI=2.8, 9.2; *P*=.10) and for children who had a hearing problem (4.5%; 95% CI=2.6, 7.6; *P*=.12) was higher than the prevalence of injury among all children who had a single disability when compared with children without a disability.

Table 4 presents the risk of injury for children with each type of disability compared with children without a disability, after we had controlled for potentially confounding sociodemographic factors. The risk of injury remained significantly higher among children who had "other emotional or behavioral problems" compared with children without a disability, after we controlled for potentially confounding factors (prevalence ratio [PR]=1.50; 95% CI=1.15, 1.97; *P*<.01). Although not statistically significant, children who had a hearing problem (PR=1.78; 95% CI=0.95, 3.33; *P*=.07); children who had an "other" impairment (PR=1.57; 95% CI=0.97, 2.53; *P*=.07); children who had a speech problem (PR=1.30; 95% CI=0.96, 1.77; *P*=.09); and children who had an asthma or breathing problem (PR=1.38; 95% CI=0.94, 2.03; *P*=.10) had a higher risk of injury than did children without a disability.

DISCUSSION

Data from the NHIS made it possible for us to conduct a nationally representative analysis of injury risk among children with disabilities. Children with a single disability had a significantly higher prevalence of injury than did children without a disability. The characteristics of injury episodes did not differ significantly between children who had a single disability and children without a disability. Whether injury was prevalent among children who had a single disability depended on the type of disability. After we controlled for potentially confounding variables, data indicated that children who had a single disability had a higher risk of injury than did children without a disability. However, when we looked at type of disability, only children who had "other emotional or behavioral problems" had a significantly higher risk of injury than did children without a disability.

We found that the prevalence of injury was higher across almost all categories of sociodemographic characteristics for children with a single disability than for children without a disability. As Brehaut et al. note, the influence of sociodemographic factors must be considered

TABLE 2—Characteristics of Injury Episodes Among US Children With No Disabilities and Children With a Single Disability: National Health Interview Survey, 1997–2005

	Children Without Disabilities, Weighted % (95 CI)	Children With a Single Disability, Weighted % (95% CI)	P[a]
Type of injury episode			.08
Total sample, no.	5872	551	
Open wound	24.7 (23.4, 26.0)	24.7 (21.0, 29.0)	
Sprain/strain	18.9 (17.9, 20.1)	17.5 (13.9, 21.8)	
Fracture	18.2 (17.1, 19.4)	19.1 (16.0, 22.8)	
Complicated and unspecified	11.4 (10.4, 12.5)	11.2 (8.2, 15.3)	
Contusion	10.2 (9.3, 11.2)	9.1 (6.6, 12.5)	
Superficial injury	4.4 (3.8, 5.0)	4.1 (2.6, 6.4)	
Other injury[b]	3.6 (3.1, 4.2)	3.8 (2.2, 6.4)	
Dislocation	2.6 (2.1, 3.1)	0.8 (0.3, 2.3)	
Intracranial injury	2.5 (2.1, 3.0)	3.1 (1.8, 5.3)	
Burn	2.0 (1.6, 2.6)	3.9 (2.0, 7.2)	
Toxic effects of nonmedicinal substance	1.5 (1.2, 1.9)	2.6 (1.3, 5.4)	
Cause of injury episode			.35
Total sample, no.	5459	496	
Fall	34.0 (32.6, 35.4)	31.5 (27.1, 36.2)	
Struck by or against a person or object	21.7 (20.5, 23.0)	21.9 (18.2, 26.2)	
Other cause	11.3 (10.3, 12.3)	9.6 (7.0, 13.0)	
Transportation	10.8 (9.9, 11.8)	11.5 (8.7, 15.0)	
Cut/pierce	6.2 (5.5, 7.0)	6.7 (4.8, 9.3)	
Overexertion/strenuous movement	6.2 (5.5, 6.9)	5.4 (3.6, 7.9)	
Poisoning	5.4 (4.7, 6.1)	6.0 (3.9, 9.2)	
Animal/insect bite	3.0 (2.6, 3.5)	4.6 (3.0, 6.9)	
Fire/burn/scald	1.2 (0.9, 1.6)	2.7 (1.5, 4.7)	
Machinery	0.2 (0.1, 0.4)	0.2 (0.0, 1.4)	
Activity at time of injury episode[c]			.13
Total sample, no.	5239	471	
Leisure activity	37.3 (35.8, 38.8)	40.3 (35.3, 45.6)	
Sports	27.9 (26.6, 29.3)	22.4 (18.6, 26.8)	
Other activity[d]	16.7 (15.6, 17.9)	14.9 (11.9, 18.5)	
Attending school	8.7 (7.8, 9.6)	11.1 (8.3, 14.7)	
Driving/riding in motor vehicle	4.4 (3.7, 5.1)	5.0 (3.1, 7.9)	
Sleeping, eating, resting, drinking	2.6 (2.2, 3.1)	3.9 (2.3, 6.6)	
Working around house/yard	2.5 (2.0, 3.0)	2.4 (1.2, 4.5)	
Where injury episode occurred			.07
Total sample, no.	5228	472	
Inside home	23.9 (22.7, 25.2)	22.2 (18.6, 26.4)	
Outside home	20.2 (19.0, 21.5)	23.6 (19.7, 27.9)	
School	18.9 (17.8, 20.0)	17.9 (14.8, 21.6)	
Sport facility/athletic field/playground	13.5 (12.5, 14.6)	9.7 (7.2, 12.9)	
Other location[e]	11.4 (10.5, 12.4)	10.2 (7.7, 13.5)	
Street/highway	7.6 (6.8, 8.5)	9.2 (6.9, 12.3)	
Park/recreation area	4.4 (3.8, 5.1)	7.2 (4.8, 10.6)	

Note. CI = confidence interval.
[a]*P* value derived from χ^2 analysis of association between disability status and characteristic of injury.
[b]Other injury includes internal injury of thorax, abdomen, or pelvis; injury to blood vessels; late effects of injuries; crushing injury; entry of foreign body; injury to nerves and spinal cord; poisoning; complications of surgical and medical care; and other.
[c]Activity at time of injury and where injury occurred do not include poisoning episodes.
[d]Other activity includes working at a paid job, unpaid work, cooking, care from another person, and other.
[e]Other location includes childcare or preschool; residential institution; health care facility; parking lot; trade or service area; farm; river, lake, stream, or ocean; industrial or construction area; and other.

when assessing the risk of injury among children with disabilities.[30] Therefore, when we analyzed the risk of injury for children with a single disability compared with children without a disability, we controlled for these potentially confounding variables. We note that for children younger than 5 years, the prevalence of injury did not differ significantly by disability status. This finding may reflect that children younger than 5 years have not been identified as having a disability yet or that children younger than 5 years with and without disabilities do not have different exposures to injuries.

Our finding—that children with a single disability had a higher risk of injury than did children without a disability—supports previous research on the increased risk of injury among children who have disabilities.[2,5,10–14] However, when analyzing the risk of injury by specific type of disability, only children who had emotional or behavioral problems other than those listed had a higher risk of injury than did children without a disability ($P<.05$). This finding supports previous research on elevated injury risk among children with emotional or behavioral problems.[12,30–33] However, this increased risk among children with emotional or behavioral problems may not be consistent across all types of injuries or in all settings. Limbos et al. found that children with mental or emotional disabilities had the lowest risk of head injury in their cohort of children with disabilities.[5] Additionally, Ramirez et al. found that children with mental or emotional disabilities in 1 urban school district had a low risk of injury among all children receiving special education.[13]

Although we found an increased risk of injury among children who had a single disability compared with children without a disability, the characteristics of injury episodes among the 2 groups did not differ significantly. This finding differs from our initial hypothesis and indicates that children who have disabilities and children who do not have disabilities are experiencing the same types of injury episodes, but children who have disabilities experience injury episodes more often than do children without disabilities. Previous research found significant differences in a child's activity when injured, cause of injury, and body part injured, but not in

TABLE 3—Prevalence of a Medically Attended Injury Among US Children During the 3 Months Before Interview, by Type of Disability: National Health Interview Survey, 1997–2005

Type of Disability	No.	Weighted % (95% CI)	P[a]
No disability	229 544	2.5 (2.5, 2.6)	
All single disabilities	13 252	3.8 (3.4, 4.1)	<.001
Bone/joint/muscle problem only	327	5.7 (3.5, 9.4)	.03
Vision problem only	232	5.1 (2.8, 9.2)	.10
Other impairment only	714	4.7 (3.3, 6.6)	.01
Other emotional/behavioral problem only	2,347	4.5 (3.7, 5.5)	<.001
Hearing problem only	328	4.5 (2.6, 7.6)	.12
ADD/ADHD only	1,106	4.4 (3.2, 6.1)	.01
Asthma/breathing problem only	1,284	4.1 (3.1, 5.5)	.01
Epilepsy/seizures only	146	3.5 (1.4, 8.2)	.55
Speech problem only	1,927	3.4 (2.6, 4.3)	.06
Other developmental problem only	2,155	3.3 (2.6, 4.3)	.07
Learning disability only	1,767	2.9 (2.1, 3.9)	.53
Birth defect only	479	2.7 (1.4, 5.0)	.89
Injury-related disability only	128	2.6 (0.9, 6.9)	.98
Mental retardation only	312	1.1 (0.4, 3.5)	.04

Note. CI = confidence interval; ADD = attention deficit disorder; ADHD = attention deficit hyperactivity disorder.
[a]*P* values were derived from χ^2 analysis of association between type of disability and injury status.

TABLE 4—Effect of Type of Disability on Medically Attended Injuries During the 3 Months Before Interview Among US Children: National Health Interview Survey, 1997–2005

Type of Disability	PR (95% CI)	P
No disability (Ref)	1.00	
All single disabilities	1.30 (1.15, 1.48)	<.001
Epilepsy/seizures only	1.90 (0.75, 4.81)	.17
Hearing problem only	1.78 (0.95, 3.33)	.07
Other impairment only	1.57 (0.97, 2.53)	.07
Bone/joint/muscle problem only	1.52 (0.75, 3.09)	.24
Other emotional/behavioral problem only	1.50 (1.15, 1.97)	<.01
Asthma/breathing problem only	1.38 (0.94, 2.03)	.10
Vision problem only	1.36 (0.59, 3.13)	.47
ADD/ADHD only	1.36 (0.93, 1.98)	.11
Speech problem only	1.30 (0.96, 1.77)	.09
Other developmental problem only	1.15 (0.82, 1.62)	.41
Learning disability only	1.09 (0.78, 1.53)	.61
Birth defect only	1.08 (0.47, 2.46)	.86
Mental retardation only	0.61 (0.19, 1.93)	.40
Injury-related disability only	0.27 (0.04, 1.94)	.19

Note. PR = prevalence ratio; CI = confidence interval; ADD = attention deficit disorder; ADHD = attention deficit hyperactivity disorder. PRs were calculated for each type of disability versus no disability and were controlled for gender, age, parent's education, poverty status, and family size.

severity or type of injury between children who had and did not have disabilities.[10] However, our finding that cause of injury was most frequently a fall or being struck by or against an object or person is consistent with previous research on children who have disabilities.[13,34] Characteristics of injury episodes among children with different types of disabilities should be analyzed just as injury risk by type of disability was analyzed in this study. Research in this area has significant implications for injury prevention among children with disabilities.

Researchers need to continue studying the mechanisms behind the increased risk of injury among children with disabilities. Hypotheses as to why children with disabilities have a higher risk of injury include deficiencies in motor skills, impaired causal reasoning, impaired mental processing, physical limitations, behavioral or emotional impairments, compromised adaptability, and potential side effects of medication used to treat their condition.[2,5,13–16,35,36] The revolutionary conceptualization of injury by the Haddon Matrix proposes that unintentional injuries are not merely physical entities but reflect a complex series of interactions among the host (child), the agents (e.g., speeding vehicle), and the environment (physical and sociocultural). The injury process includes pre-event (e.g., exposure to environmental hazards), stages of injury event (e.g., appraisal of the injury risk and attempts to avoid the risk), and consequences of the injury (e.g., pain and stress). This systematic conceptualization of the injury process suggests that the physical, behavioral, and cognitive characteristics of children with disabilities interact with agents and environmental factors to increase their risk at various stages of the injury process. Support of this hypothesis is found in previous research on injuries among individuals with disabilities.[13,15,37]

Limitations

Limitations of the NHIS and of our study design need to be considered when interpreting our results. The NHIS captures members of the civilian, noninstitutionalized population; therefore, children with disabilities residing in institutional settings such as long-term care facilities are excluded. Thus, the number of children with disabling chronic conditions may be higher than reported here if the population living in institutions were included.[7] However, the number of children residing in health-related institutional facilities is relatively small, .14%, for children aged 0 to 17 years.[7] This limitation would affect our results only if institutionalized children with disabilities have a different injury rate than do noninstitutionalized children with disabilities.

Another limitation is that only injuries that were serious enough to require medical attention were reported in the NHIS. Researchers have found that children who have disabilities access the health care system more frequently than do children who do not have disabilities[7]: one study reported 2 times as many emergency department visits.[4] However, previous research was not specific to injury-related visits, and it may reflect the increased need of health care services for children with chronic conditions. Future research should include a comparison of the medical care–seeking behavior of injured children with and without disabilities.

In any study that relies on retrospective reporting from respondents, there is a potential for recall bias. Respondents for the children in our sample were asked to report injury episodes during the 3 months before the interview as well as conditions that limited the child in any way. Therefore, differences in reporting behaviors by respondents for children who had and children who did not have disabilities may have affected our results.

In addition to the limitations of the NHIS, methodological difficulties exist when investigating the epidemiology of injuries among children who have disabilities. These difficulties include lack of a consistent definition of disability, exposure-time concerns, and hospital-contact rates, which are different for children without disabilities.[3,15] In addition, determining the injury risk among children who have multiple disabilities requires a separate analysis from the risk among children who have a single disability.

Conclusions

In this study we continued our on-going research into determining how limitations that result from specific disabilities affect injury risk among children who have disabilities in the US population. When discussing the increased risk of injury among children who have disabilities compared with children who do not have disabilities, it appears that researchers need to consider the child's specific type of disability. By determining how limitations that result from specific disabilities (e.g., emotional or behavioral problems) affect injury risk, disability-specific injury-prevention programs can be developed. Additionally, sociodemographic characteristics need to be controlled when analyzing the risk of injury among children who have disabilities. Future research on injuries among children who have disabilities should consider sociodemographic variables that have been shown to affect injury risk.

Although children who had a single disability had a higher risk of injury than did children without a disability, the characteristics of injury episodes among both groups did not differ. This finding indicates that some factor associated with the disability is increasing injury risk among children who have certain types of disabilities. However, an analysis of the characteristics of injury episodes by type of disability may reveal unique differences in the characteristics of injuries for certain types of disabilities. Research in this area will help to create disability-specific injury-prevention programs.

Health promotion efforts to prevent secondary health conditions among children with disabilities should include injury prevention. Data on injury risk and injury patterns among children with disabilities are emerging as more studies are conducted to examine this important worldwide public health issue. The keys to public health intervention in injury control are the ability to (1) monitor how often injuries are occurring, (2) identify injury patterns, (3) provide interventions, and (4) continue to evaluate the effectiveness of the interventions.[3,17,38] For children with disabilities, many of these areas have not been explored systematically. As more studies are conducted and as more scientific evidence is gathered, injuries among children with disabilities will be understood more clearly, common patterns of injuries will be delineated, and effective intervention strategies will emerge. ■

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Author Contributions

S.A. Sinclair originated the study and led the writing. H. Xiang assisted with the data analyses and writing. Both authors helped to conceptualize ideas, interpret findings, and review drafts of the article.

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Human Participant Protection

The institutional review board at the Research Institute at Nationwide Children's Hospital approved this study.

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