ORIGINAL ARTICLE

Non-fatal injuries among adults with activity limitations and participation restrictions

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Objective: To investigate non-fatal unintentional injuries among adults with activity/participation limitations.

Design: Injuries in the previous 12 months were reported by a stratified probability sample of non-institutionalized adults. Based on self reported activity/participation limitations, 2602 respondents were classified into three groups (no limitations, moderate limitations, and severe limitations) and injury characteristics were compared.

Results: A total of 19.2% of respondents reported activity/participation limitations. Twenty four percent (95% confidence intervals (CI) 14.5% to 33.6%) with severe and 17.8% (95% CI 13.2% to 22.4%) with moderate limitations were injured, compared with 12.6% (95% CI 10.6% to 14.7%) of respondents without limitations. The odds ratio of injury was 3.72 (95% CI 1.94 to 7.14) for respondents with severe and 1.87 (95% CI 1.25 to 2.77) for respondents with moderate limitations. The leading cause of injuries among respondents with activity/participation limitations was falls.

Conclusions: Individuals with activity/participation limitations are at an increased risk for injuries.

Recent statistics suggest that over 68 million Americans have activity limitations and the proportion of individuals with activity limitations in the United States has increased among youths <18 years of age and adults 18–44 years old during the past decade.^{1–3}

Health problems among persons with activity limitations have received attention worldwide.^{4–8} Major efforts have been made to identify and therefore prevent chronic health problems such as depression, osteoarthritis, diabetes, and stroke among individuals with activity limitations.^{4–7} A few studies investigating injuries among persons with developmental, mental, or physical impairments found that individuals with impairments are at a significantly higher risk for injuries than those without impairments.^{9–15}

Although previous studies have examined injuries among individuals with impairments, these studies focused on children with special needs in school/daycare settings^{10 12–15} or adults in nursing homes.^{9 11} It is unknown whether general non-institutionalized individuals with activity or participation limitations also have a high risk for injuries. Therefore, we conducted a large population based survey to examine injury risk among this vulnerable population.

METHODS

Study design

In 1999 and 2000, we conducted the Colorado Disability Survey using the Behavioral Risk Factor Surveillance System.^{16 17} One adult aged 18 years or older from each household was randomly selected, and for those who agreed to participate in the study, a 30–45 minute telephone interview was conducted. Based on American census definitions, we used two sample strata: urban areas (counties with a metropolitan area $\geq 100\,000$ people or a city with a population of at least 50 000 people) and rural areas (all other counties).

The study protocol was approved by the institutional review board of the Colorado State University.

Classification of activity limitations and participation restrictions

This study used the World Health Organization approved International Classification of Functioning, Disability, and Health (ICF) to define activity limitations and participation restrictions and examined health issues among respondents with activity/participation limitations.^{18 19} The ICF has three health and health related domains to describe changes in body function and structure, what a person with a health condition can do in a standard environment (their level of capacity), as well as what they actually do in their usual environment (their level of performance). These domains are classified from body, individual, and societal perspectives using two lists: a list of body functions and structure and a list of domains of activity and participation.

In our study, respondents who responded “yes” to at least one of the following four questions were classified as having activity/participation limitations: (A1) “Are you limited in the kind or amount of work you can do because of any impairment or health problem?” (A2) “Because of any impairment or health problem, do you have any trouble learning, remembering, or concentrating?” (A3) “Do you use special equipment or help from others to get around?” (A4) “Are you limited in any way in any activities because of any impairment or health problem?”

Individuals with activity/participation limitations who responded “yes” to at least one of the following three questions were further classified as having severe activity/participation limitations: (B1) “Because of any impairment or health problem, do you need the help of other persons with your personal needs, such as eating, bathing, dressing, or getting around the house?” (B2) “Because of any impairment or health problem, do you need the help of other persons in handling your routine needs, such as everyday household

Abbreviations: CI, confidence interval; ICF, International Classification of Functioning, Disability, and Health; OR, odds ratio

chores, doing necessary business, shopping or getting around for other purposes?" (B3) "Using special equipment or help, what is the farthest distance that you can go?" (Persons who couldn't go more than one or two city blocks were considered as having severe limitations.) All others who were classified as having activity/participation limitations but did not meet the criteria for severe limitations and restrictions were defined as having moderate activity/participation limitations. In our discussion, the term "activity limitations and participation restrictions" was abbreviated as "activity/participation limitations".

Injury definition

An injury was defined as an injury event occurred in the previous 12 months that resulted in seeking medical attention other than first aid, or caused the respondent to restrict usual activities for a day or more. For all injured respondents, details were obtained about the most recent injury. We ensured that all activity/participation limitations existed before the injury event under investigation by including only those individuals who had reported that they had activity/participation limitations more than 12 months before the interview.

Poverty status

Respondents were classified as living in poverty if their corresponding household income level was below the poverty

level defined in the United States Department of Health and Human Services 2000 poverty guidelines.²⁰

Statistical analysis

A weight taking into account the probability of selection was developed for each respondent.²¹ The number of people in age-by-sex categories in Colorado population was derived from 2000 census data and was used in our weighting procedures so that our results reflected the age and gender distributions of the total Colorado urban and rural population in 2000.

Analyses were conducted using SAS software (SAS Institute, Cary, NC) and the SAS callable SUDAAN software (Research Triangle Institute, Research Triangle Park, NC).²² Data were first prepared in the SAS software but all data analyses were done using SUDAAN procedures to account for the complex sampling design. Proportions and 95% confidence intervals (CIs) of individuals with activity/participation limitations by respondents' demographics were calculated and injury characteristics were compared between individuals with and without activity/participation limitations. Logistic regression models were used to calculate the odds ratio (OR) and 95% CIs.

All variables that were statistically significant ($p < 0.05$) in univariate analyses were included in a multivariable model. However, because race/ethnicity, etc are potential confounding factors, although non-significant in our univariate

Table 1 Selected descriptive characteristics of adults with and without activity/participation limitations

Characteristics	Severe limitations		Moderate limitations		No limitations		p Value†
	No	% (95% CI)*	No	% (95% CI)*	No	% (95% CI)*	
All subjects	144	4.5 (3.5 to 5.4)	435	14.7 (13.0 to 16.5)	2023	80.8 (78.9 to 82.7)	
Gender							<0.001
Male	42	2.7 (1.7 to 3.7)	179	14.1 (11.5 to 16.6)	879	83.2 (80.5 to 86.0)	
Female	102	6.2 (4.6 to 7.9)	256	15.4 (13.1 to 17.7)	1144	78.4 (75.7 to 81.0)	
Age (years)							<0.001
18–24	2	0.2 (0.0 to 0.5)	27	11.4 (6.6 to 16.2)	189	88.4 (83.6 to 93.2)	
25–34	12	2.1 (0.7 to 3.4)	48	7.6 (5.0 to 10.1)	453	90.4 (87.5 to 93.2)	
35–44	19	2.2 (0.7 to 3.7)	90	14.1 (10.4 to 17.8)	509	83.7 (79.8 to 87.6)	
45–54	25	4.0 (1.9 to 6.1)	94	17.2 (13.0 to 21.3)	418	78.9 (74.4 to 83.3)	
55–64	23	6.1 (3.0 to 9.2)	59	17.5 (11.9 to 23.1)	220	76.4 (70.3 to 82.6)	
65+	63	16.5 (11.6 to 21.4)	117	25.6 (20.2 to 30.9)	234	57.9 (51.7 to 64.2)	
Race/ethnicity							0.12
White non-Hispanic	104	4.3 (3.3 to 5.4)	379	15.9 (13.9 to 17.9)	1637	79.8 (77.6 to 82.0)	
White Hispanic	21	4.2 (1.6 to 6.8)	28	9.8 (5.7 to 13.9)	219	86.0 (81.3 to 90.7)	
Black	5	9.1 (0.0 to 18.5)	6	10.7 (1.6 to 19.7)	48	80.3 (68.0 to 92.5)	
Other	8	2.6 (0.5 to 4.7)	20	13.6 (6.3 to 21.0)	106	83.8 (76.2 to 91.4)	
Education							0.01
Less than high school	33	8.0 (4.1 to 11.9)	62	23.7 (16.8 to 30.6)	146	68.3 (60.7 to 75.9)	
High school graduate	43	4.1 (2.5 to 5.7)	131	13.2 (10.3 to 16.2)	639	82.7 (79.4 to 85.9)	
Some college	67	4.0 (2.8 to 5.2)	242	14.1 (11.9 to 16.2)	1237	81.9 (79.5 to 84.3)	
Marital status							<0.001
Married/unmarried couple	68	3.9 (2.7 to 5.0)	230	14.9 (12.6 to 17.1)	1222	81.3 (78.8 to 83.7)	
Divorced/separated/widowed	63	9.5 (6.3 to 12.7)	151	18.1 (14.6 to 21.6)	461	72.4 (68.0 to 76.8)	
Single, never married	13	1.7 (0.6 to 2.8)	53	11.0 (7.3 to 14.8)	334	87.2 (83.3 to 91.2)	
Poverty‡							0.001
Yes	34	9.2 (5.1 to 13.3)	52	18.3 (12.0 to 24.5)	148	72.5 (65.2 to 79.8)	
No	77	3.3 (2.3 to 4.2)	339	14.7 (12.8 to 16.6)	1664	82.0 (79.9 to 84.1)	
Area of residence							0.02
Urban	67	4.2 (3.1 to 5.3)	208	14.2 (12.2 to 16.2)	1097	81.6 (79.4 to 83.8)	
Rural	77	5.7 (4.3 to 7.2)	227	17.6 (15.1 to 20.1)	926	76.7 (73.9 to 79.4)	

*95% confidence intervals.

†p Value from χ^2 test.

‡Classified using United States Department of Health and Human Services 2000 poverty guidelines.

Table 2 Injury proportion by selected demographic characteristics and activity/participation limitations

Characteristics	Severe limitations (n = 144)		Moderate limitations (n = 435)		No limitations (n = 2035)	
	No injured	%* (95% CI)†	No injured	%* (95% CI)†	No injured	%* (95% CI)†
All subjects	32	24.0 (14.5 to 33.6)	76	17.8 (13.2 to 22.4)	255	12.6 (10.6 to 14.7)
Gender						
Male	12	29.8 (12.5 to 47.0)	33	17.9 (10.8 to 24.9)	133	15.5 (12.1 to 18.8)
Female	20	21.5 (10.0 to 33.0)	43	17.7 (11.7 to 23.8)	122	9.5 (7.4 to 11.7)
Age (years)						
18–24	0	‡	10	41.9 (20.3 to 63.4)	38	21.8 (13.4 to 30.1)
25–34	2	24.5 (0.0 to 55.2)	11	22.6 (7.7 to 37.5)	58	11.7 (8.1 to 15.3)
35–44	9	32.6 (6.8 to 58.4)	19	17.3 (8.3 to 26.4)	70	13.1 (9.1 to 16.9)
45–54	5	20.8 (0.0 to 43.7)	16	10.8 (4.1 to 17.5)	50	12.6 (8.2 to 16.9)
55–64	8	36.8 (12.2 to 61.4)	8	10.9 (1.0 to 20.9)	26	7.4 (3.4 to 11.3)
65+	8	19.3 (4.4 to 34.2)	12	15.4 (6.3 to 24.3)	13	4.6 (1.5 to 7.6)
Race/ethnicity						
White non-Hispanic	25	26.1 (14.6 to 37.5)	65	17.9 (12.8 to 22.9)	199	12.3 (10.0 to 14.7)
White Hispanic	1	14.2 (0.0 to 39.5)	5	16.6 (1.3 to 31.8)	29	14.9 (8.7 to 21.0)
Black	1	8.8 (0.0 to 27.2)	2	31.2 (0.0 to 70.5)	8	15.7 (3.4 to 28.1)
Other	2	24.3 (0.0 to 60.3)	3	13.2 (0.0 to 30.1)	17	9.5 (3.9 to 15.2)
Education						
Less than high school	5	11.8 (0.5 to 23.0)	10	15.0 (3.3 to 26.7)	12	10.5 (3.2 to 17.7)
High school graduate	11	30.7 (11.7 to 49.7)	17	17.8 (8.4 to 27.2)	80	11.9 (8.6 to 15.2)
Some college	16	24.8 (11.0 to 38.6)	49	18.5 (12.7 to 24.4)	163	13.3 (10.6 to 16.0)
Marital status						
Married/unmarried couple	17	26.3 (13.2 to 39.3)	31	13.5 (8.4 to 18.8)	143	11.6 (9.3 to 13.9)
Divorced/separated/ widowed	13	22.4 (6.2 to 38.7)	28	18.0 (10.3 to 25.6)	52	7.9 (5.1 to 10.7)
Single, never married	2	14.7 (0.0 to 35.3)	17	38.3 (20.6 to 55.9)	60	20.0 (13.3 to 26.6)
Poverty [§]						
Yes	8	20.8 (2.5 to 39.1)	12	24.9 (8.1 to 41.7)	18	9.0 (3.3 to 14.8)
No	20	26.0 (13.8 to 38.2)	56	17.6 (12.5 to 22.7)	210	12.9 (10.6 to 15.3)
Area of residence						
Urban	16	24.2 (12.5 to 36.0)	39	17.7 (12.1 to 23.2)	120	12.1 (9.7 to 14.4)
Rural	16	23.1 (12.0 to 34.2)	37	18.2 (12.2 to 24.3)	135	15.7 (12.7 to 18.6)

*Proportion and 95% CI were calculated using weighted sample size, which were different from proportion calculated by directly dividing the number of injured by total number people with or without limitations (for example, 32/144 = 22.2%).

†95% confidence intervals.

‡Proportion and 95% CI were not calculated when n = 0.

§Classified using United States Department of Health and Human Services 2000 poverty guidelines.

analyses, we included them in the final model. Interaction among independent variables were examined in the logistic regression models and the significant level was predetermined as $p < 0.05$.

RESULTS

A total of 2380 households in urban areas and 1926 in rural areas were selected for the study. Only 2713 non-institutionalized Colorado adults completed the survey, resulting in the response rates of 57.4% in the urban stratum and 63.4% in the rural stratum. After exclusion of respondents whose activity/participation limitations started within 12 months and those who did not provide information on key variables necessary for weighting procedures or classifying activity/participation limitations, 2602 respondents (95.9%) were included in the final analyses.

In total, 19.2% of respondents had some degree of activity/participation limitations (table 1). Compared with their counterparts, females, individuals aged 65 or older, those with less than a high school education, individuals living in poverty, and those living in urban areas were more likely to have activity/participation limitations ($p < 0.05$).

Our results indicated that 24.0% of individuals with severe and 17.8% of individuals with moderate activity/participation limitations were injured, compared with only 12.6% of injured individuals without limitations (table 2). Stratified by respondents' demographics, it was found that with the

exception of groups with a small sample size (45–54 age groups, White-Hispanic, Black, and marital status of single), there was a linear relationship between severity of activity/participation limitations and injury proportions.

Table 3 summarizes injury characteristics. A total of 56.1% injuries among respondents with severe and 40.3% among respondents with moderate activity/participation limitations occurred at private residential areas while only 28.0% of injuries among respondents without limitations occurred at such areas. The leading cause of injuries among individuals with activity/participation limitations was falls (34.9%, 28.0% v 20.8%). More than half (52.9%) of respondents with severe and 40.1% of those with moderate activity/participation limitations reported that the injury kept them from their usual activities for six or more days.

Univariate regression analysis indicated that injury risk was strongly associated with level of activity/participation limitations (table 4). The OR of injury was 2.19 (95% CI 1.25 to 3.81) for individuals with severe and 1.50 (95% CI 1.04 to 2.16) for individuals with moderate activity/participation limitations. After controlling for confounding variables, OR increased to 3.63 (95% CI 2.03 to 6.47) for individuals with severe and 1.74 (95% CI 1.20 to 2.53) for individuals with moderate activity/participation limitations (model 2). Interactions among independent variables were also examined. However, none of them was significant at $p < 0.05$ level; therefore, the results are reported here.

Table 3 Characteristics of most recent injury by activity/participation limitations

Characteristics	Severe limitations		Moderate limitations		No limitations	
	No	%* (95% CI)†	No	%* (95% CI)†	No	%* (95% CI)†
Place injury occurred						
Transportation area	6	11.4 (1.3 to 21.6)	11	19.4 (7.9 to 30.9)	31	14.9 (8.6 to 21.1)
Private residential area	16	56.1 (33.1 to 79.2)	31	40.3 (26.3 to 54.5)	86	28.0 (20.6 to 35.5)
Production/workshop area	0	‡	12	11.3 (3.6 to 19.1)	38	16.7 (10.5 to 23.0)
Stores/shops	4	17.6 (0.0 to 35.9)	3	2.9 (0.0 to 7.3)	13	4.3 (1.5 to 7.2)
School/public buildings	2	6.3 (0.0 to 15.0)	5	8.1 (0.3 to 15.8)	14	6.8 (1.6 to 12.0)
Sports	2	7.7 (0.0 to 21.2)	4	6.1 (0.0 to 14.6)	37	18.3 (10.1 to 26.5)
Other	1	0.8 (0.0 to 2.5)	9	11.8 (2.9 to 20.7)	34	10.9 (6.2 to 15.7)
External cause of injury						
Acute overexertion	8	35.7 (12.7 to 58.7)	22	33.8 (19.5 to 48.2)	78	30.2 (21.6 to 38.8)
Falls	13	34.9 (11.4 to 58.4)	23	28.0 (15.5 to 40.6)	56	20.8 (14.2 to 27.4)
Struck/hit from collisions	4	7.9 (0.0 to 16.9)	11	14.6 (4.9 to 24.3)	42	16.6 (10.3 to 22.8)
Crushing, cutting, piercing	3	14.4 (0.0 to 31.5)	9	10.4 (3.0 to 17.7)	29	13.0 (6.7 to 19.3)
Chemical/thermal/electrical	0	‡	2	1.7 (0.0 to 4.2)	11	3.4 (0.8 to 6.2)
Multiple causes	0	‡	5	5.2 (0.0 to 10.9)	22	11.8 (5.8 to 17.9)
Other	3	7.1 (0.0 to 16.0)	3	6.3 (0.0 to 13.5)	14	4.2 (1.2 to 7.1)
Missed days of work or regular activities						
0	10	33.4 (11.0 to 55.7)	22	28.9 (15.8 to 42.0)	103	39.9 (31.0 to 48.8)
1–5	4	13.7 (0.0 to 29.8)	26	31.0 (17.5 to 44.4)	95	37.8 (29.4 to 46.2)
≥6	15	52.9 (28.5 to 77.4)	26	40.1 (26.0 to 54.3)	54	22.3 (15.0 to 29.7)
Activity at time of injury						
Working for income	7	14.4 (2.1 to 26.8)	22	28.0 (15.0 to 41.0)	77	34.6 (26.2 to 43.1)
Unpaid work§	11	50.1 (25.8 to 74.3)	26	35.5 (21.9 to 49.1)	63	23.1 (16.1 to 30.0)
Sports, athletics, exercise	2	9.0 (0.0 to 23.2)	10	18.9 (6.5 to 31.3)	60	25.3 (16.9 to 33.7)
Leisure activities¶	1	1.3 (0.0 to 3.8)	8	6.4 (1.6 to 11.3)	29	7.7 (3.6 to 11.7)
Self care activities**	4	15.2 (0.0 to 31.0)	5	4.5 (0.2 to 8.8)	15	5.5 (1.4 to 9.5)
Educational activities††	0	‡	1	2.7 (0.0 to 7.9)	2	1.6 (0.0 to 3.7)
Other	5	10.0 (0.0 to 20.8)	3	3.9 (0.0 to 9.2)	7	2.4 (0.3 to 4.4)

*Percentage and 95% CI were calculated using weighted sample size, which were different from percentage. Calculated by directly dividing the number of injuries in each category by total number injuries.

†95% confidence intervals.

‡Percentage and 95% CI were not calculated when n=0.

§Household maintenance, cleaning, cooking, caring for relatives or children (not for wages).

¶Leisure activity for entertainment or recreation (for example, going to movie, concert, dancing).

**Sleeping, resting, eating, and personal hygiene.

††Attending school, college, university, or training.

DISCUSSION

Our study demonstrated a clear association between activity/participation limitations and non-fatal unintentional injury risk among non-institutionalized adults. Compared with adults with no activity/participation limitations, individuals with moderate and severe activity/participation limitations were significantly more likely to be injured in the previous 12 months. We also found that injuries that occurred among individuals with activity/participation limitations were more likely to occur at private residential areas, resulted in more missed days of work or regular activities, and were more likely to be caused by falls.

Persons with activity/participation limitations are more susceptible to non-fatal injury risk because of their limitations, environmental barriers, isolation, or other physiological changes (for example, diminished bone density).^{23–25} The revolutionary injury conceptualization by the Haddon matrix proposes that unintentional injuries are not merely physical entities but reflect a complex series of interactions among the host (people), the agents, and the environment (physical and sociocultural). This systematic conceptualization of injury suggests that physical, behavioral and cognitive characteristics of individuals with activity/participation limitations interact with agents and environmental factors to increase their injury risk. Findings from previous studies indicated that individuals with disabilities were at a significantly increased risk of injury than those without disabilities.^{9–14} However, none of these studies used the systematic ICF to define the disability status. Our study is possibly the first population based study that used the ICF in the investigation

of injury risk among individuals with and without activity/participation limitations.

One plausible explanation for why injuries among individuals are more likely to occur at residential areas is that compared with individuals without activity/participation limitations, individuals with activity/participation limitations are less likely to participate in activities outside their homes. This was further supported by our findings about activities at the time of injury. We found that more than half of injuries among individuals with severe activity/participation limitations occurred when the respondents were conducting unpaid work such as household maintenance, cleaning, cooking, or caring for relatives or children. A significantly higher proportion of them were injured also when they participated in vital activities such as sleeping, resting, eating, and personal hygiene. Our findings underscore the importance of injury prevention at residential areas among individuals with activity/participation limitations.

Not only were individuals with activity/participation limitations at an increased risk of injuries, injuries among them also caused more missing days of work or regular activities. This result suggests that injuries among individuals with activity/participation limitations might be more severe. Similar findings have been reported among young persons with intellectual disabilities in Australia.¹³

We found that compared with injuries among individuals with no activity/participation limitations, a significantly higher proportion of injuries among individuals with activity/participation limitations were caused by falls. Our findings were consistent with findings reported in previous

Table 4 Logistic regression models of injury risk and activity/participation limitations

Variable	Model 1†		Model 2‡		Model 3§	
	OR	95% CI*	OR	95% CI*	OR	95% CI*
Limitation status						
Severe limitations	2.19	1.25 to 3.81	3.63	2.03 to 6.47	3.72	1.94 to 7.14
Moderate limitations	1.50	1.04 to 2.16	1.74	1.20 to 2.53	1.87	1.25 to 2.77
No limitations	Ref¶		Ref		Ref	
Gender						
Male			1.49	1.11 to 2.01	1.66	1.20 to 2.29
Female			Ref		Ref	
Age (years)						
18–24			3.11	1.60 to 6.04	3.32	1.59 to 6.96
25–24			1.68	0.96 to 2.92	1.40	0.75 to 2.60
35–44			1.92	1.13 to 3.27	1.76	0.97 to 3.19
45–54			1.56	0.94 to 2.89	1.45	0.77 to 2.73
55–64			1.19	0.64 to 2.23	1.42	0.72 to 2.79
65+			Ref		Ref	
Marital status						
Married/unmarried couple			Ref		Ref	
Divorced/separated/widowed			0.92	0.65 to 1.32	0.91	0.62 to 1.34
Single, never married			1.4	0.91 to 2.16	1.58	0.99 to 2.50
Race/ethnicity						
White non-Hispanic					1.89	0.88 to 4.06
White Hispanic					2.19	0.92 to 5.25
Black					2.44	0.77 to 7.74
Other					Ref	
Education						
Less than high school					0.70	0.35 to 1.40
High school graduate					0.99	0.68 to 1.43
Some college					Ref	
Poverty**						
Yes					0.85	0.45 to 1.52
No					Ref	
Area of residence						
Urban					Ref	
Rural					1.23	0.92 to 1.64

*95% confidence intervals.

†Univariate logistic regression model (injury = dependent variable).

‡Multivariable logistic regression model by controlling for confounding variables that were statistically significant variables in univariate models (gender, age, and marital status).

§Multivariable logistic regression model by controlling for confounding variables that were statistically significant variables (gender, age, and marital status) and non-significant variables (race, education, poverty, and residence area) in univariate models.

¶Reference group.

**Classified using United States Department of Health and Human Services 2000 poverty guidelines.

studies among individuals with body impairments.^{9 11–14 26 27} Intellectual or developmental impairments, either among children^{12–14} or among adults,^{9 11} were clearly linked to a significantly higher risk of injuries from falls. A recent literature review also indicated that a significantly high proportion of injuries among individuals with visual impairments were caused by falls.²⁶ Unstable wheelchairs were related to an increased risk of injuries from falls among wheelchair riders in another study.²⁷ These findings underscore the need to prevent and control falls as an injury prevention priority among individuals with activity/participation limitations.

The primary limitation of our study is that data were collected in a cross sectional study. Prospective studies comparing injuries among individuals with and without activity/participation limitations would solve this study design limitation. Another limitation is that injuries were self reported and thus subject to recall bias. Previous studies indicated that underestimation of injury events were likely to occur when a 12-month recall period is used.^{28 29} Recall bias would be a limitation in our study if the injury reporting

behaviors of respondents with activity/participation limitations were significantly different from that of respondents with no activity/participation limitations. Injuries, even

Key points

- A population based survey suggested that non-institutionalized adults with activity limitations and participation restrictions are more likely to experience non-fatal unintentional injuries than individuals without limitations.
- Injuries among individuals with activity/participation limitations are more likely to occur at private residential areas and result in more missed days of work or regular activities than injuries among individuals with no limitations.
- The leading cause of injuries among individuals with activity/participation limitations is falls.

minor ones, might have impacted respondents' activities and it is possible that respondents with activity/participation limitations were more likely than respondents without activity/participation limitations to report injuries. If happened, this recall bias may provide part of the explanation for a higher prevalence of non-fatal injury among those with activity/participation limitations in our study. However, no attempt has been made so far to evaluate injury recall bias among people with activity/participation limitations. More research is needed to understand how activity/participation limitation status and limitation severity influence recall bias in injury reporting.

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