

THE EPIDEMIOLOGY OF UNINTENTIONAL NON-FATAL INJURIES AMONG  
CHILDREN IN THE SOUTH PLAINS/PANHANDLE REGION OF TEXAS

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RESEARCH

ABSTRACT

The purpose of this study was to estimate and characterize the burden of unintentional injuries among children under 16 years of age in the South Plains/Panhandle region of Texas. A total of 1,500 households were selected through a cross-sectional survey in 42 counties in the fall of 2001. Telephone interviews with parents were conducted to identify the nature and place of injury among children. The age-adjusted prevalence of parent-reported childhood injury was 15.9%. Out of 228 children injured, the majority (88%) needed medical attention. The majority of injuries occurred while the child was engaged in sports or other related recreational activity, followed by unintentional falls, and accidents at home. Compared to younger children (< 6 years), older children (11 to 16 years) were more likely to sustain injuries. A total of 35 (17.6%) children required hospital admission following their injuries. Those in the lower level socioeconomic group (as determined by the responding parents' educational status) were more likely to seek admission to the hospital following injury. In the South Plains/Panhandle region, the occurrence of unintentional injuries is a significant health problem resulting in hospitalization and loss of routine activity. Further analytical studies are needed to identify more specific risk factors that can

serve as a basis for prevention efforts.

Key words: childhood injuries, epidemiology, rural health, Texas Panhandle. (Texas Journal of Rural Health 2003; 21(2): 31-41)

## INTRODUCTION

The Healthy People 2010 initiative has addressed injury prevention and control as one of its important goals (Healthy People 2010, 2000). Unintentional injuries are a leading cause of morbidity and mortality among children in the United States (National Center for Injury Prevention and Control, 1999). For children under 14 years of age, unintentional injuries are a leading cause of mortality, accounting for approximately 6,000 deaths, 7 million visits to hospital emergency rooms, more than 9 million visits to physician offices, and 228,000 hospitalizations annually (National SAFE KIDS Campaign, 2002a). Fingerhut and colleagues (1996) reported a mortality rate from injury of 28.3 per 100,000 population for children under the age of 19. The direct medical cost of injuries is estimated at a staggering \$5 billion per year and approximately \$3 billion in the loss of future earnings (National SAFE KIDS Campaign, 2002a). Among older children, sports-related injuries account for more than 700,000 cases each year and are responsible for the highest direct cost per year of unintentional injuries (Guyer & Ellers, 1990). Among younger children, injuries at home account for approximately 4.5 million cases every year (National SAFE KIDS Campaign, 2002b).

Several risk factors for child injuries have been identified. These include living in rural areas, living/working on farms, being of minority ethnicity, and belonging to a lower socio-economic status (Crawley, 1996; Faelker,

Pickett, & Brison, 2000; Rivara, 1997). West Texas is sparsely settled and is largely made up of small rural counties with populations of less than 50,000. This study was undertaken as part of the Healthy People 2010 initiative to provide population-based estimates and correlates of unintentional injuries among children in rural areas of South Plains/Panhandle region of Texas.

## METHODS

This study reports results of a cross-sectional survey conducted in the fall of 2001. A total of 1,500 households located in 42 counties of the South Plains/Panhandle area of Texas were interviewed using computer assisted telephone interviews (winCATI). After obtaining an informed consent, parents of children less than 16 years of age were screened for eligibility and were interviewed in English or Spanish by a bilingual interviewer. The questionnaire was pre-tested in both English and Spanish before it was administered. The outcome variables used in this analysis were self-reported child injury and hospital admission following the injury. An injury was defined as any physical event experienced by a child which required at least four hours of restricted activity or professional medical attention. The child's parents were asked to explain the nature of the injury and where it occurred. Open-ended responses were coded by an experienced coder. Any injury reported by a parent that occurred at home and did not involve a fall was classified as "home accident." Unintentional falls were defined as any reported fall at home or outside that did not occur while a child was involved in sports or a recreational activity. Six subjects who reported that their child was injured while jumping on a trampoline were

included in the “fall” category. Responses to “body part affected by an injury” were collapsed into four categories: head/neck/face, thorax/abdomen/pelvis, upper extremity, and lower extremity.

The independent variables in the analysis include: the child’s age; the child’s gender; household income; parent respondent ethnicity; urban/rural residence; parent respondent highest level of education; child living within city limits or child living/working on a farm or ranch; and number of visits to a physician in the previous 12 months. Four quartiles of body mass index (BMI) were defined and children in the highest (4<sup>th</sup>) quartile were classified as obese.

Statistical analysis was done using STATA version 7.0 statistical software. Associations between an outcome and independent variables were assessed using  $\chi^2$  statistics. For a multivariate logistic regression analysis, two separate logistic models were built using pediatric injury and hospital admission as outcome variables. Both unadjusted and adjusted odds ratios along with 95% confidence intervals are reported. The study was approved by the institutional review board.

## RESULTS

A total of 1,500 respondents participated in the pediatric injury survey. The response rate was 64% among eligible households. Among the children, there were 51.4% boys and 48.6% girls. The mean age of the children reported was 7.6 years (std=4.88). Of the respondents who participated in the survey, 61% were non-Hispanic White, 32% were Hispanic, and 4% were non-Hispanic Black. The age-adjusted prevalence of parent-reported childhood injury was 15.9% (n=228).

Parents reported that the injury sustained by their child required medical attention in approximately 88% of these cases (n=200). Nearly 68% of the injuries were characterized as minor or moderate and 32.5% were characterized as serious or life threatening. The majority of the injuries occurred while the child was engaged in sports or other related recreational activity (see Table 1). Home accidents and unintentional falls were identified as the second and the third leading contributors to injury. Approximately 43% of respondents reported that the injury restricted their child’s activity for seven or more days and approximately 21% reported restricted activity for more than two weeks. There was no difference in the prevalence of injury according to gender. Children in the older age group experienced significantly more injuries than children in the younger age group. Parents with more than a high school education, of non-Hispanic White ethnicity, and in the higher income group reported significantly more injuries among their children (see Table 2). Those living outside city limits were 1.44 times more likely to report injuries. Similarly, children who either worked or lived at a farm/ranch were 1.54 times more likely to get injured. This odds ratio, however, diminished when adjustments were made for other confounding factors. Children with injuries were twice as likely to have visited physicians four or more times in the previous 12 months. The most common service site for injuries was the emergency room (ER) (52.3%), followed by the doctor’s office (27.1%), and other sites (20.6%). Hispanic children formed the largest group to receive medical attention in the ER (69%, p=0.038). Children in the younger age group were more likely to receive medical attention in the ER, while children in the age group 11 to 16 were more likely to be seen in a doctor’s office (see Table 2). The four most

frequently reported injuries were sprain/strain/torn ligament (22.4%), cut/laceration (18.0%), broken bone/fracture (15.8%), and bruise/contusion (9.2%). Younger children were more likely to receive head/face/neck injuries, whereas older children were more likely to receive lower extremity injuries (see Table 3). Younger children in the rural areas were more likely to sustain head/neck/face injuries than those in the urban areas ( $p=0.045$ ).

A total of 35 (17.6%) children required hospital admission following their injuries. Characteristics of children requiring hospital admission are presented in Table 4. Although reporting a child's injury was highest among the higher level SES group (as determined by the responding parents education status), admission to the hospital following the injury was higher among lower level socioeconomic groups. Hispanics were more likely to have less than a high school education (77.2% versus 21.9%  $p<0.001$ ) and were more likely to be hospitalized following an injury (37.1%

versus 19.6%  $p=0.025$ ). Although older children were more likely to suffer from an injury, younger children were more likely to be hospitalized as a result of an injury. Children with injuries affecting the thorax/abdomen/pelvis and those in the first BMI quartile (underweight) carried the highest risk of hospitalization (see Table 4).

## DISCUSSION

Childhood injuries remain a major source of concern for parents because they not only affect children but also contribute to significant emotional and financial burdens on the parents. This survey was a first attempt to describe patterns of injuries among children in the largely rural area of West Texas. The age-adjusted prevalence of unintentional childhood injury was found to be 15.9%. The prevalence did not vary by gender. However, differences among age groups were observed. Injuries related to sports/recreational activi-

**Table 1. Leading Contributors to Pediatric Injuries**

	n=228	%
Sports/recreational activities	115	50.44
Home accident	41	17.98
Fall	27	11.84
Riding in a car/motor vehicle accident	7	3.07
Struck by an object	5	2.19
Self-inflicted injuries	2	0.88
Working/playing at farm	5	2.19
Playing with a gun	1	0.44
Other injuries	13	5.70
Refused/don't know <sup>1</sup>	12	5.26

<sup>1</sup>Subjects either refused to answer or don't know the exact cause of the injury to their child.

**Table 2: Prevalence (%) and Odds Ratios of Pediatric Injuries by Selected Characteristics**

	N <sup>1</sup> (%)	p-value <sup>2</sup>	Unadjusted OR (95% CI)	Adjusted OR <sup>3</sup> (95% CI)
<b>Total w/ Injuries</b>	228 (15.9) <sup>4</sup>			
<b>Sex</b>				
Male	121 (15.8)		1.09 (0.82, 1.44)	1.12 (0.84, 1.50)
Female	107 (14.8)	0.571	1.00	1.00
<b>Urban</b>	127 (15.5)		1.06 (0.80, 1.40)	1.10 (0.82, 1.48)
<b>Rural</b>	101 (14.8)	0.700	1.00	1.00
<b>Location of Residence</b>				
Inside city limits	172 (14.2)		1.00	1.00
Outside city limits	55 (19.3)	0.031	1.44 (1.03, 2.02)	1.29 (0.91, 1.83)
<b>Age</b>				
<6	67 (10.6)		1.00	1.00
6-10	55 (14.0)		1.36 (0.93, 2.00)	1.32 (0.90, 1.94)
11-16	103 (22.6)	0.000	2.45 (1.75, 3.43)	2.39 (1.70, 3.35)
<b>Responding Parent's Race/Ethnicity</b>				
Non-Hispanic Whites	166 (18.2)		1.00	1.00
Hispanics	50 (10.6)		0.54 (0.38, 0.75)	0.57 (0.40, 0.79)
Non-Hispanic Blacks	7 (11.9)		0.61 (0.27, 1.36)	0.59 (0.26, 1.35)
Other	4 (8.9)	0.001	0.44 (0.16, 1.24)	0.46 (0.16, 1.30)
<b>Responding Parent's Education</b>				
< High school	22 (8.4)		1.00	1.00
= High school	206 (16.7)	0.001	2.20 (1.38, 3.48)	1.80 (1.07, 3.00)
<b>Income</b>				
<30,000	74 (12.3)		1.00	1.00
>30,000	132 (17.0)		1.46 (1.07, 2.00)	1.12 (0.80, 1.57)
Missing <sup>5</sup>	22 (19.0)	0.027	1.68 (0.99, 2.83)	1.39 (0.80, 2.43)
<b>Child Living or Working at Farm/Ranch</b>				
No	192 (14.6)		1.00	1.00
Yes	36 (20.8)	0.032	1.54 (1.04, 2.30)	1.32 (0.87, 2.00)
<b>Number of Physician Visits</b>				
<4	95 (12.9)		1.00	1.00
>=4	95 (21.4)		1.85 (1.35, 2.53)	2.11 (1.52, 2.94)
Missing <sup>5</sup>	12 (7.1)	0.000	0.52 (0.27, 0.97)	0.52 (0.28, 0.98)

<sup>1</sup> N=1,498. Information on injury was not available for two children and therefore they were excluded from the final analysis; <sup>2</sup> p-value is for the  $\chi^2$  statistic for each variable; <sup>3</sup> Adjusted for age, sex, and race/ethnicity; <sup>4</sup> Adjusted to the United States 2000 projected population;

<sup>5</sup> Missing values were coded as a separate category.

ties accounted for almost half of all injuries reported, followed in frequency by home accidents and falls. Together, these three types of injuries accounted for almost two-thirds of all reported injuries. In contrast, Chan and colleagues (2000) reported that in

Hong Kong, home injuries among children accounted for almost half of the injuries, followed by sports-related injuries.

In the present study, older children were more likely to sustain lower extremity injuries and their injuries were most likely to be

**Table 3a. Characteristics of Pediatric Injuries Stratified by Age Group**

	Total (n=228)		< 6		6-10		11-16		p-value <sup>1</sup>
	n	%	n	%	n	%	n	%	
<b>Location of Treatment</b>									
Doctor's office	54	27.14	9	14.75	7	14.89	35	39.77	0.001
Emergency room	104	52.26	41	67.21	29	61.70	34	38.64	
Other	41	20.60	11	18.03	11	23.40	19	21.59	
<b>Head/Face/Neck Injuries</b>									
Yes	55	24.12	28	41.79	15	27.27	12	11.65	0.000
No	173	75.88	39	58.21	40	72.73	91	88.35	
<b>Thorax/Abdomen/Pelvic Injuries</b>									
Yes	16	7.02	5	7.46	4	7.27	7	6.80	0.985
No	212	92.98	62	92.54	51	92.73	96	93.20	
<b>Upper Extremity Injuries</b>									
Yes	26	11.40	10	14.93	6	10.91	10	9.71	0.574
No	202	88.60	57	85.07	49	89.09	93	90.29	
<b>Lower Extremity Injuries</b>									
Yes	87	38.16	11	16.42	19	34.55	54	52.43	0.000
No	141	61.84	56	83.58	36	65.45	49	47.57	
<b>Sprain/Strain/Torn Ligament</b>									
Yes	51	22.37	5	7.46	10	18.18	36	34.95	0.000
No	177	77.63	62	92.54	45	81.82	67	65.05	
<b>Scrape/Abrasion</b>									
Yes	8	3.51	3	4.48	2	3.64	3	2.91	0.864
No	220	96.49	64	95.52	53	96.36	100	97.09	
<b>Bruise/Contusion</b>									
Yes	21	9.21	5	7.46	5	9.09	10	9.71	0.880
No	207	90.79	62	92.54	50	90.91	93	90.29	

<sup>1</sup> p-value is for the  $\chi^2$  statistic comparing three age groups for each variable.

<sup>2</sup> One or more cell has an expected count of less than 5. Fisher's exact p-value reported.

sports-related, an observation consistent with findings reported by others (Hambidge, Davidson, Gonzales, & Steiner, 2002). Younger children, however, were more likely to suffer from head/neck/face injuries, possibly due to falls, and were more likely to be admitted to the hospital. Those in rural areas carry the highest risk of sustaining

head/neck/face injuries. According to data from the National Vital Statistics System, in 1992, fatal injuries were 44% higher for rural children ages 1 to 19 than for urban children (Clark, Savitz, & Randolph, 1999). Vane and Shackford (1995) reviewed pediatric mortality data in a largely rural state and concluded that injuries to the head accounted for 72% of all

**Table 3b. Characteristics of Pediatric Injuries Stratified by Age Group**

	Total (n=228)		< 6		6-10		11-16		p-value <sup>1</sup>
	n	%	n	%	n	%	n	%	
<b>Broken Bone/Fracture</b>									
Yes	36	15.79	5	7.46	10	18.18	20	19.42	0.091
No	192	84.21	62	92.54	45	81.82	83	80.58	
<b>Dislocation<sup>2</sup></b>									
Yes	4	1.75	2	2.99	0	0.00	2	1.94	0.579
No	224	98.25	65	97.01	55	100.00	101	98.06	
<b>Cut/laceration</b>									
Yes	41	17.98	18	26.87	13	23.64	10	9.71	0.009
No	187	82.02	49	73.13	42	76.36	93	90.29	
<b>Puncture/Stab/Jab<sup>2</sup></b>									
Yes	3	1.32	1	1.49	0	0.00	2	1.94	0.797
No	225	98.68	66	98.51	55	100.00	101	98.06	
<b>Traumatic Rupture<sup>2</sup></b>									
Yes	2	0.88	2	2.99	0	0.00	0	0.00	0.147
No	226	99.12	65	97.01	55	100.00	103	100.00	
<b>Crushed/Mangled<sup>2</sup></b>									
Yes	2	0.88	2	2.99	0	0.00	0	0.00	0.147
No	226	99.12	65	97.01	55	100.00	103	100.00	
<b>Nerve Injury<sup>2</sup></b>									
Yes	2	0.88	0	0.00	1	1.82	1	0.97	0.726
No	226	99.12	67	100.0	54	98.18	102	99.03	
<b>Burn/Blister/Scald<sup>2</sup></b>									
Yes	9	3.95	6	8.96	1	1.82	1	0.97	0.019
No	219	96.05	61	91.04	54	98.18	102	99.03	

<sup>1</sup> p-value is for the  $\chi^2$  statistic comparing three age groups for each variable.

<sup>2</sup> One or more cell has an expected count of less than 5. Fisher's exact p-value reported.

injury-related deaths. Head and neck injuries in early childhood not only may result in fatalities, but may lead to permanent disability. They may also have important future developmental implications for children. Further research is needed to develop intervention strategies targeted toward this vulnerable and high risk group.

Socioeconomic status is an important indicator of injury. Children living in low income stratas or in poor neighborhoods are more likely to sustain injuries (Durkin, Davidson, Kuhn, O'Connor, & Barlow, 1994). Faelker et al. (2000) reported that children living in poor neighborhoods experienced higher rates of injuries than those living in affluent neighborhoods. In this study, children of parents in the higher SES group (as determined by the responding parent's education level) were more likely to sustain injuries; however, once injured, children in the lower SES group were more likely to be hospitalized. Our observation that children from the higher SES group, who were predominantly non-Hispanic Whites, were more likely to sustain injuries may be related to the fact that almost half of the injuries reported involved sports/recreational activities, a finding consistent with earlier reports (Ni, Barnes, & Hardy, 2002). Lower income neighborhoods generally have poor or substandard playgrounds and play equipment, exposing children to the risk of sustaining severe injuries. It is possible that children belonging to the lower SES group in this study sustained injuries severe enough to warrant hospitalization, raising serious concerns both about the safety of play areas and adult supervision. The results of this study also raise concerns regarding disparities in access to health care. Hispanic children were more likely to receive medical attention for their injuries in the ER. Because Hispanics

were predominantly in the lower SES stratum, it is possible that they lack adequate health insurance and may not be willing to seek medical care for minor injuries experienced by their children. However, more research is needed to determine if Hispanic children need to visit the ER because they have more severe injuries or because of inadequate health insurance.

Living or working on farms exposes children to several hazards, including heavy machinery, chemicals, and animals. In the United States, an estimated 1 million children under the age of 15 live on farms/ranches (American Academy of Pediatrics, 2001). The results of the present study show that approximately 21% of the children who experienced injury either lived or worked on farms/ranches. The majority of these children (32.4%) belonged to the age group 11 to 16, which suggests the possibility that the injuries they experienced could be work-related. These findings also raise concern that adult supervision may be inadequate. An alarming fact is that few responding parents acknowledged, when asked directly, that the injury sustained by their child was farm/ranch-related. Although farm-related fatalities among children have declined in the past two decades, farm-related injuries continue to increase (Rivara, 1997). Our results further add to the evidence that the farm environment remains a major contributor to unintentional injuries. Further studies are needed to evaluate the extent of potential hazards and the risks to children living on farms and ranches.

## CONCLUSION

This article examined the health impact of childhood injuries in the largely rural area of

**Table 4. Proportion (%) and Odds Ratios of Pediatric Injuries Requiring Hospital Admission**

Variables	n=35 (%)	p-value <sup>1</sup>	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
<b>Residence</b>				
Urban	24 (22.2)		2.08 (0.96, 4.52)	1.86 (0.82, 4.21)
Rural	11 (12.1)	0.061	1.00	1.00
<b>Sex</b>				
Male	22 (20.4)		1.53 (0.72, 3.25)	1.38 (0.63, 3.00)
Female	13 (14.3)	0.261	1.00	1.00
<b>Age</b>				
<6	17 (27.9)		3.01 (1.27, 7.15)	2.62 (1.08, 6.36)
6-10	8 (14.0)		1.6 (0.59, 4.38)	1.58 (0.57, 4.37)
11-16	10 (11.4)	0.035	1.00	1.00
<b>Responding Parent's Race/Ethnicity<sup>2</sup></b>				
Non-Hispanic	22 (14.4)		1.00	1.00
Hispanic	13 (28.9)	0.025	2.42 (1.10, 5.31)	1.90 (0.83, 4.34)
<b>Child BMI<sup>3</sup></b>				
1 <sup>st</sup> quartile	5 (27.9)		2.79 (0.88, 8.79)	2.50 (0.60, 2.96)
2 <sup>nd</sup> quartile	12 (12.2)		1.00	1.00
3 <sup>rd</sup> quartile	8 (17.4)		1.52 (0.45, 5.07)	1.73 (0.49, 6.07)
4 <sup>th</sup> quartile	2 (4.7)		0.35 (0.06, 1.92)	0.37 (0.07, 2.05)
Missing	8 (30.8)	0.017	3.20 (0.91, 11.20)	2.08 (0.55, 7.85)
<b>Injuries to Thorax/Abdomen/Pelvis</b>				
Yes	8 (50.0)		5.78 (2.00, 16.71)	6.98 (2.26, 21.54)
No	27 (14.8)	0.000	1.00	1.00
<b>Type of Injury: Burn<sup>4</sup></b>				
Yes	3 (37.5)		2.98 (0.68, 13.11)	2.32 (0.46, 11.63)
No	32 (16.8)	0.149	1.00	1.00
<b>Responding Parent's Education</b>				
< High school	9 (42.9)		1.00	1.00
> High school	26 (14.6)	0.001	0.22 (0.09, 0.59)	0.22 (0.07, 0.69)
<b>Family Income</b>				
<30,000	15 (22.4)		1.00	1.00
>30,000	16 (14.2)		0.57 (0.26, 1.25)	0.82 (0.35, 1.90)
Missing <sup>5</sup>	4 (21.1)	0.343	0.92 (0.27, 3.21)	1.29 (0.34, 4.89)

<sup>1</sup> p-value is for  $\chi^2$  statistic for each variable; <sup>2</sup> Variable recoded as Hispanic/non-Hispanic due to presence of zero cells; <sup>3</sup> BMI=Body Mass Index <sup>2</sup>; <sup>4</sup> One or more cell has an expected count of less than 5. Fisher's exact p-value reported; <sup>5</sup> Missing values were coded as a separate category.

the South Plains/Panhandle of Texas. While fatalities are the standard vital statistic available for review, information on morbidity, disability, and economic costs are also critical in our attempts to understand the impact of injuries on rural populations. The fact that younger children were more likely to suffer head/neck/face injuries, receive treatment in an emergency room, and require hospitalization deserves further study. This certainly presents a costly scenario in economic and emotional terms. Is there a common etiology that could be amenable to intervention? The fact that children living/working on farms/ranches were more likely to sustain injuries in this sample raises serious concerns about the safety of a farm environment. More detail on these injuries is needed to develop injury control strategies or interventions to reduce their occurrence.

While the present study has advanced our understanding of how location of residence and major demographic characteristics of children and their parents are associated with the occurrence of injuries, further research should be conducted to identify other more modifiable risk factors. Future research should also include more thorough measures of injury severity. A specific differentiation of minor versus major injuries would enable public health policymakers and practitioners to target those parents and children who are in the greatest need of preventive interventions and medical care.

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