

Associated Economic Impact of Skatepark-Related Injuries in Southern California

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Objective: To correlate the types of skatepark-related injuries with medical expenses and the monetary effects of time missed from work or school.

Design: Prospective case series and survey with repeat measures over 1 year.

Setting: Southern California Level I Trauma Center and Emergency Department.

Participants: Subjects age 7 years or older who sustained an injury at a local skatepark and treated in the emergency department were included in the study.

Methods: A skatepark-related injury survey was conducted at the time of the subject's emergency department evaluation. Thereafter, subjects were contacted by telephone at 1 week and 1, 3, 6, 9 and 12 months post-injury to assess the extent of ongoing follow-up medical care, time lost from work and school for both the subject and parents, and the degree of self-reported disability. The costs of injury were estimated using accepted econometric methods. The cost of medical care and lost household productivity were estimated using data specific to the nature of the injury and the body part injured.

Results: Skatepark-related injuries resulted in a mean loss of 1.1 school days and 5.5 work days to the subject and family. The mean total injury costs were \$3,167, of which 64% were medical costs and 28% were wages lost by the subject and family. Costs were much greater for subjects aged 26 years and older than for younger subjects and for those with more severe injuries than for less severe injuries.

Conclusion: Skatepark injuries resulted in substantial medical costs and lost wages. Injured skatepark users 26 years and older and those with more severe injuries had the highest cost.

Keywords: Cost; Economic; Injury; Skateboarding; Skatepark

Skateboarding popularity remains high in the United States. While it experienced a notable decrease in popularity in the 1980s, it re-emerged as a popular and fashionable sport in the mid-1990s as evidenced by the introduction and success of ESPN's X Games. Unfortunately, as its popularity has grown, so have the number of skateboard-related injuries seen in the emergency department.¹ Between years 1997 and 2005, the number of emergency department visits rose from over 48,000 to more than 112,000.²

To help control the growing number of skateboard-related injuries, communities across the nation have instituted the development of skateparks. While it may be believed that

young skateboarders who are under some form of supervision may be at less risk for injury, a recent study revealed that injuries in skateparks may be of greater severity with an increased risk for operative intervention.³

Given the continued parallel growth of skateboarding popularity and injuries, and skatepark development, the extent of the economic impact of these injuries comes into question. Currently, our understanding of the degree to which skateboarders and parents of skateboarders are economically affected by injuries is limited, as is the degree to which the injuries affect the ability of working adults to maintain their jobs. Intuitively, the severity of skateboarding injuries should affect individuals substantially, but the only previous study reporting cost for skatepark injuries examined only medical

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Table 1. Characteristics of persons injured in a skatepark (n=95).

Characteristic	Number	Percent
Age		
8-14 years	41	43
15-19 years	13	14
20-29 years	28	29
30-39 years	13	14
Sex		
Female	2	2
Male	93	98
Education		
≤11 years	47	52
12-15 years	33	36
≤16 years	11	12
Not reported	4	
Activity		
Skateboarding	74	78
In-line skating	15	16
Bicycle motocross	6	6
Self-reported skill level		
Beginner	14	15
Intermediate	36	38
Advanced	35	37
Pro	10	10
Previous injury in the same activity		
Yes	58	61
No	37	39
Reported use of protective equipment		
Helmet	95	98
Knee pads	92	95
Elbow pads	89	92
Wrist guards	16	16
Mouth guard	0	0
Other (includes gloves, shin guards, ankle brace)	4	4

care costs.⁴ The purpose of this study was to correlate types of skatepark-related injuries with medical expenses and the monetary effects of time missed from work or school.

Methods

In 1998, a large private skatepark was constructed across the street from our urban emergency department and level I trauma center. The skatepark was a modern private facility with a strict safety equipment code mandating helmet, elbow pad and knee pad use. A prospective survey study was conducted between July 1999 and July 2001 in a level I trauma center and emergency department located in Southern, California that receives 43,000 annual visits. Potential subjects were identified as individuals 7 years or older who sustained an injury at a skatepark and were evaluated in the emergency department. Skatepark users included skateboarders, in-line skaters and bicycle motocross riders. Eligible subjects were consented. In the case of subjects less than 18 years of age, assent was obtained along with parental informed consent. At our institution, the assent is defined as the affirmative agreement of a minor's (7 to 17 years old) affirmative agreement, documented in writing, to participate in research.

Trained research assistants approached prospective study subjects after their initial evaluation and assessment by the emergency medicine physician. Enrolled subjects underwent a brief questionnaire to gather demographic information and details surrounding their injury.

Subjects were contacted by telephone at 1 week post-injury and again at 1, 3, 6, 9 and 12 months post-injury to assess the extent of ongoing follow-up medical care, time lost from work and school for both the subject and parents, and the degree of self-reported disability. Skatepark injury short-term disability results have been previously published.⁵ Hours lost from work and school were converted to days, assuming that a workday equals 8 hours and a school day equals 6.5 hours. Injury severity was coded using the 2000 NASS Injury Coding Manual, 1990 edition of the Abbreviated Injury Scale (AIS).⁶

The cost of injury was estimated from a societal perspective using accepted econometric methods previously described by Lawrence et al.⁷ The costs of medical care were estimated using data specific to the ICD-9 injury diagnosis and the level of medical treatment. Medical costs per non-admitted injury

victim came from the Civilian Health and Medical Program for the Uniformed Services (CHAMPUS) and National Medical Expenditure Survey (NMES). A previously validated multiplier was used to estimate lifetime costs from the short-term costs.⁸ NMES and National Health Interview Survey data were used to differentiate the costs of non-admitted injury victims treated in emergency departments from victims treated only in doctors' offices or clinics. Medical care costs for admitted patients were estimated by multiplying length of stay from the National Hospital Discharge Survey by costs per hospital day due to consumer product injuries in New York and Maryland, adjusted to national costs per hospital day using American Hospital Association data on mean hospital costs per day by state.

Lost days of work were valued using published national statistics about the wage and fringe benefit loss per day of wage work by age and sex, as recommended by standard guidelines.⁹⁻¹¹ Household work hours per day by age and sex were estimated using published regression equations¹² and assuming that disability for household work was 90% of the lost days of work. The distribution of work hours by task was multiplied by national wage data by occupation to value household work hours.

The data were analyzed using SPSS (SPSS Inc., Chicago, IL). The means, 25th and 75th percentiles are reported. Percentiles were obtained directly from the data. Because the distributions of the lost days and costs were skewed, distributions among subsets of subjects were compared using the Kruskal-Wallis rank sum test.

The study protocol was reviewed and approved by the institutional review board for human subject research at the University of California-Irvine.

Results

Ninety-five subjects were enrolled in the study which accounted for 97 injury encounters. Interviews at 1 week post-injury were completed for 93 injury events (96% follow-up). All six post-emergency department visit interviews (1 week; 1, 3, 6, 9 and 12 months) were completed for 88 injury

events (91% follow-up). All eligible subjects were enrolled; we had no refusals to enroll.

Ninety-one percent of the injuries were treated in the emergency department and discharged to their home. Only 9% were admitted to the hospital (extremity fractures, n=6; loss of consciousness, n=2; intra-abdominal injury, n=1). Table 1 shows study subject demographics, injury characteristics and reported use of safety equipment. Estimates of lost work days, lost school days and costs are shown in table 2. The subject's lost work days were greater than the subject's lost school days or parent lost work days. We asked about lost school days of parents, but none were reported. All the subjects incurred some medical costs. Medical costs accounted for 64% of the total injury event costs. Subjects' lost wages were the second largest cost, accounting for 28% of the total costs.

The distribution of lost days and costs were highly skewed. Fifteen subjects, with a variety of injuries, accounted for half the medical costs. Five subjects accounted for 55% of the lost work days and 57% of the lost wages for all subjects. These subjects ranged in age from 18 to 31 years, and all had fractures of the extremities. Seven other subjects accounted for 55% of the lost work days and lost wages for parents and 37% of the lost school days for the subjects. These subjects ranged in age from 9 to 18 years, and they all had fractures of the upper extremity.

The mean costs and lost days, stratified by age, are shown in table 3. Parental lost work days and wages and patient lost school days were greatest for those subjects age 18 years or younger. Lost work days and wages for the subjects, lost household production, medical costs and total costs were greatest for those subjects age 26 and older.

The mean costs and lost days, stratified by the maximum AIS score, are shown in table 4. Maximum AIS Level 3 (AIS-3) injuries resulted in more subject days lost from school and work, higher medical costs and more lost household production than less severe injuries. Subject lost wages were also highest with maximum AIS-3 injuries, but the difference

Table 2. Lost days and associated costs per skatepark injury (n=97).

	Mean	Standard deviation	Minimum	25th percentile	75th percentile	Maximum
Lost days from school, subject	1.1	2.9	0	0	1	20
Lost days from work, subject	5.5	14.8	0	0	3	105
Lost days from work, parent	0.6	1.5	0	0	1	10
Medical cost	\$2,025	\$2,586	\$366	\$952	\$1,426	\$13,956
Lost wages, subject	\$886	\$2,684	\$0	\$0	\$277	\$19,170
Lost wages, parent	\$82	\$189	\$0	\$0	\$130	\$1,299
Lost household production, subject	\$174	\$439	\$0	\$0	\$115	\$3,149
Total cost	\$3,167	\$4,335	\$366	\$1,206	\$2,771	\$23,271

Table 3. Mean lost days and costs by age per skatepark injury (n=97).

	≤ 18 years	19-25 years	≥ 26 years
Number	51	23	23
Lost days from school–subject*	2.0	0.3	0.0
Lost days from work–subject*	0.8	4.5	16.9
Lost days from work–parent*	1.1	0.2	0.0
Medical cost*	\$1,827	\$1,516	\$2,972
Lost wages–subject	\$31	\$506	\$3,163
Lost wages–parent*	\$146	\$22	\$0
Lost household production–subject*	\$44	\$115	\$522
Total cost*	\$2,049	\$2,158	\$6,657

* $P < 0.05$ by Kruskal-Wallis rank sum test.

was not significant with the Kruskal-Wallis test. Parent lost work days and wages were greater for maximum AIS-2 and maximum AIS-3 injuries than for maximum AIS-1 injuries.

Discussion

In our study, skatepark-related injuries affect a wide range of ages. The youngest age group (≤18 years) missed the most amount of time from school (average=2.0 days). The injuries these children sustained forced their parents to stay home and care for them. This resulted in an average of \$146 lost wages from work. Consequently, skatepark-related injuries sustained by children have both a direct (medical cost) and an indirect economic impact (lost wages from work) on the individual and their families. The oldest age group (26 to 39 years) had the least amount of time missed from school (0.0 days), but lost the greatest amount of time from work (16.9 days). The lost time from work resulted in a significant amount of lost wages (an average of \$3,163). This actually represented more than half of the total injury event cost. Furthermore, the total cost incurred to this group turned out to be almost 3.5 times as much as the youngest group. This reflects the considerable risk that skatepark-related injuries present to employed adults and should encourage the use of proper protective gear at all times.

The estimates of lost wages are based on the subject's age and the days of work lost. It did not include lost wages after the injury-related disability. In one instance, a subject lost his job since he could not return to work for an extended period of time. Consequently, this subject was evicted from his apartment and had to seek shelter at a friend's apartment while he recovered. Another subject, who earned a living by tuning guitars and pianos, suffered a forearm fracture and was fired because he could not perform his regular work. Thus, for adults who suffer injuries while skateboarding, the economic impact can go significantly beyond the medical cost.

A comprehensive examination of all the injured subjects revealed that a small group of subjects represented the bulk of the time missed from work/school and total cost of injury. In fact, the 75th percentile fell below the mean for most of the statistical categories. For example, the average amount of days lost from school was 1.1 days with a 75th percentile of 1 day. This occurred because a few of the injuries were far more

severe than most of the others. Also, the injuries incurred an average total cost of \$3,167 with a 75th percentile of \$2,771. Notably, one subject paid an estimated total amount of \$23,271 – more than 7 times the average. Thus, a few subjects bore most of the cost.

Correlating injury severity with time lost and lost wages revealed a predictable trend: those with the least severe injuries (maximum AIS=1) possessed the smallest medical and total costs; and conversely, those with the most severe injuries (maximum AIS=3) possessed the greatest medical and total costs. Furthermore, a reduction in the severity of the injury affects the oldest group the most, since their total cost is sharply affected by the time lost from work.

While skateparks do present the inherent risks we have already stated, they do provide a number of important benefits. Skateparks provide people with a confined area to skateboard and encourage potential skaters to participate. The cardiovascular benefits of skateboarding can be beneficial and should be noted, given the rising rates of obesity and other medical ailments that are worsened by a sedentary lifestyle. Furthermore, the motor-biomechanical skill training that skateboarding offers is likely to be beneficial.

We acknowledge that our study has limitations. First, sample size is limited by subjects who sought care in our emergency department for their injuries (n=95). It is conceivable that other skatepark users who suffered more minor injuries may not have sought emergency care service at our institution, despite the fact that our emergency department is across the street from a skatepark. It is also possible that a few more than minorly injured skatepark users may have sought acute medical care at another hospital. This could contribute to an underestimation of the total number of skatepark injuries suffered at the skatepark during our study period. Because of this and the fact that our study only analyzed one private skatepark location, the findings cannot be easily generalized to all skateparks. Finally, we do not know who bore the costs of these skatepark-related injuries. Seventy-one percent of the injuries listed a specific private or public payer, who may have borne much of the cost of medical care. Moreover, we do not know the extent to which lost work days for parents or injured subjects were borne by these individuals or employer sick pay.

Table 4. Mean lost days and costs by maximum abbreviated injury scale (AIS) per skatepark injury (n=97)

	Maximum AIS		
	1	2	3
Number	26	56	15
Lost days from school–subject*	0.4	1.2	2.0
Lost days from work–subject*	2.1	5.6	11.0
Lost days from work–parent*	0.1	0.8	0.7
Medical cost*	\$977	\$1,628	\$5,323
Lost wages–subject*	\$270	\$950	\$1,716
Lost wages–parent*	\$17	\$109	\$94
Lost household production–subject*	\$66	\$178	\$344
Total cost*	\$1,331	\$2,885	\$7,476

* $P < 0.05$ by Kruskal-Wallis rank sum test.

Presumably much of the cost of lost household work was borne by the injured subjects and their families. Access to “sick pay” or “saved” vacation time could have affected the amount of time individuals decide to take off from work in order to recuperate or to help their children recuperate from their injuries.

Conclusions

Skatepark-related injuries result in substantial medical costs and lost wages. In our study, skatepark users age 26 years and older and subjects with more severe injuries bore the greatest economic burden of injury. With the continued proliferation of skateparks, injury prevention efforts focused on skatepark-related injuries should be closely studied. In particular, as the minority of injuries (maximum AIS-3) had the greatest socioeconomic impact, further research should concentrate on the biomechanical aspects of these skatepark-related injuries, as well as associated behavioral determinants in order to help prevent them. Larger scale health economic research should also be conducted to further assess skatepark-related (private vs. community) injury cost, their impact on healthcare expenditure, and how these vary according to national geographic location.

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