

INJURY CLASSICS

Medically attended injuries among young children: observations in a suburban area

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These are the 12th and 13th papers in a series of Injury Classics. Our goal is to reprint one or two such papers in each issue to initiate newcomers to the field of these old, often quoted, and important contributions. As many are difficult to find, it should help all of us to have a copy at hand. Your suggestions about future articles are welcome. Write to the editor with details of your favourite, most quoted paper.

Pediatricians have manifested increasing concern with the problem of childhood accidents, yet relatively little information is available on the nature and extent of non-fatal accidental injuries in childhood which come to the attention of physicians practicing in suburban communities. The present paper provides information on such accidents occurring to children under 7 years of age in a new, fairly homogenous, suburban area. The information was obtained in the course of a four year control study to test the effect of intensive community educational efforts on the incidence of accidental injury among preschool children.

The Child Injury Prevention Project is being conducted in Rockland County, located on the west bank of the Hudson River about 30 miles north of New York City. Rockland County embodies many of the changes taking place in large metropolitan areas. In a relatively short time, it has changed from a sedate area of large estates and heavily wooded lands to a bustling suburban community. The population of the county has increased sharply, from 89 300 in 1950 to 136 800 in 1960. Between 1951 and 1960, about 14 650 new homes were built in the county, about 85% of these being on realty subdivisions.

The composition of the county's population has also changed. Formerly consisting to a large extent of older adults, the population is now predominantly young married adults with young children. This is largely a reflection of the composition of the new realty subdivisions. According to the 1960 decennial census, 17% of the total population of the county was under 7 years of age. On the other hand, in several random samplings performed in connection with the present study, the subdivisions were found to have 26% of their population in this age group.

The large proportion of young children in the subdivision households provided an excellent opportunity for a control study in accident prevention among young children. Many variables, such as family make-up, socioeconomic level, and social interests were already largely controlled by the homogeneity of the population. The physical environment was also fairly uniform, since the subdivision homes were generally of similar cost and architectural design.

Methods

The Rockland County Child Injury Prevention

Project is designed to test the effect of education on the incidence of accidents to preschool children living in a suburban area. Two groups of similar realty developments, separated by a buffer zone, were selected for study. The study group is exposed to an intensive program of health education to encourage them to take measures to prevent accidents, whereas the control group is not given any attention in this regard beyond what they would otherwise be exposed to in the community.

Since other studies have shown the difficulty in obtaining accurate information on childhood accidents from interviews with parents after a lapse of time following the event, data were obtained directly from physicians, dentists, and hospitals in the county every two weeks. The active interest and participation of physicians were solicited at the start of the project. After the project was endorsed by the County Medical Society and personal visits were made to the 114 physicians in the county whose practices included care of children, 97% of the physicians agreed to furnish data for the duration of the project. All the dentists and hospitals in the county also agreed to furnish reports.

The report was obtained on a special form for any accident to a child, 6 years of age or under, who had received care from a physician or dentist. An accident was arbitrarily defined as any actual or presumed trauma following an incident for which direct medical or dental attention was obtained. For example, a child may have been brought to the attention of a physician for a presumed poisoning, even though the child may not have actually ingested any toxic material. Multiple injuries occurring in any one incident were counted as one injury, except in analyzing the nature and severity of the injury. Care by persons other than physicians or dentists was not included nor was advice given over the telephone counted as medical or dental attention. A fee of one dollar was paid for each report completed. The entire county was included in the reporting system to avoid any bias that might result from knowledge of the locating of study and control areas.

Four data collectors, three of whom are registered nurses, visited physicians in assigned areas every two weeks to encourage reporting and to collect completed report forms. The data collectors sorted the cases in the study and control areas from those in the remainder of the county.

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The actual count of children living in the study and control areas, by age (from recorded date of birth) and sex, was obtained from the school census for the school districts involved in the total study area. Because of the rapidly changing school population, special efforts had been made by the schools to ensure the reliability of the census of preschool and school children. There were 9206 children in the age group under 7 years in the area. There was a small excess of males, the greatest difference by sex being among the 1 year olds (table 1).

Results

Baseline data on injuries among the total study group covered the year from December 1, 1960 to November 30, 1961, before any of the group had been exposed to any special efforts in accident prevention. The total of 1137 injuries represented an annual rate of 124 per 1000 children under 7 years of age (table 2). This is considerably higher than the rate of 80 per 1000 children of the same age in the study conducted in Washtenaw County, Mich.¹ The Washtenaw County data were based on interviews with parents covering events during the year preceding the interview, and its definition of injuries included any incidents resulting in expenditure of funds or in the injured person's being kept away from usual activities, in addition to the sole criterion of medical or dental attention used in the Rockland County study. On the other hand, the Rockland County rate was considerably lower than the annual rate of 294 per 1000 children under 7 years of age found in the National Health Survey for July 1959–June 1961. The injuries counted in the National Health Survey were those occurring during the two weeks prior to the interview. Its definition of injury was somewhat broader than in the present study, since it covered injuries causing restriction of usual activities for a day or more, as well as those coming to medical attention.²

Table 1 Number of children under 7 years of age, by year of age

Age (years)	Total	Male	Female
Under 1	1091	544	547
1	1167	630	537
2	1277	632	645
3	1462	765	697
4	1531	743	788
5	1402	726	676
6	1276	672	604
Total	9206	4712	4494

Table 2 Number of injuries and injury rate, by age

Age (years)	Total injuries	Injury rate per 1000
Under 1	37	34
1	158	135
2	228	179
3	199	136
4	190	124
5	178	127
6	147	115
Total	1137	124

There were no deaths from accidents during the course of the year in the group of 9206 children under study. Among the 9206 children, 92 had two or more accidents; 10 of these had three accidents, and two had four accidents.

The injury rate was decidedly higher at 2 years of age (179 per 1000 children) than in any other age group (table 2). The low rate of 34 per 1000 was found among infants under 1 year of age. Otherwise, the injury rate varied within a narrow range of 115 to 136 per 1000 children.

Boys had higher accidental injury rates than girls at all ages, except under 1 year (table 3). The overall accidental injury rate was 146 per 1000 boys and 100 per 1000 girls. Two year old boys suffered the highest rate of accidents of any age-sex groups, the rate in this group being more than 75% greater than in any other age-sex group.

TYPES OF ACCIDENTS

Falls were the cause of 551 accidental injuries, or 48% of the total (table 4). Blows or collision with objects totaled 182 (16%), and contact with sharp or rough objects accounted for 121 accidents (11%). Accidents involving bites or having the child caught in or between objects each constituted 6% of the total. There were 41 poisonings (4%), 31 accidents involving motor vehicles (3%), and 30 burns and scalds (3%). The general distribution of broad types of accidents was similar among boys and girls, although the boys appeared to suffer a disproportionate number of accidents involving sharp or rough objects.

Boys were involved in about 60% more falls from one level to another than were girls, but there was only a 29% difference between boys and girls in the number of falls on the same level. This might be related to differences in aggressiveness and adventure-someness between the two sexes in the early years of growth and development. If it were related only to coordination, it might be expected that boys would also have disproportionately more falls on the same level, which was not the case. There was little variation in the number of injuries from falls from ages 1 through 5.

To measure the impact of falls, injuries caused by falls were ranked by severity (table 5). The 551 falls sustained by the children in

Table 3 Injury rate, by age and sex

Age (years)	Male		Female	
	No of injuries	Injury rate per 1000	No of injuries	Injury rate per 1000
Under 1	13	24	24	44
1	92	146	66	123
2	145	229	83	129
3	111	145	88	126
4	124	167	66	84
5	107	147	71	105
6	94	140	53	88
Total	686	146	451	100

Table 4 Major types of accidents occurring to children, by sex

Type of accident	Total	% of total accidents	Males	% of total accidents	Females	% of total accidents
All falls	551	48	323	47	228	51
Blows or collision	182	16	116	17	66	15
Sharp or rough object	121	11	86	13	35	8
Caught in or between objects	66	6	42	6	24	5
Bites	65	6	35	5	30	7
Poisonings	41	4	19	3	22	5
Motor vehicle	31	3	22	3	9	2
Burns and scalds	30	3	18	3	12	3
All other accidents	50	4	25	4	25	5
Total	1137	100	686	100	451	100

Table 5 Injuries from falls by nature of injury

Nature of injury and rank of severity	No	Injury rate per 1000
1. Cerebral concussion with loss of consciousness	9	1
2. Fracture	56	6
3. Teeth cracked or lost	26	3
4. Laceration and suture	236	26
5. Foreign body or eye penetration	4	0.5
6. Puncture of skin	7	1
7. Cerebral concussion without loss of consciousness	13	1
8. Sprain or strain	22	2
9. Bruise or contusion	80	9
10. Laceration without suture	119	13
11. Abrasion	45	5
12. Other injuries	13	1
13. No significant injury	5	1
Total injuries	635	
Total accidents	551	

the study resulted in a total of 635 recorded injuries. More than half of the injuries are in the top seven categories of severity. About 39% were lacerations requiring sutures. There were 55 fractures as a result of falls; these constituted 72% of all fractures.

Another measure of the severity of falls and their resultant injuries was the amount of care needed. About 61% of the children injured by falls made two or more visits for medical or dental care, compared with 48% of the children involved in other types of accidents.

LOCATION OF ACCIDENTS

A total of 501 (about 45%) of the accidents occurred indoors, all but 6% of those with location specified being in the home (table 6). The kitchen was the most frequent site of these accidents, with the bedroom a close second. The recreation room and basement combined were next in order.

About 55% of the accidents took place out of doors, with the yard outranking all other sites, indoors or out (table 7). More than 26% of all accidents are known to have occurred in the yard. This may be related to the inaccessibility of supervised public play areas and the large amount of play equipment in the yards. The street was far behind the yard as the site of outdoor accidents, but it outranked any single indoor site. Accidents occurring inside an automobile or bus accounted for 42, or 3.7%, of the total. Schools were the site of 13 accidents, but this small number was to be expected because of the age distribution of the

Table 6 Location of indoor accidents

	No	Injury rate per 1000
Kitchen	107	12
Bedroom	97	11
Living room	76	8
Recreation room	45	5
Basement	33	4
Stairs	32	3
Bathroom	21	2
Store	14	2
School	11	1
Other	24	3
Unspecified	41	4
Total	501	54

Figures exclude two accidents with location unknown.

Table 7 Location of outdoor accidents

	No	Injury rate per 1000
Yard	300	33
Street	113	12
Driveway	35	4
Porch	22	2
Steps	19	2
Playground	16	2
Garage	14	2
School	13	1
Inside motor vehicle	42	5
Woodlands	9	1
Home swimming pool	4	<0.5
Other	18	2
Unspecified	29	3
Total	634	69

Figures exclude two accidents with location unknown.

child population under study.

Although backyard wading and swimming pools were in evidence, both as individual or neighborhood enterprises, they did not figure significantly in the accident picture. Home pools were the location of only four accidents, and all were falls. Perhaps the mothers are aware of this possible hazard and supervise pool activities; gathering around the pool tends to be a neighborhood activity, thus providing adult supervision and discipline of pool use. Apparently, the off-hours water hazard of the pool did not pose a problem, at least during the year of baseline data collection.

Stairs and steps, indoors and out, were involved in 51 accidents. Even if we assume that all were falls, these represent only 19% of the total number of falls from one level to another. This might be interpreted to indicate that parents are more aware of the accident potential of stairs and therefore protect their children on the stairs in the early years. On the other hand, children may be more stable when negotiating stairs than when climbing on furniture, play equipment, ladders, or trees. The Cape Cod and split level homes have stairs from one level to another, and even ranch styled homes have stairs of some sort leading to recreation rooms or basements.

Many of the suburban families have recently moved from city apartments, so that we had anticipated that stairs and rooms on different levels would create an accident situation. However, since the largest number of accidents occurred in the yard and street, we suspect that the drastic change in play habits and the variety

of new play opportunities created the greater hazard. Certainly, observation suggested that supervision of children's activities changed when the families moved to 'the country'. Mothers might have been more aware of street and playground hazards in the city and supervised the child when he was out of the apartment. In the suburbs, however, the child was turned loose in what parents apparently considered a safe environment away from busy city traffic.

Another newly emerging problem in suburban areas is that of glass panels, mostly in sliding doors and full length windows, commonly found in suburban homes. During the year of observation, nine boys and five girls had accidents involving glass panels. Eleven of the 14 required two or more visits for medical care, but none required hospitalization. Most of the injuries were suffered when children ran into the panels or pushed their hands through the glass.

Falls occurred more frequently than any other type of accident in the kitchen (45 accidents), with boys sustaining falls in the kitchen nearly twice as often as girls. Poisoning, contact with fire or hot substances, contact with sharp or rough objects, and blows or collision were of about equal importance in kitchen accidents. Falls were also the major type of accident in the bedroom, comprising 48.5% of the total in this location, with little difference between the sexes.

Falls comprised 64 (56%) of the total number of accidents taking place in the street. Falls from one level to another in the street, mainly falls from bicycles or tricycles, occurred nearly twice as frequently as falls on the same level. This bears out the observation that in the Rockland County suburban areas, the street seemed to be the place to ride a tricycle. The next most frequent type of accident was blows or collisions (23 accident, or 20% of the total). These could be related to tricycle riding, as well as the availability of stones and other solid objects used as weapons in airing hostility toward playmates. Falls and blows or collisions accounted for three quarters of the accidents occurring in the street.

Playing in the street and driveway accounted for the second largest number of accidental injuries. Riding bicycles or tricycles presented a hazardous situation for young children, since falls from a higher level on the street were responsible for many injuries. Bicycles, rather than tricycles, were used frequently at ages 4 and 5. Since there are relatively few sidewalks in the newly developing suburban areas in Rockland County and because some of the homes are so new that yards with well

established grass are not available as play areas for children, the only outdoor place at the moment for children from these homes is the street.

OTHER OBSERVATIONS

There was little variation in the number of accidents by day of week for the year of observation, with a range from 148 accidents on Sundays to 186 on Mondays. Accidents on other days varied only from 153 to 166. The slight excess of accidents on Mondays, of doubtful significance, may be a result of the let-down of mothers following the weekend activities or possibly to the increased load of household chores on Monday, with less supervision of the young child.

Nearly 75% of the injured children were seen by the doctor within one hour of the time occurrence of the accident. A few were seen as late as 48 hours following the accident, probably because of the development of complications.

Summary

A control study of the effect of public health education on the rate of accidental injuries among children under 7 years of age in a newly developing suburban area provided an opportunity to gain an insight into the nature and extent of the accident problem itself during a one year baseline period preceding the educational phase of the study.

An accident was arbitrarily defined as any actual or presumed trauma following an incident for which direct medical or dental attention was obtained. Data were gathered through regular visits of data collectors to physicians, dentists, and hospitals in the area.

An annual accident rate of 124 per 1000 children under 7 years of age was found. Two or more accident occurred to 10% of the children.

The highest injury rate by age (179 per 1000 children) was found among 2 year old children, with the rate amount 2 year old boys 75% higher than any other age-sex group.

The possible relationships of suburban living to the type and location of accidents by age and sex and to the variation in accidents by day of week are also presented.

1 An experience in home safety. *Home injuries*. Ann Arbor: University of Michigan School of Public Health, publication No 75, 1953.

2 Health Statistics From United States National Health Survey, Series B-No 37. *Persons injured by detailed type and class of accident, United States, July 1959-June 1961*. Public Health Service, Oct, 1962.