
# SPECIAL STUDY: INJURIES AND DEATHS ASSOCIATED WITH CHILDREN'S PLAYGROUND EQUIPMENT

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**Deborah K. Tinsworth**
**Joyce E. McDonald**
**Directorate for Epidemiology**
**U.S. Consumer Product Safety Commission**
**Washington, D.C. 20207**

## EXECUTIVE SUMMARY

In support of U.S. Consumer Product Safety Commission (CPSC) efforts to address playground hazards, Directorate for Epidemiology staff conducted a special study of playground equipment-related injuries treated in U.S. hospital emergency rooms from November 1998 through October 1999. Staff also reviewed data on playground-related deaths reported to CPSC from January 1990 through August 2000. Highlights of this analysis include the following:

- In 1999, an estimated 205,850 playground equipment-related injuries were treated in U.S. hospital emergency rooms. This adjusted estimate translates to a rate of about 7.5 injuries per 10,000 U.S. population in 1999. Age-specific incidence was about 29.1 injuries per 10,000 children younger than 5 years, 34.8 per 10,000 children 5–14 years, and 0.6 per 10,000 population 15 years and older.

- Approximately 156,040 (75.8 percent) of the 1999 injuries occurred on equipment designed for public use, 46,930 (22.8 percent) occurred on equipment designed for home use, and 2,880 (1.4 percent) occurred on homemade equipment (primarily rope swings).

- About 45 percent of the injuries involving public equipment occurred in schools, followed by about 31 percent in public parks. Injuries on public equipment also occurred in commercial daycare settings (10 percent), apartment complexes (3 percent), fast food restaurants (2 percent), and other locations (9 percent). About three percent of the injuries involving home equipment occurred in home daycare settings.

- Overall, fractures were the most commonly reported injury, accounting for 39 percent of all injuries on home and public equipment. Almost 80 percent of these fractures involved the wrist, lower arm, and elbow. About 15 percent of the injuries to the head and face were diagnosed as concussions, internal injuries, and fractures; these injuries accounted for about 5 percent of all surface fall-related injuries in this study.

- About one-half (53 percent) of the injuries involving public equipment occurred on climbers. About 60 percent of the injuries on climbers occurred on various configurations of overhead "horizontal ladders." About two-thirds (67 percent) of the injuries involving home equipment occurred on swings.

- Over 40 percent of the injuries that occurred on public equipment and 30 percent of the injuries that occurred on home equipment involved multi-use structures. For both home and public equipment, however, the multi-use aspects of the equipment (e.g., overlapping use zones, multiple users, etc.) didn't appear to be causal factors in the injuries that occurred.

- Overall, about three-fourths (79 percent) of the injuries that occurred on public equipment involved falls, primarily to the surface below the equipment. On home equipment, 81 percent of the injuries were associated with falls. All of the hospitalized injuries (3 percent of the total) resulted from falls.

- In locations where public equipment was installed, almost 80 percent had protective surfacing under the equipment, most often bark mulch or wood chips. In contrast, only about nine percent of home locations had protective surfacing, most often sand. Dirt and grass were, by far, the most prevalent surfaces present under home playground equipment.

- From January 1990 through August 2000, CPSC received reports of 147 deaths to children younger than age 15 that involved playground equipment. In the 128 incidents for which location was reported, 90 (70 percent) occurred in home locations and 38 (30 percent) occurred in public locations.

- Over one-half (56 percent) of the playground equipment-related deaths involved hanging, primarily from ropes, shoestrings, cords, leashes, clothing strings, and other items tied to, or entangled on the equipment. Homemade rope, tire, or tree swings were also involved in a number of hanging deaths. Other causes of playground equipment-related deaths included falls, equipment tipover or collapse, entrapment, or impact with moving components.

- Comparison of data from the current study to data from a 1988 CPSC study of playground hazards revealed that falls continue to account for the majority of injuries. Injuries associated with public equipment continue to outnumber those on home equipment, and injuries in school settings now appear to be greater than in public parks. Climber-related injuries have increased in public locations, perhaps because of the greater number of multi-use climbing structures. Deaths from swing impact are now rare.

- Future safety efforts to address playground hazards should include activities to continue to promote the importance of appropriate protective surfacing in both home and public locations; to evaluate various protective surfaces in terms of reducing fractures to the wrist, lower arm, and elbow; to research the appropriateness of certain upper body equipment (e.g., horizontal ladders) for different age groups and skill levels; and to alert caregivers and children to the risk of attaching ropes, cords, and similar items to playground equipment.

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# I. BACKGROUND

Each year, over 200,000 people are treated in U.S. hospital emergency rooms for injuries associated with playground equipment, with the majority of these injuries involving children under the age of 15 years. Previous analyses of data by U.S. Consumer Product Safety Commission (CPSC) staff revealed that deaths and serious injuries resulted from falls, hangings, impact with moving equipment, entrapment and contact with protrusions, pinch points, sharp edges and sharp points. [1, 2, 3, 4]

CPSC's last in-depth study of playground equipment injuries was conducted in 1988, and published in 1990.[1] Since that time, there have been changes in the types, construction, and usage of equipment in the United States. Composite play structures, such as climber/slide combinations, have become increasingly common in both home and public settings. Materials and techniques of construction are very different from those used in past years, with plastics and wood replacing some of the all-metal structures of the past. Soft contained play equipment, such as the type found in fast-food restaurants and "pay-for-play" settings, has become more popular. There appears to be a greater awareness of surfacing issues, and a wider variety of surfacing materials available than in past years. As playground equipment and surfacing materials have evolved, questions have emerged about the safety of these products and their effectiveness in preventing playground injuries.

Since the 1988 study, a variety of actions have been taken to address playground hazards. In 1991, CPSC replaced its 1981 2-volume handbook set for public playground safety with a single Handbook for Public Playground Safety.[5,6] The 1991 handbook was then revised and republished in 1997. The new Handbook is intended for use by playground designers, purchasers, installers, and consumers. The ASTM voluntary standard for public playground equipment, first published in 1993, serves as the guideline for manufacturers.[7] In addition, ASTM voluntary industry standards have been developed/revised for home playground equipment, soft contained playground systems, and playground surfacing.[8, 9, 10]

Playground equipment is divided into several major groups:

- PUBLIC PLAYGROUND EQUIPMENT - is usually found in schoolyards, public parks, amusement parks, licensed child care facilities, apartment complexes and other public recreational areas. The CPSC handbook contains recommendations for this type of equipment. There is also an ASTM voluntary standard for public playground equipment (ASTM F1487).

- PRESCHOOL PLAYGROUND EQUIPMENT - is a subset of public playground equipment. Intended for children 2-5 years of age, it is usually found at licensed child care facilities, preschools, and in separate preschool areas at public playgrounds. The CPSC playground handbook contains a number of specific recommendations for pre-school playground equipment (Section 6.3 of the current handbook).

- HOME PLAYGROUND EQUIPMENT - is generally found in the yards of private residences. It is usually of lighter weight and less durable than public playground equipment. There is an ASTM voluntary standard (ASTM F1148) for this type of equipment. Home playground equipment may also be found in childcare facilities that are being operated in private residences.

- SOFT CONTAINED PLAYGROUND EQUIPMENT - is generally found in fast food restaurants, indoor shopping malls and facilities where children pay to play on the equipment. Typically it consists of plastic crawl tubes and slides, climbing nets, ball pits and other padded climbing apparatus. It is enclosed, generally by netting, to minimize the likelihood that a child can fall to the ground surface. There is an ASTM voluntary standard for this type of equipment (ASTM F1918).

In order to assess the need for further actions to address playground hazards, such as revisions to the CPSC handbook or the ASTM voluntary standards, up-to-date injury information was needed. Thus, CPSC staff conducted a special study of playground equipment-related injuries treated in U.S. hospital emergency rooms from November 1998 through October 1999. Staff also reviewed data on playground-related deaths reported to CPSC from January 1990 through August 2000. The analysis of these data is the focus of this report.

# II. METHODOLOGY

## INJURIES

The injury cases included in this study were identified through CPSC's National Electronic Injury Surveillance System (NEISS), a statistically selected sample of 100 hospital emergency rooms located throughout the United States that report product-related injuries to CPSC on an ongoing basis. The hospitals within NEISS are stratified by size and assigned weights that are used to make national projections of product-related injuries.

From November 1, 1998 through October 31, 1999, a systematic sample (1:10) of playground equipment-related cases reported through NEISS was assigned for telephone investigation to obtain detailed information about these injuries.[1] For these investigations, a structured questionnaire, containing primarily open-ended questions about the hazard scenario, was developed by CPSC staff and used by interviewers under contract to CPSC. During this time period, a total of 756 cases were assigned for telephone follow-up. In 227 of these cases, the victim, parent, or caregiver could not be contacted or was unwilling to provide additional information. In 11 cases, contact was made, but the victim was 15 years or older, so details of the incident were not necessary. In an additional 64 cases (approximately 15.2 percent of the weighted cases for which follow-up was possible), the incident was found to be out of scope because it did not involve playground equipment (e.g., porch swing, infant swing, swimming pool slide, etc.). The remaining 454 cases were followed up with full telephone investigations, and were the basis for this analysis. In 409 of the 454 cases, CPSC field investigators also conducted an on-site investigation. On-site investigations were particularly important in documenting the type of equipment involved, since there is such diversity in equipment today.

## DEATHS

CPSC obtains information on playground equipment-related deaths from death certificates, medical examiner and coroner reports, consumer complaints, newspaper clippings, emergency room records, and various other sources. Incident reports from these sources are often assigned for in-depth investigations to collect additional data. These data are extremely useful for characterizing the products and circumstances involved in serious playground equipment-related incidents. For this study, staff reviewed information on deaths reported to CPSC from January 1990 through August 2000.[2]

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[1] The cases in the 1:10 sample were re-weighted according to their stratum to account for non-sampled cases.

[2] The data files searched were the In-depth Investigation file (INDP), the Injury and Potential Injury Incident file (IPII), the Death Certificate file (DTHS) and the National Electronic Injury Surveillance System (NEISS).

# III. RESULTS AND DISCUSSION

## INJURIES

Based strictly on the NEISS sample, an estimated 242,751 playground equipment-related injuries were treated in U.S. hospital emergency rooms in 1999 (CV=0.06). Investigative data obtained through the current study, however, suggested that a portion of these injuries (approximately 15.2 percent during the study period) involved products other than playground equipment. Thus, the 1999 estimate was adjusted to 205,853 to reflect the exclusion of these products.[3]

This adjusted estimate translates to a rate of about 7.5 injuries per 10,000 U.S. population in 1999. Age-specific incidence was about 29.1 injuries per 10,000 children younger than 5 years, 34.8 per 10,000 children 5–14 years, and 0.6 per 10,000 population 15 years and older.

The design and use of playground equipment may affect associated patterns of injury. Based on this study, 22.8 percent of the equipment associated with emergency room-treated injuries was designed for home use, 75.8 percent was designed for public use, and 1.4 percent was homemade (primarily rope swings)(Table 1). Applying these

Table 1.

1999 Estimates of Emergency Room-Treated Injuries Associated with Home, Public, and Homemade Playground Equipment

| Type of Equipment | Percent Based on Special Study | Adjusted 1999 Estimate of Injuries |
|---|---|---|
| Total | 100% | 205,850 |
| | | |
| Public | 75.8% | 156,040 |
| Home | 22.8% | 46,930 |
| Home Made | 1.4% | 2,880 |

Source: National Electronic Injury Surveillance System (NEISS);
11/1/98 – 10/31/99 Special Study, 01/01/99 – 12/31/99 Surveillance Data
U.S. Consumer Product Safety Commission/EPHA

[3] The NEISS estimate for playground equipment-related injuries treated in U.S. hospital emergency rooms during the 11/1/98 – 10/31/99 special study time period was 242,426 (CV= 0.06). Adjusting for out-of-scope cases produced an estimate of 205,577.

percentages to the adjusted 1999 estimate of playground equipment-related injuries resulted in an estimate of 156,040 injuries associated with public equipment, 46,930 injuries associated with home equipment, and 2,880 injuries associated with homemade equipment.

The remainder of this analysis is based on injuries to children younger than 15 years that involved equipment designed for home and public use only.

## Victims

### Age and Sex

Overall, 30 percent of the victims reported through the current study were of preschool age, i.e., under 5 years (Table 2). School-age children ages 5-9 years were associated with the largest portion of injuries, 56 percent. Older school-age children ages 10-14 years were associated with about 14 percent of the injuries. The ages of the children, however, varied by location of incident, probably due to differences in exposure. Commercial daycare and home locations tended to have the highest proportions of preschool victims.

Females were injured slightly more frequently (55 percent) than males (45 percent).

Table 2.

Playground Equipment-Related Injuries Treated in U.S. Hospital Emergency Rooms, Ages of Victims by Location of Incident

| Age of Victim (Years) | Location of Incident | | | | | |
|---|---|---|---|---|---|---|
| | Total | Home | Public Park | School | Comm. Daycare | Other |
| Total | 100% | 100% | 100% | 100% | 100% | 100% |
| < 2 | 3% | 5% | 8% | 0% | 2% | <1% |
| 2 – 4 | 27% | 34% | 23% | 9% | 54% | 56% |
| 5 – 9 | 56% | 59% | 55% | 66% | 42% | 30% |
| 10 – 12 | 12% | 1% | 12% | 20% | 2% | 13% |
| 13-14 | 2% | 1% | 2% | 5% | 0% | 0% |

Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10/31/99
U.S. Consumer Product Safety Commission/EPHA

## Body Part, Diagnosis, and Disposition

Injuries to the arm and hand (primarily the lower arm, wrist, and elbow) were most common, with 43 percent of the injuries (Table 3). Injuries to the head and face followed, with 34 percent of the injuries, and injuries to the leg/foot, trunk, neck, and other parts of the body were associated with 23 percent of the injuries. By age, however, differences were apparent. For preschool-age children, head/face injuries were most frequent, accounting for almost one-half (49 percent) of the injuries. For older children, head and face injuries accounted for 28 percent of the total, and arm/hand injuries were most common, with almost one-half of the injuries (49 percent).

Table 3.

Playground Equipment-Related Injuries Treated in U.S. Hospital Emergency Rooms, Body Part Injured by Age of Victim

| Body Part | Age of Victim | | |
|---|---|---|---|
| | Total | < 5 Years | 5 -14 Years |
| Total | 100% | 100% | 100% |
| | | | |
| Arm/Hand | 43% | 30% | 49% |
| Head/Face | 34% | 49% | 28% |
| Other | 23% | 21% | 23% |

Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10/31/99
U.S. Consumer Product Safety Commission/EPHA

Overall, fractures were the most commonly reported injury, accounting for 39 percent of the total (Table 4). Lacerations, contusions/abrasions, and strains/sprains were the next largest categories, with 22, 20, and 11 percent of the injuries, respectively. By body part, over three-fourths (76 percent) of the injuries to the arm/hand area were fractures, primarily to the wrist, lower arm, and elbow (also, 78 percent of all injuries diagnosed as fractures involved the wrist, lower arm, and elbow). While 83 percent of the injuries to the head/face were lacerations, contusions, and abrasions, approximately 15 percent were more serious diagnoses—concussions, internal injuries, and fractures.

Approximately 3 percent of the victims were admitted to the hospital for further treatment. All of the hospitalized injuries resulted from falls, and almost all involved arm fractures that required surgery to repair. Most hospitalized cases occurred on equipment designed for public use.

Table 4.

Playground Equipment-Related Injuries Treated in U.S. Hospital Emergency Rooms,
Diagnosis by Body Part Injured

| Diagnosis | Body Part | | | |
|---|---|---|---|---|
| | Total | Arm/Hand | Head/Face | Other |
| Total | 100%[1] | 100% | 100% | 100% |
| | | | | |
| Fracture | 39% | 76% | <1% | 24% |
| Laceration | 22% | <1% | 60% | 6% |
| Contus./Abras. | 20% | 8% | 23% | 39% |
| Strain/Sprain | 11% | 11% | 0% | 29% |
| Concussion | 3% | 0% | 10% | 0% |
| Internal Injury | 2% | 0% | 5% | <1% |
| Other | 3% | 5% | 2% | <1% |

[1]Column detail may not add to total due to rounding.

Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10/31/99
U.S. Consumer Product Safety Commission/EPHA

## Types of Equipment

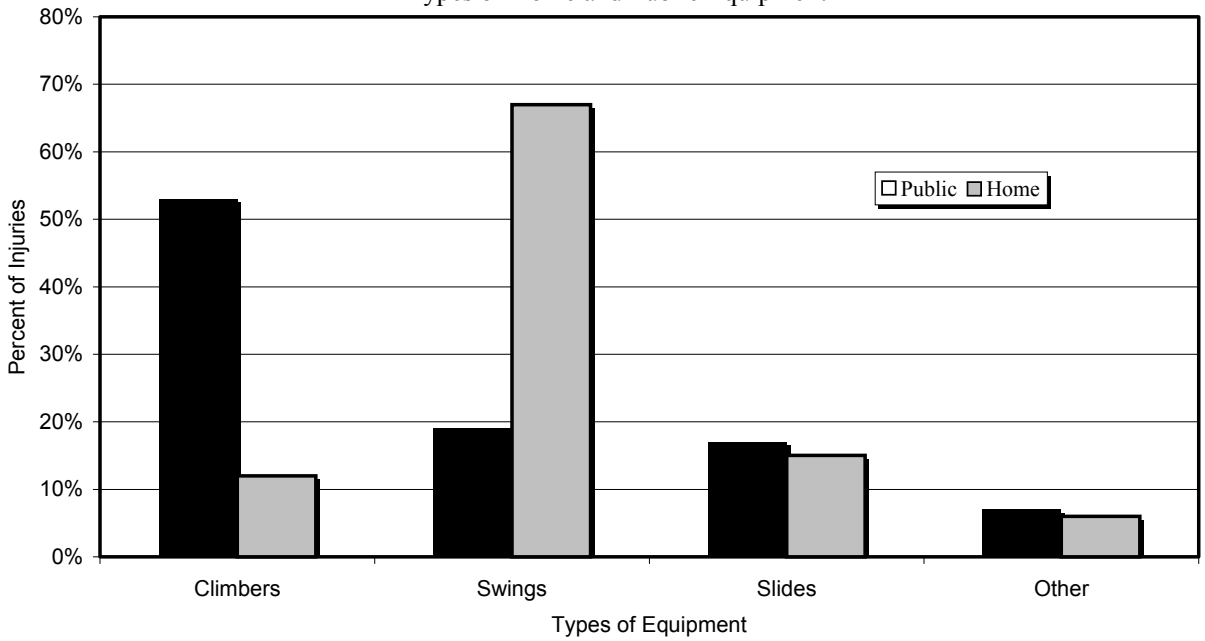
Because equipment designed for public use is often constructed and used differently than equipment designed for home use, these categories of equipment are discussed separately below.[4] Figure 1 illustrates how the percentages of injuries associated with home and public equipment differ by specific equipment type, particularly climbers and swings.

Appendix tables provide further information on the types of public equipment involved in injuries by hazard pattern (Table A1), the ages of victims injured on public equipment by hazard pattern (Table A2), and the ages of victims injured on public equipment by the type of equipment involved (Table A3). Appendix Tables A4 through A6 provide similar information for injuries involving home equipment.

[4] In about two-thirds of the cases involving both home and public playground equipment, the respondent did not witness the incident. Details about the incident, when provided, were supplied by the victim or others knowledgeable about the circumstances involved.

Figure 1.

Playground Equipment-Related Injuries Treated in U.S. Hospital Emergency Rooms,
Types of Home and Public Equipment



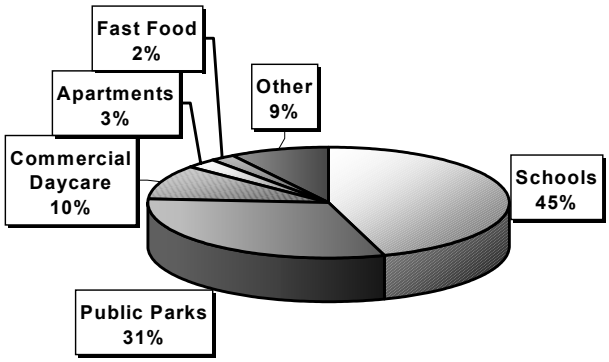

Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10/31/99
U.S. Consumer Product Safety Commission/EPHA

## Public Equipment

**Location and Type.** About 45 percent of the injuries involving public equipment occurred in schools, followed by about 31 percent in public parks (Figure 2). Injuries on public equipment also occurred in commercial daycare settings (10 percent), apartment complexes (3 percent), fast food restaurants (2 percent), and other locations (9 percent).

**Figure 2.**

**Playground Equipment-Related Injuries Treated in U.S. Hospital Emergency Rooms, Location of Incidents Involving Public Equipment**




Source: National Electronic Injury Surveillance System (NEISS), 11/1/98-10/31/99
U.S. Consumer Product Safety Commission/EPHA

About one-half (53 percent) of the injuries involving public equipment occurred on climbers. Swings and slides were involved in about 19 and 17 percent of the injuries, respectively. See-saws accounted for about three percent of the injuries, and merry-go-rounds, about one percent. Other types of equipment, such as sandboxes, trapeze bars, ball pits, track rides, etc., were involved in about seven percent of the injuries (Table A1).

In one-fourth (25 percent) of the cases involving climbers, the specific type of structure involved in the injury was not reported. Where reported, however, about 60 percent of the injuries on climbers occurred on "horizontal ladders." These were designed in various configurations, from a straight-ladder style to variations of curved or serpentine. An additional 6 percent of the climbers involved "hand-over-hand" style overhead rings or triangles, and 2 percent of the climbers involved arch climbers. Thus, over two-thirds (68 percent) of the injuries on climbers involved overhead equipment.

Where reported, over 40 percent of the injuries that occurred on public equipment involved multi-use structures. An additional two percent of the injuries involved soft contained equipment, which could also be classified in the category of multi-use equipment or structures. About 35 percent of the injuries that occurred in schools involved multi-use structures, and about 46 percent of the injuries that occurred in public parks involved multi-use structures. In other locations, about 47 percent of the injuries occurred on multi-use structures. However, while multi-use structures were associated with a substantial portion of the injuries reported through this study, the multi-use aspects of the equipment (e.g., overlapping use zones, multiple users, etc.) didn't appear to contribute to the injuries that occurred.

**Age, Materials, and Condition.** In about one-half (47 percent) of the incidents on public playground equipment, the age of the equipment was not known, although much of the equipment appeared to be older styles (e.g., "stand-alone" metal equipment), based on the descriptions provided. In the remaining cases, the equipment ranged in age from newly installed to 40 years. About one-third (36 percent) of the equipment of known age was reported to have been less than 5 years old, and over one-half (56 percent) was less than 10 years old. However, about one-fourth (24 percent) of the equipment was reported to be 20 years or older. In schools, about one-third of the equipment (32 percent) was reported to be 20 years or older, as compared to 14 percent for public parks, and 17 percent for other locations. In the majority of cases, the respondents did not know if the equipment was purchased new or used.

Almost one-half (48 percent) of the public equipment was constructed primarily of metal. An additional 19 percent of the incidents involved plastic/metal equipment, and 12 percent of the incidents involved wood/metal equipment. The remaining 21 percent of the incidents involved equipment constructed of wood, plastic, or various combinations of materials such as wood, plastic, metal, and rope. Where equipment materials and age were both reported, about 22 percent of the all-metal structures were less than 10 years old, while about 85 percent of the structures that were made of other materials or combinations of materials were less than 10 years old.

Three-fourths (74 percent) of the public equipment was reported to be in "good" condition and an additional 17 percent was reported to be in "fair" condition. Other equipment was described to be rusted, broken, scarred, or abused. In the majority of cases, it was not known whether the equipment had been repaired or changed prior to the incident.

## Home Equipment

**Location and Type.** All of the injuries involving home equipment occurred in or around private homes. About three percent occurred in home daycare settings.

Over two-thirds (67 percent) of all injuries involving home equipment occurred on swings, followed by slides, with 15 percent of the injuries, and climbers, with 12 percent of the injuries. Other types of equipment, such as trapeze bars, teeter-totters, and the roof of the playhouse portion of a multi-use structure, were associated with about six percent of the injuries (Table A4). Unlike public equipment, few of the injuries involving climbers were reported to have involved overhead ladders.

About 30 percent of the injuries that occurred on home equipment involved multi-use structures. For this analysis, a traditional-style swing set was not considered a multi-use structure. As with public equipment, the multi-use aspects of the equipment didn't appear to contribute to the injuries that occurred.

**Age, Materials, and Condition.** In about 17 percent of the incidents on home playground equipment, the age of the equipment was not known. In the remaining cases,

the equipment ranged in age from new to about 20 years. Based on the information reported, home equipment appeared to be newer than that found on public playgrounds. About 72 percent of the equipment was reported to be under 5 years old, and 88 percent was reported to be less than 10 years old. Corresponding figures for public playground equipment were 36 percent and 56 percent, respectively.

Almost one-third (30 percent) of the home equipment was reported to be constructed of combinations of plastic and metal, about 23 percent was reported to be constructed primarily of metal, and about 18 percent was reported to be primarily constructed of wood. The remaining 29 percent of the equipment was reported to be made primarily of plastic or combinations of metal, wood, plastic, and rope.

Over two-thirds (69 percent) of the home equipment was reported to be in "good" condition and an additional 24 percent was reported to be in "fair" condition. A few items of equipment were reported to be rusted or broken. In about 14 percent of the cases, the equipment was said to have been repaired, painted, or had parts replaced.

## Hazard Patterns

### Public Equipment

Injuries to preschool-age children (under 5 years) most often involved climbers (40 percent) and slides (33 percent). Injuries to school-age children (5 and older) most frequently involved climbers (56 percent) and swings (24 percent) (Table A3). Hazard patterns did not vary substantially by age (Table A2).

**Falls.** Overall, about 79 percent of the injuries that occurred on public equipment involved falls (Table A2). Specifically, 68 percent of the injuries involved falls to the surface below the equipment, 10 percent involved falls to other parts of the same equipment, and 1 percent involved falls to unidentified surfaces.

Fall-related injuries were most prevalent on climbers, accounting for 86 percent of the total injuries on these products (Table A1). About 80 percent of the injuries associated with swings involved falls, about 69 percent of the injuries associated with slides involved falls, and about 59 percent of the injuries associated with other types of equipment (i.e., see-saws, merry-go-rounds, and other combined) involved falls.

Falls to other parts of the same equipment were reported to have occurred most often on climbers, and usually involved falls to steps or rungs of ladders, horizontal climbing bars, or vertical support poles (Table A1).

On public equipment, 17 percent of the injuries involving falls to the surface occurred from heights of 30 inches or less, 47 percent occurred from heights of 48 inches or less, and 78 percent from heights of 72 inches or less.[5] Virtually all (99.6 percent) of the injuries involving falls to the surface occurred from distances of less than 10 feet. Fall heights from climbers tended to be greater than fall heights from other equipment, in that 67 percent of the falls from climbers were greater than 48 inches, as compared to 37 percent for other equipment.

The most frequently reported cause of falls, accounting for 40 percent of all fall-related injuries on public equipment, was the child losing his or her grip (primarily on climbing bars or swing chains). Other frequently reported causes included the victim's feet slipping or tripping (16 percent; most often on slides), the victim jumping or dismounting intentionally (14 percent; most often on swings), or the victim losing his or her balance (10 percent; most often on slides). Less often, victims bumped into or were pushed by another person or reached for a part of the equipment and missed.

**Impact.** About eight percent of the injuries involved impact with stationary equipment, such as when a child ran into a playground structure (Table A1). About three percent of the injuries involved impact with moving equipment, such as a swing.

**Other.** About 10 percent of the injuries involved other or unspecified hazard patterns (Table A1). Where reported, these injuries generally resulted from contact with hardware, pinch points, sharp edges, etc.

Over two thirds (67 percent) of those injured on public playground equipment had used the equipment on a daily or weekly basis. About eight percent had never used the equipment previously.

On public equipment, about 17 percent of the injuries occurred in the morning (6:00 am – 11:59 am), 42 percent occurred in the early afternoon (12:00 pm – 2:59 pm), 27 percent occurred in mid- to late-afternoon (3:00 pm – 5:59 pm), 13 percent occurred in the evening (6:00 pm – 8:59 pm), and less than 1 percent occurred at night (9:00 pm – 5:59 am). By location, almost 80 percent of the injuries in school settings occurred before 3:00 pm, hours when some form of playground supervision would most likely be present. In parks, about 37 percent of the injuries occurred before 3:00 pm.

Overall, about one-fourth (26 percent) of the incidents on public playground equipment involved other children. In school settings, about 28 percent of the incidents involved other children, as compared to 19 percent in public parks. For incidents involving other children, about one-fourth (24 percent) occurred on playgrounds having 15 or more children present. Most often, these were school playgrounds.

[5] Recommendations in the CPSC Handbook for Public Playground Safety and the ASTM voluntary standard for public playground equipment (ASTM F 1487) are for a protective barrier for preschool-age children and a guardrail or barrier for school-age children on platforms exceeding 30 inches in height, and a barrier on platforms exceeding 48 inches in height.

Where reported, about one-third (34 percent) of the public playgrounds had separate play areas for different age groups. Similar proportions were found for schools and public parks. Signage about appropriate ages or use of the equipment was generally not present on public playgrounds.

In almost 80 percent of the cases involving public equipment, it was not known if there were any regular maintenance or inspection programs in place. However, where it was reported, the majority of playgrounds were inspected on a fixed schedule and repairs were made as needed.

## Home Equipment

The types of equipment and hazard patterns involved did not vary substantially by age of victim on home equipment (Tables A6 and A5).

**Falls.** Falls were associated with 81 percent of the injuries associated with home playground equipment (Table A4). Specifically, 69 percent involved falls to the surface below the equipment, 10 percent involved falls to other parts of the same equipment, and 2 percent involved falls to an unknown surface.

All of the injuries associated with home climbers involved falls, whereas about 80 percent of the injuries on slides and swings involved falls.

Falls to other parts of the same structure occurred most often when children fell on slide chutes, platforms, and support beams when climbing up a slide backwards. Other scenarios included cases of children falling on ladders or railings of climbers, or falling on the footrest of a glider swing.

On home equipment, 31 percent of the injuries involving falls to the surface occurred from heights of 30 inches or less, 79 percent occurred from heights of 48 inches or less, and 93 percent from heights of 72 inches or less. Almost all (98.7 percent) of the injuries involving falls to the surface occurred from distances of less than 7 feet.

The most frequently reported cause of falls was when victims were jumping or dismounting intentionally from equipment (35 percent, primarily from swings). Other causes included victims losing their grip (primarily on components of climbers), losing their balance (primarily on swings), slipping or tripping (primarily on slides), bumping into or being pushed by another person, reaching for an equipment component and missing, and playing on equipment that broke during the incident.

**Impact.** Incidents involving impact with moving equipment were associated with about six percent of the incidents. Injuries usually resulted from children being hit by a moving swing (Table A4).

**Other.** About 13 percent of the injuries on home equipment involved other or unspecified hazard patterns (Table A4). Where reported, these involved such scenarios

as contacting a nearby metal fence while swinging, getting a foot caught in the floor slats of a bench-type glider swing, contacting a protruding bolt on a glider swing, and having a wrist bent back while trying to slow down on a slide. Preschool-age children tended to have a higher proportion of these types of injuries than older children (Table A5).

About 77 percent of those injured on home equipment used the equipment on a daily or weekly basis. Less than three percent had never used the equipment before.

On home equipment, about 17 percent of the injuries occurred in the morning (6:00 am—11:59 am), 16 percent occurred in the early afternoon (12:00 pm—2:59 pm). Almost one-half (46 percent) of the incidents occurred in mid- to late-afternoon (3:00 pm—5:59 pm), and 21 percent occurred in the evening.

About 20 percent of the incidents on home playground equipment involved other children. In the majority of these cases (75 percent), there were three or fewer children present.

## Playground Surfacing

Because severe head injuries from falls have the potential for serious long-term consequences or even death, improving the safety of playground surfaces has become an important issue. ASTM test methods to evaluate the suitability of surfacing materials have been based on specific head injury criteria, and CPSC recommendations on appropriate surfacing have been based on the results of these tests.

In locations where public equipment was installed, almost 80 percent had protective surfacing under the equipment, most often bark mulch or wood chips (Table 5). By location, about 74 percent of schools had protective surfacing, as compared to 86 percent for parks, 96 percent for commercial daycare, and 70 percent for other locations. In contrast, only about nine percent of home locations had protective surfacing, most often sand. Dirt and grass were, by far, the most prevalent surfaces present under home playground equipment. Figure 3 illustrates the differences in surfacing types under home and public equipment.

Table 5.

Playground Equipment-Related Injuries Treated in U.S. Hospital Emergency Rooms, Surfacing Type by Home or Public Equipment

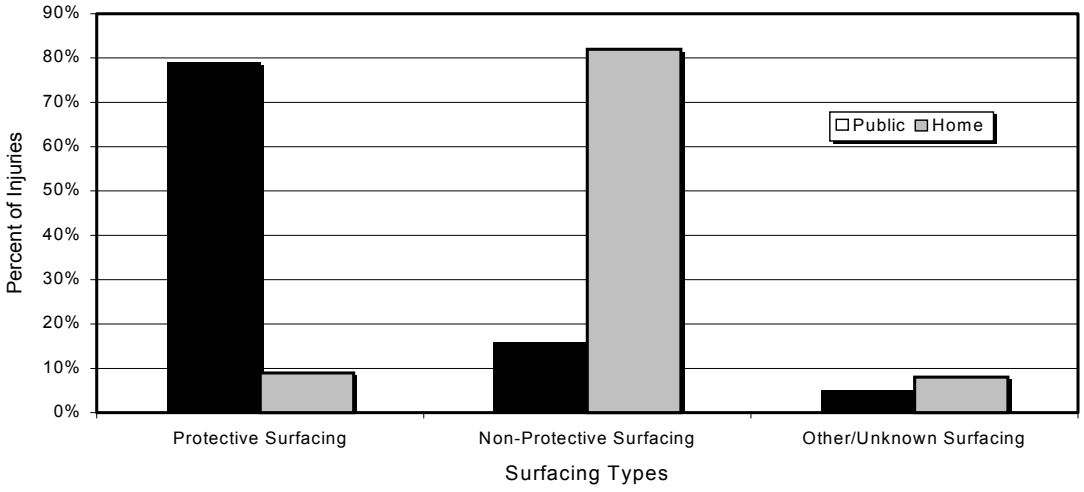
| Surfacing Type | Public Equipment | Home Equipment |
|---|---|---|
| **Total** | **100%**[1] | **100%** |
| **Protective Surfacing** | **79%** | **9%** |
| Bark Mulch/Wood Chips | (30%) | ( 2%) |
| Sand | (23%) | ( 7%) |
| Mats/Poured Resilient Surfaces | (14%) | ( 0%) |
| Gravel | ( 8%) | ( 0%) |
| Shredded Tires | ( 4%) | ( 0%) |
| **Non-Protective Surfacing** | **16%** | **82%** |
| Dirt/Grass | (14%) | (82%) |
| Concrete/Asphalt | ( 2%) | (<1%) |
| **Other/Unknown Surfacing** | **5%** | **8%** |

[1] Column detail may not add to total due to rounding.

Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10/31/99
U.S. Consumer Product Safety Commission/EPHA

Figure 3.

Playground Equipment-Related Injuries Treated in U.S. Hospital Emergency Rooms, Surfacing Type by Home or Public Playground Equipment




Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10/31/99
U.S. Consumer Product Safety Commission/EPHA

As noted above, protective playground surfaces are primarily intended to address the risk of serious head injury. Assuming that serious head injuries would include diagnoses of fracture, concussion, and internal organ injury, then serious injuries to the head/face were associated with about five percent of all surface fall-related injuries in this study (Table 6). Thus, small sample sizes precluded the possibility of drawing firm conclusions about the relative severity of fall injuries onto protective versus non-protective surfaces, as well as the contribution of fall heights. However, the few cases that did involve serious head injuries usually occurred on non-protective surfaces or on protective surfaces of insufficient depths (e.g., 1-2 inches) to prevent serious injury.

Table 6.

Playground Equipment-Related Injuries Treated in U.S. Hospital Emergency Rooms, Body Part/Severity by Surface Type

| Body Part/ Severity | Surface Type | | | |
|---|---|---|---|---|
| | Total | Protective | Non-Protective | Other/ Unknown |
| Total | 100%[1] | 100% | 100% | 100% |
| More severe | (59%) | (59%) | (64%) | (18%) |
| Less severe | (41%) | (41%) | (36%) | (82%) |
| | | | | |
| Head/face | 21% | 22% | 20% | 24% |
| More severe | (5%) | (6%) | (5%) | (0%) |
| Less severe | (16%) | (16%) | (15%) | (24%) |
| | | | | |
| Arm/hand | 57% | 53% | 68% | 19% |
| More severe | (47%) | (46%) | (51%) | (18%) |
| Less severe | (10%) | (6%) | (17%) | (2%) |
| | | | | |
| Other | 22% | 25% | 12% | 57% |
| More severe | (7%) | (7%) | (7%) | (0%) |
| Less severe | (15%) | (18%) | (4%) | (57%) |

[1] Column detail may not add to total due to rounding.

Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10/31/99
U.S. Consumer Product Safety Commission/EPHA

With regard to the effect of different protective surfaces on fall injuries in general, higher proportions of arm/hand injuries occurred on non-protective surfaces than on protective surfaces. However, differences in the severity of injury among specific types of surfaces (e.g., loose fill versus resilient mats and poured surfaces) could not be evaluated due to small sample size.

## Other

### Weather

In most instances, weather conditions did not appear to contribute to the incidents involving either public or home playground equipment. In a few cases, it was reported that the weather was hot, and that the victim lost his or her grip on the bars of overhead climbers due to sweaty palms. In a few other cases, it was reported that the victim slipped on the wet step, platform, or chute of a slide.

### Disabilities

Disabilities were not reported to be present in most incidents involving either home or public equipment.

## DEATHS

A review of the Commission's data files for January 1, 1990 to August 1, 2000 revealed 147 deaths associated with playground equipment.[6] These deaths do not constitute a statistical sample of known probability of selection, nor do they include all playground equipment-related deaths. They do, however, provide a minimum figure for deaths associated with playground equipment that occurred during that time period. These incidents also provide data about the circumstances surrounding playground fatalities.

## Victim Age

Of the 147 deaths, almost one-third (31 percent) involved children younger than five years, and 79 percent involved children younger than ten (Table 7).

Table 7.

Playground Equipment-Related Fatalities,
Age Group by Number and Percent of Deaths

| Age of Victim | Deaths | |
|---|---|---|
| | Number | Percent |
| Total | 147 | 100% |
| < 2 | 6 | 4% |
| 2 – 4 | 40 | 27% |
| 5 – 9 | 70 | 48% |
| 10 – 12 | 21 | 14% |
| 13 – 14 | 9 | 6% |
| Unknown | 1 | 1% |

Source: In-depth Investigation (INDP), Injury and Potential Injury Incident (IPII), Death Certificate (DTHS) and National Electronic Injury Surveillance System (NEISS) Data Files; 1/90 –8/00
U.S. Consumer Product Safety Commission/EPHA

## Location

Based on the available information, it was sometimes difficult to determine whether the playground equipment involved in fatal incidents was manufactured for

[6] The data files searched were the In-depth Investigation file (INDP), the Injury and Potential Injury Incident file (IPII), the Death Certificate file (DTHS) and the National Electronic Injury Surveillance System (NEISS).

home or for public use. For the purpose of this report, however, it was assumed that equipment found in home locations was designed primarily for home use and that equipment found in public locations (such as parks and schools) was designed primarily for public use. In the 128 cases for which location was specified, 90 incidents (70 percent) occurred in home locations and 38 (30 percent) occurred in public locations (Table 8). Home locations appeared to have a slightly greater proportion of pre-school age victims (34 percent) than public locations (26 percent).

Table 8.

Playground-Related Fatalities, Age of Victim by Location of Incident

| Age of Victim | Location | | | |
|---|---|---|---|---|
| | Total | Public | Home | Unknown |
| Total | 147 | 38 | 90 | 19 |
| 0-1 | 6 | 1 | 3 | 2 |
| 2-4 | 40 | 9 | 28 | 3 |
| 5-9 | 70 | 18 | 44 | 8 |
| 10-12 | 21 | 9 | 10 | 2 |
| 13-14 | 9 | 1 | 4 | 4 |
| Unknown | 1 | 0 | 1 | 0 |

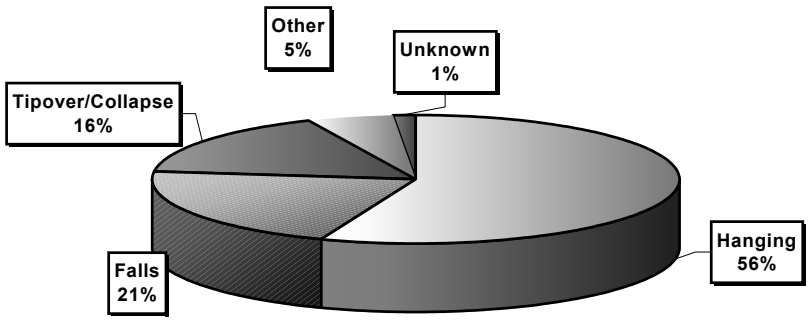
Source: In-depth Investigation (INDP), Injury and Potential Injury Incident (IPII), Death Certificate (DTHS) and National Electronic Injury Surveillance System (NEISS) Data Files; 1/90 –8/00 U.S. Consumer Product Safety Commission/EPHA

## Hazard Patterns

The fatal incidents were analyzed by hazard pattern rather than by type of equipment, since the specific type of equipment involved was not always identified. Where the type of equipment was reported, it is noted below. The top three hazard patterns associated with the 147 deaths were hanging (82 deaths), falls (31 deaths) and tipover or collapse of the equipment (24 deaths) (Figure 4). Other reported hazards, including entrapment and impact, were associated with eight deaths. Information on the circumstances involved in the death was not available in two cases.

**Figure 4.**

**Hazard Patterns Associated with Playground Equipment-Related Deaths**




Source: In-depth Investigation (INDP), Injury and Potential Injury Incident (IPII), Death Certificate (DTHS) and National Electronic Injury Surveillance System (NEISS) Data Files; 1/90 –8/00
U.S. Consumer Product Safety Commission/EPHA

## Hanging

The 82 deaths reported as hangings involved unintentional strangulation due to entanglement in items that were generally not designed to be part of the equipment (e.g., ropes, clothing drawstrings, etc.) or were homemade items (e.g., rope swings).

Most of the entanglements involved items tied to the equipment, tied around the child's neck, or both. Ropes, jump ropes, shoestrings, cords, sashes, and leashes were among the items involved in these types of incidents. Playground slides were most often involved, although climbing equipment and swing sets were also reported. One example of this scenario involved a child who strangled when a cord that had been tied to a slide platform became wrapped around his neck as he went down the tube slide. In another case, a girl strangled when a homemade dog leash around her neck became wedged between equipment components as she went down a slide. A third case involved a girl who became hanged while playing "puppy" with one end of a bathrobe sash tied around her neck and the other end to the top of the slide. A particularly unusual case involved a 5-year-old who had a sled rope around her neck while climbing the slide ladder. When she fell from the top platform, the sled caught on the railings, hanging her. These

incidents illustrate that children can be unaware of the inherent dangers of using the playground equipment in conjunction with objects that are not part of the structure.

An issue that has surfaced since children have started to wear bicycle helmets is the involvement of those helmets in fatal playground incidents. Among the deaths due to hanging were two incidents involving bicycle helmets. Although these incidents did not involve the typical entrapment scenario, they nevertheless indicated how these deaths have occurred. In one case, a 10-year-old male was found near the bottom of a tubular slide hanging from a bicycle inner tube tied to the back of the bike helmet he was wearing. In the second incident, a 6-year-old male was believed to have been balancing on his bicycle seat trying to untangle the rope of a trapeze bar from an overhead horizontal bar. The victim's helmet and head got caught between the trapeze bar/hand-hold assembly and the cord that suspends the trapeze. The helmet's chinstrap tightened around the victim's neck, cutting off his oxygen.

Clothing worn by the victims was involved in a number of incidents, including several with clothing drawstrings, as well as parts of coats, and a mitten string. In some cases, clothing caught on protruding bolts (on a homemade swing, slide, and gym set). In other cases, drawstrings caught on joints or openings on slides, and in one case, a swing set.

Another common hanging scenario involved rope, tire, or tree swings, many of which were identified as homemade. In most of these cases, the victim's neck was either caught or placed in a loop or the rope became entangled around the victim's neck.

Finally, there were a few incidents where the child was hung on components of playground equipment, such as swings and a rope climber. At least some of this equipment appeared to be manufactured products.

### Falls

In recent years, the Commission has purchased death certificates reporting falls from only one or two states (with the exception of 1991). Thus, deaths due to falls are under-reported in the Commission's data. Nevertheless, CPSC has received reports of 31 playground fall deaths since 1990. About three-fourths of these deaths involved a head injury. Swings, slides, and climbers were the primary types of equipment involved in fall deaths.

For most incidents involving swings, details about the scenario were not available. However, a few cases provided information about the circumstances involved. In one case, a child tried to do a back flip off of a swing and landed on her head. In another case, a child was seated on a swing that unhooked causing her to fall and sustain a closed head injury. In a third case, a child stood up on a swing and lost her balance, falling and striking her head on asphalt. For some of the deaths involving climbers, there were reports of the fall being caused by slipping or losing grip on components of the climber.

### Tipover/Collapse

In 24 incidents, children were fatally injured when playground equipment either tipped over or collapsed. In some cases, the equipment was not anchored to the ground or was not anchored properly. In other cases, the equipment broke or disengaged, hitting the victim. Swing sets were the type of equipment most frequently reported in these incidents. In 11 cases, the equipment was reported to be homemade, although in some cases, this information was not known.

### Entrapment

Of the 147 deaths, 3 resulted from a child's head or neck becoming entrapped in the equipment. One death occurred when a child became entrapped between the horizontal rungs of a ladder. The second case involved a child who became entrapped between the leg support and slide of home playground equipment. The third incident involved a child who was wearing a bicycle helmet that became wedged in a gap between two platforms.

### Impact

There were three fatalities that involved impact with a moving component of playground equipment. All involved a head injury. The deaths involved being struck by a rotating passenger compartment; an animal swing, and a homemade swing.

### Other/Unknown

Four deaths were included in this category. In one case, a 13-year-old boy was lying in a ball pit at a pay-for-play establishment and other teenagers who went down a slide landed on top of him. In another case, a child died from aspiration of gravel from a school playground. In two cases, details about the circumstances involved in the death were not available.

## 1988 PLAYGROUND STUDY

Comparison of the findings from the current study to those from a 1988 CPSC study of playground hazards[1] revealed a few notable similarities and differences. Population-based rates of injury for both time periods were comparable.

Public equipment continues to be associated with the greatest proportion of injuries, 76 percent in the current study as compared to 70 percent in 1988. Locations in which these injuries occurred, however, appear to have shifted somewhat. In the current study, about 45 percent of the injuries involving public equipment occurred in schools, 31 percent occurred in public parks, and 24 percent occurred in other locations. In 1988, however, about 42 percent of the injuries occurred both in schools and in public parks, and 16 percent occurred in other locations.

During both time periods, climbers accounted for the greatest proportion of injuries on public equipment (Table 9). The proportion of injuries involving climbers in public locations increased from 32 percent in 1988 to 53 percent in the current study. The proportions of injuries associated with slides, swings, and other public equipment declined somewhat. On home equipment, swings and swing sets continued to be associated with the greatest proportion of injuries.

Table 9.

Playground Equipment-Related Injuries Treated in U.S. Hospital Emergency Rooms, Home & Public Equipment /Hazard Patterns from 1988 & 1999/2000 CPSC Studies

| Equipment & Hazard Pattern | 1988 Study | | 1998/1999 Study | |
|---|---|---|---|---|
| | Home | Public | Home | Public |
| Total | 100%[1] | 100% | 100% | 100% |
| | | | | |
| Climbers | 31% | 32% | 12% | 53% |
| Slides | 4% | 29% | 15% | 17% |
| Swings | 60% | 26% | 67% | 19% |
| Other | 5% | 13% | 6% | 11% |
| | | | | |
| Falls | 73% | 74% | 81% | 79% |
| Impact | 22% | 18% | 6% | 11% |
| Other | 6% | 7% | 13% | 10% |

[1] Column detail may not add to total due to rounding.

Source: National Electronic Injury Surveillance System (NEISS),
4/1/88-12/31/88, 11/1/98 – 10/31/99
U.S. Consumer Product Safety Commission/EPHA

In the current study, substantial proportions of the injuries occurred on multi-use structures, about 30 percent of the injuries on home equipment and about 40 percent of the injuries that occurred on public equipment. Information on the specific proportions of home and public multi-use structures was not presented in the 1988 study, although these structures were less common at that time. For both time periods, however, the multi-use aspects of the equipment did not appear to be causal factors in the injuries that occurred.

Falls accounted for about 81 percent of the injuries on home equipment and 79 percent of the injuries on public equipment, in the current study (Table 9). In 1988, falls accounted for 73 and 74 percent of the injuries on home and public equipment, respectively. It is possible that the increased proportion of injuries attributable to falls in recent years may actually be a reflection of a reduction of other hazards such as impact with moving or stationary equipment; contact with hardware, pinch points, sharp edges; etc.

In the current study, about 79 percent of the equipment in public locations was installed over protective surfacing. In 1988, only about 36 percent of the surfaces under public equipment were protective. During both time periods, the surfacing under home equipment was predominantly dirt or grass. It is encouraging that the proportion of public playgrounds having protective surfacing appears to have increased in recent years.

Since the 1988 study, deaths from swing impact appear to have almost disappeared. Strangulation due to entanglement on ropes, shoestrings, cords, leashes, clothing strings, and similar items continues to be the most common scenario involved in fatal playground incidents. The majority of fall-related deaths continue to be related to head injury, although generally not on recommended surfaces.

Reasons for the differences between the two time periods may be related to changes in exposure (e.g., increased use of after-school programs, commercial daycare, etc.); improved construction and materials (e.g., fewer sharp edges, protruding hardware components, heavy swings, etc); changes in equipment types (e.g., more multi-use structures, fewer swings and merry-go-rounds, etc.); and increased recognition of hazards (importance of protective surfaces, improved layout, etc.).

# IV. CONCLUSIONS AND RECOMMENDATIONS

Fall-related injuries continue to account for more injuries on playground equipment than any other hazard scenario. Reported fall-related deaths most often involved head injury. Actions taken to address severe head injuries from falls include the development of the CPSC Handbook for Public Playground Safety, which includes guidelines on protective surfacing, and an ASTM safety standard, which provides a test method to evaluate the impact attenuation of playground surfaces. While serious head injuries (i.e., fractures, concussions, and internal injuries) accounted for only a small portion of the fall-related injuries in this study, adequate protective surfaces were not present in most of the serious cases. Particularly since death may occur, the installation and maintenance of appropriate protective surfaces are important in reducing the risk of severe head injury. It is encouraging that the proportion of public playgrounds having protective surfacing has increased in recent years. However, home equipment continues to be installed over dirt and grass, surfaces which do not offer much protection against serious head injuries.

CPSC developed the recommendations for protective surfacing on playgrounds to address the risk of serious head injury. The effectiveness of various safety surfaces in reducing the frequency and severity of other fall-related injuries is not known, and may be an area for future research. Fractures of the hand and arm, particularly the wrist, lower arm, and elbow, were the most common injuries treated in hospital emergency rooms during the special study time period. While generally not life-threatening, these injuries can nevertheless be debilitating and may have long-term consequences. Most of the hospitalized injuries involved serious fall-related fractures of the hand and arm.

A number of recommendations in the CPSC Handbook and the ASTM standards address fall hazards through modification of the equipment, such as with guardrails and barriers. However, for specific equipment types, additional consideration may need to be given to the ages and skill levels of the intended users. For climbers especially, fall-related injuries were common, particularly with overhead equipment such as horizontal ladders. While four-year-olds are generally the youngest children capable of using upper body equipment, perhaps some equipment configurations are difficult even for older children to negotiate successfully.

With regard to playground equipment-related deaths, hanging and fall-related deaths continue to be the most common hazard scenarios. While installation and maintenance of appropriate protective surfacing and certain equipment modifications may address most of the fatal fall incidents, hanging deaths remain problematic. Voluntary ASTM standards and CPSC guidelines for playground equipment and children's clothing drawstrings have addressed some aspects of clothing entanglement.[6, 7, 8, 11, 12] However, children have also become entangled in other items that were not designed to be part of the equipment (e.g., ropes, cords, leashes, etc.) or were homemade (e.g., rope swings). To consumers, this may be a "hidden hazard."

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# APPENDIX

Table A1. Injuries Associated with Public Playground Equipment,
Type of Equipment by Hazard Pattern

| Type of Equipment | Hazard Pattern | | | | | | |
|---|---|---|---|---|---|---|---|
| | Total | Falls to Surface | Falls to Equipment | Falls to Unk Surface | Impact, Moving Equipment | Impact, Stationary Equipment | Other, Unknown |
| Total | 100%[1,2] (100%)[3] | 100% (68%) | 100% (10%) | 100% (1%) | 100% (3%) | 100% (8%) | 100% (10%) |
| Climbers | 53% (100%) | 55% (70%) | 77% (14%) | 68% (2%) | 0% (0%) | 58% (9%) | 29% (5%) |
| Swings | 19% (100%) | 21% (76%) | 5% (3%) | 21% (1%) | 69% (12%) | 4% (2%) | 11% (5%) |
| Slides | 17% (100%) | 16% (65%) | 6% (4%) | 6% (<1%) | 0% (0%) | 10% (5%) | 45% (26%) |
| See-Saws | 3% (100%) | 2% (48%) | 0% (0%) | 0% (0%) | 27% (27%) | 10% (23%) | <1% (2%) |
| Merry-Go-Rounds | 1% (100%) | <1% (31%) | 2% (19%) | 0% (0%) | 0% (0%) | 0% (0%) | 5% (50%) |
| Other | 7% (100%) | 5% (52%) | 9% (13%) | 5% (1%) | 4% (2%) | 18% (20%) | 9% (12%) |

[1] Detail may not add to total due to independent rounding.
[2] Upper percents sum vertically.
[3] Lower percents sum horizontally.

Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10 /31/99
U.S. Consumer Product Safety Commission/EPHA

Table A2. Injuries Associated with Public Playground Equipment,
Age of Victim by Hazard Pattern

| Age of Victim (Years) | Hazard Pattern | | | | | | |
|---|---|---|---|---|---|---|---|
| | Total | Falls to Surface | Falls to Equipment | Falls to Unk Surface | Impact, Moving Equipment | Impact, Stationary Equipment | Other, Unknown |
| Total | 100%[1,2] (100%)[3] | 100% (68%) | 100% (10%) | 100% (1%) | 100% (3%) | 100% (8%) | 100% (10%) |
| < 2 | 3% (100%) | 2% (48%) | 2% (7%) | 0% (0%) | 2% (2%) | 0% (0%) | 14% (43%) |
| 2 – 4 | 24% (100%) | 21% (63%) | 30% (13%) | 16% (<1%) | 7% (1%) | 23% (8%) | 41% (15%) |
| 5 – 9 | 55% (100%) | 61% (74%) | 57% (10%) | 10% (<1%) | 36% (2%) | 59% (9%) | 20% (5%) |
| 10 – 12 | 15% (100%) | 16% (70%) | 11% (7%) | 6% (<1%) | 7% (2%) | 10% (5%) | 26% (15%) |
| 13 – 14 | 3% (100%) | 0% (0%) | 0% (0%) | 68% (27%) | 47% (52%) | 8% (22%) | 0% (0%) |

[1] Detail may not add to total due to independent rounding.
[2] Upper percents sum vertically.
[3] Lower percents sum horizontally.

Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10 /31/99
U.S. Consumer Product Safety Commission/EPHA

Table A3. Injuries Associated with Public Playground Equipment,
Age of Victim by Type of Equipment

| Age of Victim (Years) | Type of Equipment | | | | | | |
|---|---|---|---|---|---|---|---|
| | Total | Climbers | Swings | Slides | See-Saws | Merry-Go-Rounds | Other |
| Total | 100%[1,2] (100%)[3] | 100% (53%) | 100% (19%) | 100% (17%) | 100% (3%) | 100% (1%) | 100% (7%) |
| < 2 | 3% (100%) | 0% (0%) | 2% (10%) | 11% (64%) | 4% (4%) | 63% (21%) | 0% (0%) |
| 2 – 4 | 24% (100%) | 21% (45%) | 8% (6%) | 40% (29%) | 0% (0%) | 25% (1%) | 58% (19%) |
| 5 – 9 | 55% (100%) | 65% (60%) | 53% (18%) | 42% (13%) | 66% (4%) | 12% (<1%) | 29% (4%) |
| 10 – 12 | 15% (100%) | 12% (41%) | 30% (38%) | 7% (8%) | 31% (7%) | 0% (0%) | 13% (7%) |
| 13 – 14 | 3% (100%) | 3% (48%) | 8% (52%) | 0% (0%) | 0% (0%) | 0% (0%) | 0% (0%) |

[1] Detail may not add to total due to independent rounding.
[2] Upper percents sum vertically.
[3] Lower percents sum horizontally.

Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10 /31/99
U.S. Consumer Product Safety Commission/EPHA

Table A4. Injuries Associated with Home Playground Equipment,
Type of Equipment by Hazard Pattern

| Type of Equipment | Hazard Pattern | | | | | |
|---|---|---|---|---|---|---|
| | Total | Falls to Surface | Falls to Equipment | Falls to Unk Surface | Impact, Moving Equipment | Other, Unknown |
| Total | 100%[1,2] (100%)[3] | 100% (69%) | 100% (10%) | 100% (2%) | 100% (6%) | 100% (13%) |
| Climbers | 12% (100%) | 12% (66%) | 41% (34%) | 0% (0%) | 0% (0%) | 0% (0%) |
| Slides | 15% (100%) | 13% (62%) | 30% (20%) | 0% (0%) | 0% (0%) | 26% (18%) |
| Swings | 67% (100%) | 71% (73%) | 2% (<1%) | 100% (3%) | 100% (9%) | 74% (14%) |
| Other | 6% (100%) | 5% (54%) | 27% (46%) | 0% (0%) | 0% (0%) | 0% (0%) |

[1] Detail may not add to total due to independent rounding.
[2] Upper percents sum vertically.
[3] Lower percents sum horizontally.

Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10 /31/99
U.S. Consumer Product Safety Commission/EPHA

Table A5. Injuries Associated with Home Playground Equipment,
Age of Victim by Hazard Pattern

| Age of Victim (Years) | Hazard Pattern | | | | | |
|---|---|---|---|---|---|---|
| | Total | Falls to Surface | Falls to Equipment | Falls to Unk Surface | Impact, Moving Equipment | Other, Unknown |
| Total | 100%[1,2] (100%)[3] | 100% (69%) | 100% (10%) | 100% (2%) | 100% (6%) | 100% (13%) |
| < 2 | 5% (100%) | 3% (46%) | 0% (0%) | 0% (0%) | 7% (8%) | 17% (46%) |
| 2 – 4 | 37% (100%) | 36% (68%) | 35% (10%) | 0% (0%) | 47% (7%) | 45% (16%) |
| 5 – 9 | 57% (100%) | 59% (72%) | 65% (11%) | 100% (4%) | 46% (5%) | 33% (8%) |
| 10 – 12 | 1% (100%) | 2% (100%) | 0% (0%) | 0% (0%) | 0% (0%) | 0% (0%) |
| 13 – 14 | <1% (100%) | 0% (0%) | 0% (0%) | 0% (0%) | 0% (0%) | 5% (100%) |

[1] Detail may not add to total due to independent rounding.
[2] Upper percents sum vertically.
[3] Lower percents sum horizontally.

Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10 /31/99
U.S. Consumer Product Safety Commission/EPHA

Table A6. Injuries Associated with Home Playground Equipment,
Age of Victim by Type of Equipment

| Age of Victim (Years) | Type of Equipment | | | | |
|---|---|---|---|---|---|
| | Total | Climbers | Slides | Swings | Other |
| Total | 100%[1,2] (100%)[3] | 100% (12%) | 100% (15%) | 100% (67%) | 100% (6%) |
| < 2 | 5% (100%) | 5% (13%) | 7% (23%) | 4% (63%) | 0% (0%) |
| 2 – 4 | 37% (100%) | 34% (11%) | 38% (15%) | 36% (65%) | 54% (8%) |
| 5 – 9 | 57% (100%) | 60% (13%) | 51% (14%) | 58% (69%) | 46% (5%) |
| 10 – 12 | 1% (100%) | 0% (0%) | 0% (0%) | 2% (100%) | 0% (0%) |
| 13 – 14 | 1% (100%) | 0% (0%) | 4% (100%) | 0% (0%) | 0% (0%) |

[1] Detail may not add to total due to independent rounding.
[2] Upper percents sum vertically.
[3] Lower percents sum horizontally.

Source: National Electronic Injury Surveillance System (NEISS), 11/1/98 – 10 /31/99
U.S. Consumer Product Safety Commission/EPHA