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ABSTRACT

This report provides an overview of public playground equipment injuries, identifies risks associated with different types of equipment and surfaces, and examines the possible effects of approaches to reducing these injuries. Findings include the following: (1) falls are the most common type of playground equipment accident, (2) the proportion of all injuries which involved each of the major types of playground equipment (swings, slides, climbers, etc.) is roughly equivalent to the proportion of all playground equipment represented by each major type, (3) falls to paved surfaces account for a disproportionately high number of injuries and severe injuries relative to the amount of paved surfacing in use, (4) about five percent of total accidents involve either malfunctioning or broken equipment, (5) equipment modifications might have reduced injuries by 55,000 in a one year period, and (6) equipment spacing and playground layout and design may account for as many as 8,300 injuries. In this study, analyses by hazard pattern and by type of equipment were conducted. Study results for location, equipment condition and material as well as deaths related to public playground equipment are reported. Data tables, an analysis of technical requirements submitted by the National Bureau of Standards, study methodology, and a list of 293 special study cases are appended. (Author/RH)

# HIA HAZARD ANALYSIS

# INJURIES ASSOCIATED WITH PUBLIC PLAYGROUND EQUIPMENT

George W. Rutherford, Jr.

August 1979



U.S. CONSUMER PRODUCT SAFETY COMMISSION
Directorate for Hazard Identification and Analysis - Epidemiology

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HIA DATA SUMMERIES contain brief descriptions of cases found to be relevant to specific hazard patterns. Cases included are from in-depth investigations of NEISS and other sources such as mortality reports, consumer complaints, and newspapers.

HIA HAZARD ANALYSIS REPORTS contain comprehensive analyses of all available epidemiological data pertaining to specific products or product areas. Data from the National Electronic Injury Surveillance System (NEISS) as well as information contained within the Death Certificate File, Injury Surveillance Desk data base, and non-CPSC data sources are utilized. Generally, data summaries are included as appendices to these reports.

HIZ SPECIAL REPORTS contain the results of specific surveys, and responsesment in accidents.

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## Contents

## Executive Summary

Injuries associated with public playground equipment resulted in an estimated 93,000 emergency room visits in 1977. The staff of the U.S. Consumer Product Safety Commission (CPSC) and the Product Safety Division of the National Bureau of Standards (NBS) have been working toward the goal of developing a workable, supportable set of technical requirements for public playground equipment.

This report attempts to provide an overview of public playground equipment injuries, to identify risks associated with different types of equipment and surfaces, and to examine the possible effects of approaches to reducing these injuries.

Analysis of public playground equipment related injuries revealed the following information:

- Falls are the most common type of playground equipment accident. Seventy-two percent (66,000) of public playground equipment related injuries resulted from falls. Falls to the surface accounted for 55,000 of this total. In the remainder of the fall cases, the victim was injured by striking the equipment before striking the surface.

- The proportions of all injuries which involved each of the major types of playground equipment (swings, slides, climbers, etc.) were roughly equivalent to the proportion of all playground equipment represented by each major type. No one general type of equipment can be identified as more hazardous than other types, relative to amount of each type in use.

- Falls to paved surfaces account for a disproportionately high number of injuries and severe injuries relative to the amount of paved surfacing in use. Protective surfaces such as sand, wood chips, or gravel, may have no effect on the frequency of injuries from falling, but may reduce the severity of those injuries.

- Accidents involving either equipment failure or broken equipment resulted in 3,700 injuries, about 5 percent of the total.

- Injuries which may be at least partially addressable through some type of equipment modification totaled 55,000 out of the 93,000 injuries which occurred over a one year period.

- Equipment spacing, playground layout, and playground design, may account for as many as 8,300 injuries.

## I. Introduction

Virtually every child in America is exposed at one time or another to public playground equipment. Most are exposed on a daily basis. In 1977, approximately 93,000 injuries related to public playground equipment were treated in U.S. hospital emergency rooms.

In 1974 the Commission made a preliminary finding of unreasonable risk associated with public playground equipment. As a result, an offeror type proceeding was initiated and a draft mandatory product safety rule was submitted by the National Recreation and Parks Association. This standard was reviewed by the staff, and it was decided that additional work was necessary to develop appropriate technical requirements. The staff then undertook to revise and modify this standard in order to develop a standard which could be finalized and published. CPSC and the National Bureau of Standards (NBS) have completed development of these requirements, and a final determination of the action to be taken on public playground equipment should be made early in 1979.

The objectives of this analysis are to:

- Provide a comprehensive overview of the national injury experience associated with public playground equipment, to assist the safety efforts of persons operating playgrounds and parks.
- Identify the risks of injury associated with public playground equipment and the frequency of each type of accident.
- Determine the feasibility of reducing public playground equipment injuries through equipment modification.
- Determine if any of the general types of playground equipment present a greater risk of injury than the other types.
- Identify the frequency of injuries involving broken equipment or equipment failure.
- Identify the effects of surfacing materials on fall injuries.
- Identify the possible gain in injury reduction through changes in playground layout and design.

Table 1, which follows, shows the breakdown of injuries by type of equipment involved and hazard pattern. These distributions are discussed and analyzed, relative to the objectives, in subsequent sections.

Table 1.

Estimated Number of Public Playground Equipment Related Injuries by Type of Equipment and Hazard Pattern*

January 1, 1977 - December 31, 1977

| | Total | Falls to the Surface | Falls/Struck Same Piece of Equipment | Falls/Struck Another Piece of Equipment | Impact with Moving Equipment | Pinch Points/ Protrusion/ Sharp Edges/ Sharp Points | Fell Against or Ran Into Equipment | Unknown |
|---|---|---|---|---|---|---|---|---|
| Total | 92,560 (100.0%) | 54,984 (59.7%) | 10,340 (11.2%) | 708 (0.8%) | 7,066 (7.4%) | 4,472 (4.9%) | 7,576 (8.2%) | 7,281 (7.9%) |
| Swings | 21,277 (100.0%) | 14,447 (67.9%) | 106 (0.5%) | 106 (0.5%) | 5,532 (26.0%) | 191 (0.9%) | 277 (1.3%) | 617 (2.9%) |
| Slides | 15,049 (100.0%) | 10,188 (67.7%) | 948 (6.3%) | 602 (4.0%) | -- | 1,701 (11.3%) | 1,264 (8.4%) | 331 (2.2%) |
| See-Saws | 4,371 (100.0%) | 2,247 (51.4%) | 529 (12.1%) | -- | 691 (15.8%) | 122 (2.8%) | 83 (1.9%) | 704 (16.1%) |
| Climbers | 38,650 (100.0%) | 19,596 (50.7%) | 8,464 (21.9%) | -- | -- | 1,314 (3.4%) | 5,952 (15.4%) | 3,208 (8.3%) |
| Merry-Go-Rounds | 7,332 (100.0%) | 5,330 (72.7%) | 293 (4.0%) | -- | 396 (5.4%) | 1,144 (15.6%) | -- | 169 (2.3%) |
| Other | 5,881 (100.0%) | 3,176 (54.0%) | -- | -- | 447 (7.6%) | -- | -- | 2,252 (38.3%) |

* Derived through application of proportions identified by April 1978 Special Study to NEISS Estimate for January 1, 1977 - December 31, 1977.

Note: Figures may not add to totals due to independent rounding and derivation procedures.

Source: U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

## II. Analysis by Hazard Pattern

This section discusses the risks of injury associated with public playground equipment and presents the frequency and detailed analysis for each of the major types of accident. In addition, the effects of surfacing materials on fall injuries are examined. The effects of playground layout and design are also discussed.

A hazard pattern is a classification of events resulting in product-related injuries. Hazard pattern information was gathered through the NEISS* based special study, and the proportions derived were applied to the national estimates to get the number of injuries by hazard pattern.

Table 2.

Estimated Number of Public Playground Equipment Related Injuries by Hazard Pattern

| Hazard Pattern | NEISS Estimate for Year 1977 Based on Study Data | Percentage |
|---|---|---|
| TOTAL | 92,600 | 100% |
| Falls to Surface | 55,000 | 59% |
| Falls-Struck Same Piece of Equipment | 10,300 | 11% |
| Falls-Struck Another Piece of Equipment | 700 | 1% |
| Falls - Sub Total | 66,000 | 72% |
| Impact With Moving Equipment | 7,100 | 7% |
| Protrusions, Pinch Points, Sharp Edges, and Sharp Points | 4,500 | 5% |
| Fell Against, Onto, or Into Equipment | 7,600 | 8% |
| Unknown | 7,300 | 8% |

Source: NEISS emergency room based special study, April 10, 1978 - May 1, 1978.
U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

* National Electronic Injury Surveillance System, a probability sample of U.S. hospital emergency rooms. (See Appendix C. for description.)

## A. Falls to Surface

### 1. Injuries

More deaths (23) reported through the death certificate data base from 1973-1977 resulted from falls than from any other hazard pattern. Most of these were caused by head injuries. In addition the most frequently reported type of accidental injury resulted from falls or jumps from equipment to the underlying surface. Approximately 55,000 of the 93,000 injuries which occurred in 1977 occurred in this way. Over half of these injuries were lacerations or contusions/abrasions; one-fourth were fractures or dislocations. Concussions, strains, sprains, hematomas, internal organ injuries, and punctures were also sustained. (See Table A4, Appendix A.)

Injuries to the head area, although frequent (39 percent of the total), were lacerations or contusions/abrasions in eight out of every ten cases. One in every ten of the head injuries was a concussion. Other head injuries included dislocated teeth, sprained necks and hematomas. Arm injuries were just over one-third of all injuries from falls to the surface reported through the study. Two-thirds of these were fractures, dislocations, or strains/sprains.

The most common injury suffered through a fall was a laceration or contusion/abrasion to the head area. The next most common injury was a fractured or dislocated arm.

The victims fell from some type of climbing apparatus in 36% of the cases. Additionally, 26% fell from swings and about 19% fell from slides. (Table 1.) Among those cases which cited the reason for the fall, several causes were mentioned. Those victims who fell from a piece of climbing apparatus stated that they slipped, lost their grip, lost their balance, were pushed, bumped, etc., by another person or they missed a bar or rung while swinging from one to another. Those victims who fell from a swing mentioned that they lost their balance, lost their grip or slipped from the equipment. Those who fell from slides mentioned that they were pushed or bumped, slipped or lost their grip or balance as reasons contributing to the fall.

### 2. Variables Affecting Fall Injuries

#### a. Surface

Of the falls to the surface for which the surface was known, approximately 41 percent involved natural surfaces, 40 percent involved protective surfaces and 19 percent involved paved surfaces. Surface was known for 86 percent of the falls to the surface.

For the purpose of this report surfaces have been grouped into three main types: natural, protective, and paved. Natural surfaces include grass, bare earth and rocky earth, with a great deal of variation within each category. Protective surfaces include sand, gravel, rubber matting, wood chips and similar surfaces. Asphalt, macadam and concrete make up the paved category.

To evaluate the relative severity of injuries associated with the three major types of surfaces, injuries were grouped by diagnosis into severe or non-severe injury categories. Lacerations, contusions/abrasions and avulsions were classified as "non-severe." Fractures, dislocations, strains/sprains, concussions, internal organ injuries, and hematomas were classified as "severe."

| | Surfaces | | |
|---|---|---|---|
| | Natural | Protective | Paved |
| Total | 100% | 100% | 100% |
| Not Severe | 47% | 69% | 58% |
| Severe | 53% | 31% | 42% |

As can be seen in the table above, the highest proportion of severe injuries occurred on natural surfaces. The lowest proportion of severe injuries was associated with protective surfaces.

Using the above definition of severe injuries, 52 percent of severe injuries occurred on natural surfaces, 30 percent occurred on protective surfaces, and 18 percent occurred on paved surfaces.

Preliminary results of the consumer deputy survey on playground surfaces* indicated that of playground surfaces in use, 50 percent were natural surfaces, 40 percent were protective surfaces, and 10 percent were paved surfaces. These findings are displayed relative to injuries and severe injuries in the following table.

| | Playground Area | Injuries | Severe Injuries |
|---|---|---|---|
| Total | 100% | 100% | 100% |
| Natural Surface | 50% | 41% | 52% |
| Protective Surface | 40% | 40% | 30% |
| Paved Surface | 10% | 19% | 18% |

* Survey conducted from September 13, through October 27, 1978 in a sample of 36 urban and suburban counties selected from all urban and suburban counties nationally.

The table shows that paved surfaces account for a proportion of the injuries which is almost double the proportion of the surfaces in use which are paved. The same is true for the proportion of severe injuries which occur on paved surfaces.

As can be seen, protective surfaces account for more of the injuries but fewer of the severe injuries than would be expected relative to the number of protective surfaces in use.

Natural surfaces, although accounting for more injuries than either of the other types, appear to be less likely, relative to exposure, to be involved in an injury than either of the other types. The proportion of severe injuries which involve natural surfaces is almost equal to the proportion of surfaces in use which are natural.

In summary; injuries from falls to paved surfaces are more frequent and more severe than would be expected from exposure. Natural surfaces are involved in relatively fewer injuries but do not reduce the severity of injury. Protective surfaces do not appear to affect the frequency of injury but the data indicate that they may reduce the severity of injuries which do occur.

b. Distance

The distance which the victim fell could not be determined in one-third of the falls. As can be seen in Table 3, approximately half of all fall injuries for which distance could be determined, involved falls of less than 4 feet. This included 77 percent of falls from swings and 62 percent of the falls from see-saws. It is noteworthy that only about 10 percent of the falls from slides were from under 4 feet. Seventy-eight percent of falls from slides were from six feet or above.

Table 3.
Public Playground Equipment Related Fall Injuries by Fall Distance
Cumulative Percent Distribution by Type of Equipment

| Distance of Fall* | All Equipment | Swings | Seesaws | Slides | Climbing Apparatus | Other Equipment |
|---|---|---|---|---|---|---|
| Less Than 2 Feet | 6% | 1% | -- | -- | 9% | 13% |
| Less Than 4 Feet | 50% | 77% | 62% | 9% | 30% | 84% |
| Less Than 6 Feet | 76% | 86% | 75% | 22% | 77% | 94% |
| Less Than 8 Feet | 93% | 99% | 100% | 69% | 93% | 96% |
| Less Than 10 Feet | 99% | 100% | 100% | 94% | 99% | 100% |
| 10 Feet or More | 100% | 100% | 100% | 100% | 100% | 100% |

* Includes only cases in which distance was known.
Note: Data in this table extracted from Table A6, Appendix A.

Source: NEISS emergency room based special study, April 10, 1978 - May 1, 1978
U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis

B. Falls-Struck Same Piece of Equipment

Approximately 10,300 injuries occurred during 1977 when children fell from playground equipment and struck another part of the same piece of equipment. More than 8 of every 10 such injuries involved climbing apparatus. Although injuries of this type did occur on types of equipment other than climbers, it was not a major pattern for other types of equipment. This fact is understandable in light of the nature of the equipment i.e., only climbers and slides (which were second in frequency) really present the opportunity for this type of accident. If this pattern is combined with falls to the surface, two-thirds of the injuries on climbing apparatus are accounted for. Half of the injuries sustained in this manner were head injuries.

Many victims reported slipping, losing their balance, or being pushed prior to the fall. In addition, review of in-depth investigations indicated injuries which occurred when children fell back against equipment after dismounting it.

C. Falls-Struck Another Piece of Equipment

The estimate of 700 injuries associated with this pattern is based on 2 cases reported through the study. These victims fell from a swing and a see-saw. The occurrence of these injuries, although the frequency is low, indicates the presence of an avoidable hazard. If it is possible for a child to fall from one piece of equipment and strike another, separate piece of equipment, the equipment is too close together. Falls occur on playgrounds frequently enough to be an expected occurrence, and playground layout and design should not create the additional hazard of equipment sufficiently close together for this type of accident to take place.

D. Impact With Moving Equipment

An estimated 7,100 injuries occurred as the result of a person being struck by a moving piece of equipment. These injuries represent just over seven percent of the total. It is worthy of note that three out of every five such accidents involved children less than five years of age.

Eighty percent of the impact inflicted injuries were lacerations, contusions, or punctures. Other injuries were hematomas, internal organ injuries, fractures and dislocations. Nine out of ten impact injuries were head injuries. The hand and arm were the other body parts injured. (Table A4, Appendix A.)

Impact type injuries occurred primarily on swings of some type, however, see-saws and merry-go-rounds were also involved. While the small sample size limits inference about type of product involved, it appears from the data that the injuries to children less than 5 years of age involve swings and that older children sustained impact injuries from all 3 types of equipment. The accident sequences are different, however, and it appears

that young children are injured because they are less developed in their motor skills or because of an unawareness of the hazards, while children over five are frequently injured while indulging in some form of horseplay.

Investigation of cases involving impact revealed 2 important points. While accident victims were struck by swings rather than by the body of the occupant, many children were injured when they were struck by occupied swings which strike with greater force than unoccupied ones.

Generally, spacing did not appear to play a part in these accidents. Most of the equipment involved had from 18" to 24" between moving components of equipment. However, it is also noteworthy that none of the victims were injured while running between broadly spaced components. Spacing between separate pieces of equipment (i.e. swings and slides) may have been a factor in one impact case, but in general this hazard did not contribute to injuries from impact with moving equipment.

E. Protrusions, Pinch Points, Sharp Edges, and Sharp Points

These hazards, which are directly related to the equipment, accounted for 4.9 percent of the total injuries. All of the victims were between 5 and 10 years of age. Injuries involving these hazards occurred to the head, hand, arm, leg, foot, and trunk. As would be expected, most of the injuries were lacerations or contusion/abrasions (65 percent). Investigated cases involving these hazards indicate that in many instances rusty or broken equipment was involved.

F. Fell or Ran into or Against Stationary Equipment

Seventy-six hundred injuries occurred when children fell or ran into stationary playground equipment. Nearly 9 out of 10 of these injuries were to persons in the 11-14 age group. Almost all of these injuries were to the head region. In-depth investigations of this pattern revealed that victims were preoccupied by their participation in other activities, such as baseball or catch, rather than playing on the equipment. Some victims were pushed or shoved while playing near the equipment and fell against it.

While in many cases, accidents of this type may be unavoidable, except through more cautious behavior on the part of the children, playground design may still be a factor. Playground planning to separate activities such as ball playing from the area of the equipment may help reduce injuries from running into equipment.

## III. Analysis by Type of Equipment

The traditional categories of playground equipment are swings, slides, see-saws, climbers, and merry-go-rounds. These categories include the equipment that makes up most of the playgrounds in the country. There are also many new designs which combine these categories, but generally the part of the equipment involved in an accident can be included in one of these categories. Within the categories there are variations also, there are several different types of swings; slides of differing heights and configurations, and several types of climbers (horizontal ladders, chinning bars, etc.). The same type of situation exists for see-saws, merry-go-rounds, and other types of equipment. This section discusses public playground equipment injuries broken down into the traditional groupings by type of equipment, in an effort to examine the relative risks of injuries associated with each type. As can be seen, the bulk of the injuries fit into the categories used.

Preliminary results of the consumer deputy survey on playground surfaces, shown in Table 4, below, indicate that swing sets represent 20 percent of the public playground equipment units in the country. Slides represent 12 percent; climbers represent 51 percent; merry-go-rounds 5 percent; see saws 6 percent. Other equipment such as spring action riding animals and combination equipment accounts for 6 percent.

Table 4 also shows the distribution of injuries by type of equipment. As can be seen swings account for 23 percent of the injuries; slides account for 16 percent; climbers 42 percent; merry-go-rounds 8 percent; see-saws 5 percent.

The frequency of injuries associated with each type of equipment is roughly proportional to the amount of equipment in use.

Table 4.

Estimated Number of Public Playground Equipment Related Injuries by Type of Equipment
Comparison of Distribution of Injuries by Type of Equipment with Proportion of All Equipment by Type of Equipment

| | Number of Injuries | Percent of Injuries | Percent of Equipment |
|---|---|---|---|
| Swings | 21,277 | 23% | 20% |
| Slides | 15,049 | 16% | 12% |
| See-Saws | 4,371 | 5% | 6% |
| Climbers | 38,650 | 42% | 51% |
| Merry-Go-Rounds | 7,332 | 8% | 5% |
| All Other | 5,881 | 6% | 6% |

Source: NEISS emergency room based special study, April 10, 1978-May 1, 1978 and consumer deputy survey of playground surfaces September 13, 1978-October 17, 1978.
U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

## A. Swings

The estimated number of injuries associated with public swings in 1977 was approximately 21,300. The study data revealed that one-fourth of the swing related injuries involved moving impact. Slightly over two-thirds of the injuries resulted from falls or jumps to the surface. There were a few injuries involving the remaining hazard patterns. Over one-third of all swing injuries were to children less than 5 years of age. Almost half of all injuries to this age group involved swings. Another third of swing injuries were in the 5-7 age group.

Eight death certificates indicating public playground swing involvement were received from 1973-1977. Patterns indicated were hanging (by the chains), falls, moving impact, running into the equipment, and in two separate instances equipment failing and falling on the child.

Cases of swing impact were investigated as part of the study and it was noteworthy that several of these indicated the involvement of chair type infant swings. This type of swing may be quite heavy and those in the investigated cases had hard corners or ridges as well.

As might be expected, four out of every five cases of moving impact involved swings.

## B. Slides

An estimated 15,000 injuries related to slides are projected for 1977. Twelve thousand of these involved falls. Falls to the surface made up the bulk of the injuries. While falls from most types of equipment were from under 6 feet, falls from slides were mostly from 6 feet or more. This may be because it is necessary to climb to the top in order to properly use a slide, while other types of equipment are either lower or present an equal risk of falling at all heights. Nine deaths were attributed to falls from sliding boards from 1973-1977. All but one of these deaths resulted from head injuries. Clothing entrapment was another important cause of sliding board related deaths. Ropes were also involved. In these cases the clothing or rope caught at the top of the slide and the victim was strangled upon sliding.

## C. See-Saws

It is estimated that see-saws were involved in approximately 4,400 injuries during 1977. Although one of every six see-saw injuries involved impact, falls to the surface or to another part of the see-saw assembly accounted for most of the other injuries, about two-thirds of the total. Investigated cases indicated punctures involving large splinters from worn, poorly maintained, or damaged wooden see-saws to be a problem also. Children injured on see-saws were of all ages, but almost 80 percent were between 5 and 10 years of age. No death certificates indicated see-saw involvement.

D. Climbing Apparatus

Climbing apparatus was involved in more playground equipment related injuries (approximately 38,650) than any other type of equipment in 1977. Over half of these injuries resulted from falls to the surface. Another 22 percent resulted from falls in which the victim struck another part of the same piece of climbing apparatus. Fifteen percent of the victims were injured when they fell against or ran into climbing apparatus while on the ground. About 1,300 persons were injured by protrusions, pinch points, sharp edges or sharp points.

Injuries involving climbing apparatus are about equal for age groups consisting of children within the 5-7 and 8-10 year group. These two groups each account for one-third of the total. Children 11 through 14 years of age were the next most frequently injured group. One in every ten injuries involving climbing apparatus was to a child less than 5 years of age.

A total of 9 deaths, occurring during the period 1973-1977, were reported through the death certificate data base; seven resulted from falls. One was not clear enough to identify how the death occurred, and in another the apparatus fell on the victim.

E. Merry-Go-Rounds (Whirlers)

Most of the 7,300 merry-go-round injuries in 1977 involved falls to the surface. Investigated cases indicated that children either lost their grip and were thrown from the apparatus, fell down while pushing it or fell while on the equipment. Those who fell while pushing were in some instances then struck by the device. Those who fell while on the merry-go-round struck or were struck by the gripping bars, or struck the base itself. Two death certificates have been received which identify the involvement of merry-go-rounds; both deaths resulted from falls. Pinch point and entrapment hazards have been identified particularly when the equipment has been damaged. Impact occurred in one investigated case when a child on the equipment put his leg out and struck the victim with the force of the device's rotation. The victim suffered a broken femur. Very few of the merry-go-round related injuries involved children less than 5 years of age. Those in the 5-7 age group were most frequently injured.

F. Other

Other types of equipment involved in injuries reported as part of the special survey were spring action riding equipment, rope or tire swings, and sandboxes. In addition there were many cases (4 percent of the total) in which the type of equipment was unknown. Half of the victims of injuries involving other or unknown equipment types were in the 5-7 age group. Falls accounted for over half of the injuries. Impact with moving equipment was also reported, and in 40 percent of the injuries the pattern was unknown.

## IV. Study Results for Location, Equipment Condition, Equipment Material

Sixty percent of the public playground equipment injuries reported through the study occurred on school playgrounds; twenty-nine percent were on park playgrounds. Apartment complex playgrounds were involved in 6 percent of the injuries; day care centers in 5 percent.

In response to the questionnaire inquiry about equipment condition, it was reported that the equipment was broken or failed at the time of the accident in about 4 percent of the cases.

Metal equipment was involved in 76 percent of the study cases; wooden equipment was involved in 9 percent; and in 9 percent the material was not stated. Other materials reported were rope, rubber, fiberglass, and chain.

## V. Public Playground Equipment Related Deaths

Thirty-six death certificates reporting public playground equipment involvement were contained in the CPSC death certificate data base between 1973 and 1977. Patterns resulting in death were falls, impact with moving equipment, clothing and body part entrapment, running into equipment, and failed equipment falling onto victims.

Eight deaths were reported for swings, thirteen for slides, nine for climbers, two for merry-go-rounds, and one death involved a tree house. There were three deaths for which the type of equipment was unknown. No deaths were reported for see-saws.

Table 5.

Public Playground Equipment Related Deaths, 1973-1977 by Type of Equipment and Hazard Pattern

| Type of Equipment | Total | Hazard Pattern | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Falls | Impact with Moving Equipment | Entrapment | Body Part Entrapment | Running Into Equipment | Equipment Fell On Victim | Unknown |
| Total | 36 | 23 | 2 | 4 | 2 | 1 | 3 | 1 |
| Swings | 8 | 3 | 2 | - | - | 1 | 2 | - |
| Slides | 13 | 8 | - | 4 | - | - | - | 1 |
| Climbers | 9 | 7 | - | - | 1 | - | 1 | - |
| Merry-Go-Rounds | 2 | 2 | - | - | - | - | - | - |
| Tree House | 1 | 1 | - | - | - | - | - | - |
| Unknown | 3 | 2 | - | - | 1 | - | - | - |

Source: Death Certificate Program
U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

## Appendix A

## DATA TABLES

## Appendix A - Data Tables

Table A1. Comparison of the Distribution of Estimated Public and Unknown Location Playground Equipment Related Injuries for 1977 With Those Injuries Identified as Public Playground Equipment Related Through April 10, 1978 - May 1, 1978, Special Study.

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Table A8. Location of Public Playground Equipment Injuries Reported Through Special Study.

Table A9. Derivation of Adjusted Annual Estimates by Type of Equipment, Through Application of Results of Special Study.

## Table A1.

**Comparison of the Distribution of Estimated Public and Unknown Location Playground Equipment Related Injuries for 1977 With Those Injuries Identified as Public Playground Equipment Related Injuries Through the Special Study***

| VARIABLE | NEISS 1977 | STUDY DATA |
|---|---|---|
| Type of Equipment | | |
| Swings | 45,790 (36.4%) | 1,729 (23.5%) |
| Slides | 20,138 (16.0%) | 741 (10.1%) |
| Seesaws | 7,253 ( 5.8%) | 323 ( 4.4%) |
| Climbing Apparatus | 38,642 (30.7%) | 3,649 (49.6%) |
| Other/Unknown | 13,882 (11.1%) | 919 (12.5%) |
| Age of Victim | | |
| 0 - 4 | 32,717 (25.5%) | 1,150 (15.6%) |
| 5 - 7 | 39,855 (31.1%) | 2,831 (38.5%) |
| 8 - 10 | 27,902 (21.8%) | 2,004 (27.2%) |
| 11+ | 25,606 (20.0%) | 1,377 (18.7%) |
| Sex of Victim | | |
| Male | 65,633 (52.0%) | 4,668 (63.4%) |
| Female | 60,463 (48.0%) | 2,674 (36.3%) |
| Disposition of Case | | |
| Treated and Released | 117,132 (92.9%) | 6,852 (93.1%) |
| Hospitalized | 8,806 ( 7.0%) | 509 ( 6.9%) |
| Diagnosis | | |
| Laceration, Contusion/ Abrasion, Avulsion | 78,858 (58.6%) | 4,030 (54.8%) |
| Fracture, Dislocation, Strain/Sprain | 43,561 (34.5%) | 2,319 (31.6%) |
| Concussion, Internal Organ Injury, Hematoma | 7,084 ( 5.6%) | 954 (13.0%) |
| Other | 1,623 ( 1.3%) | 57 ( 0.8%) |
| Body Part | | |
| Head and Face | 57,697 (45.7%) | 3,602 (49.0%) |
| Arm and Hand | 37,104 (29.4%) | 2,026 (27.6%) |
| Leg and Foot | 17,521 (13.9%) | 1,082 (14.7%) |
| Trunk | 13,744 (10.9%) | 638 ( 8.7%) |

* NEISS emergency room based special study, April 10, 1978-May 1, 1978

Source: U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

Table A2.

Type of Equipment by Hazard Pattern
Cross-Tabulation of Estimated Injuries from Special Study Data*

| Type of Equipment | Total | Hazard Pattern | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Falls to the Surface | Falls/Struck Same Piece of Equipment | Falls/Struck Another Piece of Equipment | Impact with Moving Equipment | Pinch Points/ Protrusion/ Sharp Edges/ Sharp Points | Fell Against or Ran Into Equipment | Unknown |
| Total | 7,361 (100.0%) | 4,284 (58.2%) | 916 (12.4%) | 39 (0.5%) | 543 (7.4%) | 321 (4.4%) | 654 (8.9%) | 604 (8.2%) |
| Swings | 1,646 (100.0%) | 1,117 (67.9%) | 8 (0.5%) | 9 (0.5%) | 428 (26.0%) | 15 (0.9%) | 21 (1.3%) | 48 (2.9%) |
| Slides | 741 (100.0%) | 502 (67.7%) | 47 (6.3%) | 30 (4.0%) | -- | 84 (11.3%) | 62 (8.4%) | 16 (2.2%) |
| See-Saws | 323 (100.0%) | 166 (51.4%) | 39 (12.1%) | -- | 51 (15.8%) | 9 (2.8%) | 6 (1.8%) | 52 (16.1%) |
| Climbers | 3,659 (100.0%) | 1,854 (50.7%) | 800 (21.9%) | -- | -- | 126 (3.4%) | 565 (15.4%) | 304 (8.3%) |
| Merry-Go-Rounds | 556 (100.0%) | 404 (72.7%) | 22 (4.0%) | -- | 30 (5.4%) | 87 (15.6%) | -- | 13 (2.3%) |
| Other/ Unknown | 446 (100.0%) | 241 (54.0%) | -- | -- | 34 (7.6%) | -- | -- | 171 (38.3%) |

* NEISS emergency room based special study, April 10, 1978-May 1, 1978

Source: U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

Table A3.

Age of Victim by Hazard Pattern

Cross-Tabulation of Estimated Injuries from Special Study Data*

| Age | Total | HAZARD PATTERN | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Impact With Moving Equipment | Pinch Points Protrusions Sharp Edges/ Sharp Points | Falls To The Surface | Falls Struck Same Piece of Equipment | Falls Struck Another Piece of Equipment | Fell Against or Ran Into Equipment | Unknown |
| TOTAL | 7,360 (100.0%) | 543 (100.0%) | 322 (100.0%) | 4,284 (100.0%) | 915 (100.0%) | 39 (100.0%) | 652 (100.0%) | 602 (100.0%) |
| 0-4 | 1 147 (16%) | 317 (58%) | -- | 633 (15%) | 94 (10%) | 9 (23%) | 48 (7%) | 46 (8%) |
| 5-7 | 2,831 (39%) | 96 (18%) | 174 (54%) | 1,984 (46%) | 238 (26%) | -- | 25 (4%) | 314 (52%) |
| 8-10 | 2,004 (27%) | 83 (15%) | 148 (46%) | 1,133 (26%) | 535 (59%) | 30 (77%) | 7 (1%) | 68 (11%) |
| 11-14 | 1,275 (17%) | 31 (6%) | -- | 489 (11%) | 48 (5%) | -- | 572 (88%) | 135 (22%) |
| 15+ | 100 (1%) | 16 (3%) | -- | 45 (1%) | -- | -- | -- | 39 (6%) |

* NEISS emergency room based special study, April 10, 1978-May 1, 1978

Source: U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

Table A4.

Hazard Pattern by Diagnosis and Body Part

Cross-Tabulation of Estimated Injuries from Special Study Data*

| Hazard Pattern and Diagnosis | TOTAL** | BODY PART | | | |
|---|---|---|---|---|---|
| | | Head & Face | Arm & Hand | Leg & Foot | Trunk |
| Impact with Moving Equipment | 543 (100%) | 469 (86%) | 58 (11%) | 16 (3%) | -- |
| Lacerations Contusions/Abrasions Avulsions | 432 (80%) | 398 (73%) | 34 (6%) | -- | -- |
| Fractures, Dislocations, Strains/Sprains | 40 (7%) | -- | 24 (4%) | 16 (3%) | -- |
| Concussion, Internal Organ Injury Hematoma | 71 (13%) | 71 (13%) | -- | -- | -- |
| Pinch Points Protrusions Sharp Edges & Points | 322 (100%) | 68 (21%) | 65 (20%) | 116 (36%) | 73 (23%) |
| Lacerations, Contusions/Abrasions Avulsions | 209 (65%) | 68 (21%) | 65 (20%) | 6 (2%) | 70 (22%) |
| Fracture, Dislocations, Strains, Sprains | 103 (32%) | -- | -- | 103 (32%) | -- |
| Concussions, Internal Organ Injury, Hematoma | -- | -- | -- | -- | -- |
| Falls to Surface | 4,283 (100%) | 1,679 (39%) | 1,676 (39%) | 665 (16%) | 249 (6%) |
| Lacerations, Contusions/Abrasions, Avulsions | 2,307 (54%) | 1,354 (32%) | 536 (13%) | 208 (5%) | 195 (5%) |
| Fractures, Dislocations, Strains/Sprains | 1,690 (39%) | 96 (2%) | 1,119 (26%) | 451 (11%) | 24 (0%) |
| Concussions, Internal Organ Injury, Hematoma | 238 (6%) | 195 (5%) | 21 (0%) | 6 (0%) | 16 (0%) |
| Falls: Struck Same Equipment | 916 (100%) | 459 (50%) | 82 (9%) | 72 (8%) | 303 (33%) |
| Lacerations, Contusions/Abrasions, Avulsions | 724 (79%) | 365 (40%) | -- | 56 (6%) | 303 (33%) |
| Fractures, Dislocations, Strains/Sprains | 192 (21%) | 94 (10%) | 82 (9%) | 16 (2%) | -- |
| Concussions, Internal Organ Injury, Hematoma | -- | -- | -- | -- | -- |
| Fell Against or Ran Into Equipment. Falls: Struck Other Equipment | 692 (100%) | 633 (91%) | 18 (3%) | 41 (6%) | -- |
| Lacerations, Contusions/Abrasions, Avulsions | 113 (16%) | 113 (16%) | -- | -- | -- |
| Fractures, Dislocations, Strains/Sprains | 31 (5%) | 6 (1%) | 18 (3%) | 7 (1%) | -- |
| Concussions, Internal Organ Injury Hematoma | 548 (79%) | 514 (74%) | -- | 34 (5%) | -- |
| UNKNOWN | 603 (100%) | -- | -- | -- | -- |

* NEISS emergency room based special study, April 10, 1978-May 1, 1978

** The "All Other" categories for both Body Part and Diagnosis are included only in the Totals.

Source: U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

## Table A5.

### Fall Injuries, Playground Surface by Diagnosis and Body Part
### Cross-Tabulation of Estimated Injuries from Special Study Data*

| Surface and Diagnosis | TOTAL** | BODY PART | | | |
|---|---|---|---|---|---|
| | | Head & Face | Arm & Hand | Leg & Foot | Trunk |
| NATURAL SURFACE | 1,521 (100%) | 457 (30%) | 714 (47%) | 226 (15%) | 124 (8%) |
| Lacerations, Contusions/Abrasions, Avulsions | 705 (46%) | 323 (21%) | 199 (13%) | 95 (6%) | 88 (6%) |
| Fractures, Dislocations, Strains/Sprains | 683 (45%) | 31 (2%) | 515 (34%) | 131 (9%) | 6 (0%) |
| Concussions Internal Organ Injuries Hematoma | 119 (8%) | 103 (7%) | -- | -- | 16 (1%) |
| PROTECTIVE SURFACE | 1,476 (100%) | 735 (50%) | 572 (39%) | 102 (7%) | 53 (4%) |
| Lacerations, Contusions/Abrasions, Avulsions | 1,016 (69%) | 686 (46%) | 276 (19%) | -- | 40 (3%) |
| Fractures, Dislocations, Strains/Sprains | 427 (29%) | 31 (2%) | 287 (19%) | 96 (7%) | 13 (1%) |
| Concussions, Internal Organ Injuries, Hematoma | 33 (2%) | 18 (1%) | 9 (1%) | 6 (0%) | -- |
| PAVED SURFACES | 669 (100%) | 401 (60%) | 138 (21%) | 108 (16%) | 22 (3%) |
| Lacerations, Contusions/Abrasions, Avulsions | 367 (55%) | 296 (44%) | 17 (3%) | 38 (6%) | 16 (2%) |
| Fractures, Dislocations, Strains/Sprains | 219 (33%) | 34 (5%) | 109 (16%) | 70 (10%) | 6 (1%) |
| Concussions, Internal Organ Injuries, Hematoma | 49 (7%) | 37 (6%) | 12 (2%) | -- | -- |
| UNKNOWN SURFACE | 616 (100%) | 86 (14%) | 252 (41%) | 228 (37%) | 50 (8%) |
| Lacerations, Contusions/Abrasions, Avulsions | 217 (35%) | 49 (8%) | 43 (7%) | 75 (12%) | 50 (8%) |
| Fractures, Dislocations, Strains/Sprains | 362 (59%) | -- | 209 (34%) | 153 (25%) | -- |
| Concussions, Internal Organ Injuries, Hematoma | 37 (6%) | 37 (6%) | -- | -- | -- |

* NEISS emergency room based special study, April 10, 1978-May 1, 1978

** The "All Other" categories for both Body Part and Diagnosis are included only in the Totals.

Source: U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

## Table A6.

### Fall Injuries, Distance of Fall by Type of Equipment
### Cross-Tabulation of Estimated Injuries from Special Study Data*

| Fall Distance | TOTAL | TYPE OF EQUIPMENT | | | | |
|---|---|---|---|---|---|---|
| | | Swings | Seesaws | Slides | Climbing Apparatus | Other |
| TOTAL | 4,284 (100%) | 1,117 (100%) | 166 (100%) | 502 (100%) | 1,854 (100%) | 645 (100%) |
| Less Than 2 Feet | 160 (4%) | 6 (1%) | -- | -- | 103 (6%) | 51 (8%) |
| 2-3 Feet | 1,196 (28%) | 536 (48%) | 99 (60%) | 28 (6%) | 254 (14%) | 279 (43%) |
| 4-5 Feet | 709 (17%) | 60 (5%) | 21 (13%) | 37 (7%) | 551 (30%) | 40 (6%) |
| 6-7 Feet | 470 (11%) | 96 (9%) | 40 (24%) | 140 (28%) | 187 (10%) | 7 (1%) |
| 8-9 Feet | 169 (4%) | 5 (0%) | -- | 75 (15%) | 73 (4%) | 16 (2%) |
| 10-11 Feet | 7 (0%) | -- | -- | -- | 7 (0%) | -- |
| 12 Feet or More | 22 (1%) | -- | -- | 16 (3%) | 6 (0%) | -- |
| Distance Unknown | 1,549 (36%) | 414 (37%) | 6 (4%) | 205 (41%) | 673 (36%) | 252 (39%) |

* NEISS emergency room based special study, April 10, 1978-May 1, 1978

Source: U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

Table A7.

Type of Equipment by Age of Victim

Cross-Tabulation of Estimated Injuries from Special Study Data

| TYPE OF EQUIPMENT | TOTAL | AGE OF VICTIM | | | | |
|---|---|---|---|---|---|---|
| | | 0-4 | 5-7 | 8-10 | 11-14 | 15+ |
| TOTAL | 7,360 (100%) | 1,148 (16%) | 2,831 (38%) | 2,004 (27%) | 1,276 (17%) | 101 (1%) |
| Swings | 1,645 (100%) | 559 (34%) | 554 (34%) | 277 (17%) | 223 (14%) | 32 (2%) |
| Seesaws | 323 (100%) | 37 (11%) | 123 (38%) | 131 (41%) | 31 (10%) | -- |
| Slides | 740 (100%) | 156 (21%) | 342 (46%) | 177 (24%) | 60 (8%) | 5 (1%) |
| Merry-go-rounds | 556 (100%) | 20 (4%) | 353 (63%) | 128 (23%) | 55 (10%) | -- |
| Climbing Apparatus | 3,650 (100%) | 346 (9%) | 1,240 (34%) | 1,194 (33%) | 827 (23%) | 44 (1%) |
| Other/Unknown | 446 (100%) | 30 (7%) | 219 (49%) | 97 (22%) | 80 (18%) | 20 (4%) |

* NEISS emergency room based special study, April 10, 1978-May 1, 1978

Source: U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

## Table A8.

## Location of Public Playground Equipment Injuries Reported Through Special Study*

| TOTAL | Apartment Complex | Public Parks | School Playgrounds | Day Care Centers | Other Public Locations |
|---|---|---|---|---|---|
| 7,359 | 431 | 2,123 | 4,409 | 338 | 58 |
| (100%) | (6%) | (29%) | (60%) | (5%) | (1%) |

* NEISS emergency room based special study, April 10, 1978-May 1, 1978

Source: U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

## Table A9.

## Derivation of Adjusted Annual Estimates by Type of Equipment Through Appl' .ation of Results of Special Study*

| | NEISS 1977 | Study Data | Adjusted Annual Frequency Controlling for Type of Equipment |
|---|---|---|---|
| All Playground Equipment | | | |
| TOTAL | 166,312 | 13,706 | 166,312 |
| Home | 40,607 | 5,834 | 67,521 |
| Public | 75,041 | 7,361 | 92,560 |
| Other/Unknown | 50,664 | 511 | 6,217 |
| Swings (1241,1289) | | | |
| TOTAL | 72,078 | 5,856 (100%) | 72,078 |
| Home | 26,288 | 3,761 (64.2%) | 46,288 |
| Public | 16,881 | 1,729 (29.5%) | 21,277 |
| Other/Unknown | 28,909 | 366 (6.3%) | 4,505 |
| Slides (1242) | | | |
| TOTAL | 24,821 | 1,222 (100%) | 24,821 |
| Home | 4,683 | 463 (37.9%) | 9,402 |
| Public | 11,283 | 741 (60.6%) | 15,049 |
| Other/Unknown | 8,855 | 18 (1.5%) | 365 |
| Seesaws (1243) | | | |
| TOTAL | 8,247 | 610 (100%) | 8,247 |
| Home | 994 | 287 (47.0%) | 3,876 |
| Public | 3,871 | 323 (53.0%) | 4,371 |
| Other/Unknown | 3,382 | 0 (0.0%) | 0 |
| Climbing Apparatus (1244) | | | |
| TOTAL | 44,890 | 4,238 (100%) | 44,890 |
| Home | 6,248 | 462 (10.9%) | 4,893 |
| Public | 32,517 | 3,649 (86.1%) | 38,650 |
| Other/Unknown | 6,125 | 127 (3.0%) | 1,347 |
| All Other (1201,1234) | | | |
| TOTAL | 16,276 | 1,132 (100%) | 16,276 |
| Home | 2,394 | 213 (18.8%) | 3,062 |
| Public | 10,489 | 919 (81.2%) | 13,213 |
| Other/Unknown | 3,393 | 0 (0.0%) | 0 |

* NEISS emergency room based special study, April 10, 1978-May 1, 1978

Source: U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

Appendix B

# ANALYSIS OF TECHNICAL REQUIREMENTS SUBMITTED BY NATIONAL BUREAU OF STANDARDS

## Index - Appendix B

## Analysis of Recommended Technical Requirements

### A. Overview

This section evaluates the injuries associated with public playground equipment in terms of the possible effects of the proposed technical requirements. For some of these provisions it is possible to identify how many injuries would have been prevented if the equipment had met the requirements. For others it is only possible to identify the target population without specifying the effectiveness of the requirements, and for some others no quantification was possible and the risk of injury could be identified only through the evidence of one or more in-depth investigations. Because the identification of risk could not be specific to each provision of the requirements, a net effect of the total set of requirements can not be computed. By the process of subtracting those injuries which are not addressed at all, the figure of 52,000 injuries can be identified as the target population of injuries. This does not say that 52,000 injuries would have been prevented by the requirements. What it does show is that any reduction in public playground equipment injuries will come from within this 52,000 injuries, which may be addressed. Injury estimates are shown by type of equipment:

| | |
|---|---|
| Swings - Impact and Pinch Points | 4,100 |
| See-Saws - Pinch Points | 100 |
| Slides - Falls to Surface, Falls Striking Same Piece of Equipment | 11,000 |
| Climbers - Pinch Points, Falls to Surface, Falls Striking Same Piece of Equipment | 29,400 |
| Other - Merry-Go-Rounds - Impact, Pinch Points, Fell to Surface, Fell-Struck Same Piece of Equipment | 7,200 |
| TOTAL | 51,800 |

In addition, another 8,300 injuries may be addressable by attention to spacing and layout in playground design. These were the injuries attributed to falls in which the victim struck another piece of equipment and incidents in which people ran into or fell against equipment.

## B. Listing of Provisions of Technical Requirements

Swing Assemby Structural Integrity

Swing Assembly Moving Impact

Straight Slide Surface Incline

Straight Slide Surface Exit Region

Straight Slide Surface Side Height

Straight Slide Ladders and Stairways

Assembly, Installation, Maintenance Instructions and Identification

Materials of Manufacture and Construction

Sharp Points, Sharp Edges, Protrusions, Pinch Points, Crush Points, Suspended Hazards

Equipment that Rotates About a Vertical Axis
- a. Speed of Rotation
- b. Entrapment of Body Parts
- c. Head Entrapment

Falls From Elevated Surfaces - Guard Barrier

Hand Gripping Components

Slope of Ladders and Stairways

Steps and Rungs of Ladders and Stairways

Hand Rails of Ladders and Stairways

Slip Resistant Surfaces

Spiral Slides

## C. Summary of Findings

Some of the technical requirements are directly supported by injury data, these are:

- o Swing assembly moving impact;
- o Speed of rotation and base configuration for rotating equipment;
- o Sharp points, sharp edges, protrusions, pinch points, crush points, body part and entrapment;
- o Assembly, installation, and maintenance instructions.

Several provisions are generally supported by injury data;

- o Falls from elevated surfaces-guard barrier;
- o Hand gripping components and slip resistant surfaces;
- o Provisions for slope, steps and rungs, and hand rails of slide ladders;
- o Straight slide surface incline and exit region.

The following provisions are supported by the occurrences of one or more injuries investigated prior to the special survey, or by death certificates:

- o Strength of construction (structural integrity);
- o Straight slide surface side height;
- o Spiral slides;
- o Head entrapment.

These findings indicate that it may be appropriate to address public playground equipment related injuries through equipment modification.

## D. Discussion of Provisions

Swing Assembly Moving Impact -

Approximately 5,500 injuries involved swing impact. Review of in-depth investigations assigned from the the study data revealed that about 30 percent of these injuries (1,650) would have been prevented had the swing involved complied with the proposed requirements. Another 40 percent (2,300 injuries) occurred in cases which could not be investigated and may have been prevented. An estimated 30 percent (1,600 injuries) would not have been affected by the standard.

Straight Slide Surface Incline and Straight Slide Surface Exit Region -

These provisions address injuries associated with the high rate of exit speed at the bottom of slides. Information received indicated at least 400 injuries of this type.

Straight Slide Surface Side Height -

Falls from the sides of slides during descent were not quantified during the study. Those cases which did indicate how the fall occurred indicated that the victims fell from the top of the slide. Review of the normally collected in-depth investigations, not conducted as part of the study, indicated that children have been injured by falling during normal descent of a slide. These cases frequently involved children less than 5 years of age.

Assembly, Installation, Maintenance Instructions and Identification/Structural Integrity -

Damaged or broken equipment was indicated as a contributing factor in 4.0 percent of the special study reported injuries. Equipment failing or falling down has resulted in 3 deaths since 1973.

Incidents in which a person ran into a stationary piece of equipment may be attributable to layout and spacing between equipment. Broken equipment was estimated to have been involved in 3,700 injuries, the other two patterns represent 8,300 injuries.

Sharp Points, Sharp Edges, Protrusions, Pinch Points, Crush Points, Body Part Entrapment -

These hazards accounted for approximately 4,500 injuries in 1977.

Head Entrapment -

Head entrapment in public playground equipment has resulted in at least two deaths reported through the death certificate data base. In addition, in-depth investigations have also indicated the potential severity of this hazard. The frequency of this hazard pattern can not be identified at this time, and the effect of the proposed requirements can not be determined.

Provision for Equipment that Rotates Around a Vertical Axis -

The provisions for speed of rotation and for base configuration are aimed at reducing fall injuries from rotating equipment and at reducing the force of impact if one is struck by the equipment. Approximately 5,700 injuries involve these two hazards.

Falls From Elevated Surfaces - Guard Barrier -

It was not possible from the study data to quantify the presence or absence of guard barriers in fall injuries. While approximately 66,000 injuries, 72 percent of the total involved falls, it was not feasible to identify the involvement of platforms or guard barriers. Review of non-statistically collected in-depth investigations reveals that falls from platforms do occur, but the effect of guard barriers on these falls cannot be determined.

There is currently no injury data support on hand for the contention that children are injured when they fall while climbing on guard barriers.

Provisions for Hand Gripping Components and Slip Resistant Surfaces -

These provisions are intended to reduce the probability of equipment users losing their grips on equipment or of their slipping on steps or platform surfaces. Although response to the question about involvement of variables such as these was sketchy, it was determined that approximately 12 percent of the injuries on climbers and slides involved lost grips or foot slippage. Thus, at a minimum, approximately 7,900 injuries are addressed by these provisions.

Provisions For Slope, Steps and Rungs, and Hand Rails of Slide Ladders -

These provisions are aimed at reducing falls from slide ladders. Altogether there were an estimated 11,700 falls from slides. Of these it is estimated that at least 2,300 involved the ladder. These injuries are addressed by these provisions and by the provisions for slip resistant surfaces and hand gripping components.

Spiral Slides

Spiral slide injuries were not separated from injuries involving straight slides in the study data or in the NEISS data. The one investigated case from the special study involved a protrusion. For these reasons it is not possible to quantify the effects of the provisions which are aimed at spiral slide related injuries. In-depth investigations revealed that falls from the top are a hazard associated with spiral slides. A child at the top of a slide who is pushed or falls forward can fall over the slide chute and all the way to the ground.

## Appendix C

# METHODOLOGY

## Index - Methodology

## Methodology

Data from four sources were used in this analysis:

Data collected through the April 1978 Special Study;

Normal NEISS surveillance data;

In-Depth Investigations; and

Death Certificates.

The methodology associated with each of these will be treated separately.

### Special Study Data

During a three-week period, April 10 through May 1, 1978, a special study was conducted through NEISS hospital emergency rooms. Using the space allotted for free text on the NEISS injury report format, the coders provided information extracted from emergency room records.

Based on previous analyses of public playground equipment injury data, several variables were identified which were felt to be important and relevant and about which it was feasible to gather information through a study of this type. These variables are:

- Surface under the equipment;
- Type of equipment (more specific than product codes);
- Specific location of equipment;
- Primary material of equipment;
- Hazard pattern, i.e., how the accident happened; and
- Condition of equipment.

In cases involving falls, additional information about height of the fall and factors contributing to the fall was included. These variables were then stated with responses in multiple choice format. The following questionnaire was used in the emergency rooms.

QUESTIONNAIRE - SPECIAL STUDY - PLAYGROUND EQUIPMENT
TREATMENT DATES: APRIL 10 THROUGH MAY 1, 1978

1. Surface Under Equipment: (Use more than one if applicable.)

   a. Grass
   b. Bare Earth
   c. Sand
   d. Gravel
   e. Cement or Concrete
   f. Asphalt or Macadam
   g. Rubber Matting
   h. Other (specify on comment line)
   i. Unknown

2. Type of Equipment:

   a. Swings Only
   b. Swing Set (lightweight, backyard, combination swing, slide, glider, etc.)
   c. See-Saw
   d. Slide
   e. Merry-Go-Round
   f. Climbing Apparatus (monkey bars, jungle gyms, horizontal ladders)
   g. Spring Action Riding Equipment
   h. Rope or Tire Swing
   i. Glider Type Swing
   j. Other (specify on comment line)
   k. Unknown

3. Location of Equipment:

   a. Private Home (yard)
   b. Private Home (indoors)
   c. Apartment Complex Playground
   d. Public Playground/Park
   e. School Playground
   f. Day-Care Center
   g. Church
   h. Hotel/Motel
   i. Drive-In Theatre, Shopping Center
   j. Other (specify on comment line)
   k. Unknown

4. Primary Material of Equipment:

   a. Wood
   b. Metal
   c. Other (specify on comment line)
   d. Unknown

5. Hazard Pattern: (Use more than one if applicable.)

   a. Impact with Moving Equipment (Swings, See-Saws, Etc.)
   b. Finger or Other Body Part Caught in Pinch Point
   c. Contact with Protruding Bolts, Screws, or Other Hardware
   d. Contact with Sharp Edge or Sharp Point
   e. Fell from Equipment to Surface Below
   f. Fell from Equipment and Struck Another Part of the Same Piece of Equipment
   g. Fell from Equipment and Struck Another (Separate) Piece of Equipment
   h. Fell or Ran Into or Against Stationary Equipment
   i. Jumped from Equipment
   j. Other (specify on comment line)
   k. Unknown

6. Was the Equipment Broken, or Did it Break at the Time of the Accident?

   a. Yes
   b. No
   c. Unknown

7. If the Accident Involved a Fall, State the Approximate Distance of the Fall in Feet.

8. If the Accident Involved a Fall, Describe, on the Comment Line, the Cause of the Fall.

## Evaluation of Extent to Which Study Data is Representative of NEISS

The study data generally parallel the data normally reported through NEISS. Because the use of the questionnaire greatly reduced the number of injuries for which location was unknown, study data have been compared with 1977 NEISS data for those injuries for which the location given was "public" and those for which location was unknown. Table A1 presents this comparison for each variable reported through NEISS. As can be seen, the two data bases have very similar distributions by diagnosis, body part, and disposition. The study data differ from, and are therefore not strictly representative of NEISS with respect to type of equipment, age and sex of victim.

- Type of Equipment -The possible effects of seasonality on the study data were examined with regard to type of equipment, because swings and see-saws are frequently taken down in the winter and put up again in the spring or early summer. The data in Table A1 reveal that these types of equipment were represented in the study data in roughly the same proportions as in NEISS data for the entire year 1977. Slides were underrepresented. Thus, seasonality does not appear to have affected the distribution of the study data, as far as this variable was concerned.

  Estimates, of hazard pattern by type of equipment, used to evaluate provisions of technical guidelines, have been derived controlling for type of equipment involved (see Table A9). For this reason the discrepancy in relative frequency by type of equipment does not affect the accuracy of this analysis.

- Age - The study data contained 10 percent fewer injuries to children less than five years of age than did NEISS for 1977. However, since many of these injuries were included among those addressed by the proposed guidelines, the effect of this underrepresentation may have been that the estimate of the target population of injuries is conservative.

- Sex - A higher proportion of the victims in the study cases were male than in the NEISS data for 1977; however, review of the distribution of injuries by hazard pattern and type of equipment, controlling for gender did not indicate important discrepancies.

It is believed that diagnosis, body part, and disposition, are the best indicators of representativeness and that the discrepancies in type of equipment, age of victim, and gender of victim either do not indicate differences in accuracy of the data, or have been adjusted for in the analysis.

## Explanation of Standard Errors Associated with Estimates

This analysis is based on national estimates from the NEISS sample of hospital emergency rooms for a three-week period. Because only a sample of emergency rooms is surveyed, these estimates are subject to sampling variability. The variations that might occur by chance are referred to as the standard error, or if expressed as a percentage of the estimate, the relative standard error. The chances are 68 out of 100 that an estimate from the sample will differ from a survey of all hospitals by less than the standard error. The table below presents the approximate relative standard errors of estimates based on NEISS.

| Estimated Number of Injuries | Relative Standard Error by Percent |
|---|---|
| 200 | 69 |
| 500 | 45 |
| 1,000 | 32 |
| 5,000 | 17 |
| 10,000 | 14 |
| 100,000 | 11 |

Example of Use of Table

An aggregate estimate of 1,000 injuries has a relative standard error of 32 percent or a standard error of ± 320 injuries (32 percent of 1,000).

## Study Design

### I. Background

The playground equipment product codes encompass two very different types of product, home playground equipment and public playground equipment. Public playground equipment is the heavy duty permanently installed type of equipment used by schools and parks. Home playground equipment is generally lighter weight equipment assembled and installed in private backyards by consumers. These two different types of the product are the subject of two separate Commission projects.

Public playground equipment was the subject of an offeror type proceeding and a draft mandatory product safety rule was submitted by the National Recreation and Parks Association. This standard was reviewed by the staff and found, in many instances, to be unsupported, unclear, or not workable. The staff then undertook to revise and modify this standard in order to develop a standard which can be finalized and published. CPSC and the National Bureau of Standards (NBS) are currently working on developing these requirements, and a final rule is expected to be ready by the end of 1978. This special study will provide a statistically representative body of detailed injury data to serve as a baseline against which to compare a similar body of data collected in the future. This will provide a measure of the effectiveness of the CPSC regulation in reducing injuries.

Home playground equipment is the subject of a still outstanding petition. In addition, the industry has developed a voluntary standard for this product, however, the petitioner has expressed dissatisfaction with the standard. The Commission is thus faced with a number of alternatives ranging from doing nothing to developing a mandatory regulation. Regardless of which option is chosen, the effectiveness will need to be measured. There are also some safety issues which have not as yet been resolved which relate to home playground equipment. For home playground equipment, then, this study will serve as a measure of effectiveness and as a decision-making tool to resolve unanswered safety questions.

### II. Objectives

The objectives of this study are:

1. To establish a baseline to measure effectiveness of regulatory activity.
2. To get an accurate report of the distribution of injuries between home and public types of playground equipment.
3. To provide quantification of the contributions of specific product features to injuries.
4. To provide an accurate quantification of the hazard patterns associated with playground equipment.

## III. Study Plan

The study will run from April 10 through May 1, 1978. NEISS product codes 1201, 1234, 1241-1244 and 1289 define the scope of the study. It is expected that approximately 800 playground-equipment associated injuries will be treated in NEISS hospital emergency rooms during this period. There are three stages of data collection for this study. The first stage is to take place in the hospital emergency room, where information will be collected by emergency room personnel using the attached questionnaire. Coded responses as indicated on the questionnaire will be provided to CPSC headquarters via the NEISS injury report. Quality control on these reports will be conducted by the Division of Data Collection, HIA. Minimum acceptable responses will include answers to questions 5 and 6, and, if appropriate, question 8. Those reports for which complete information in response to the questionnaire cannot be obtained through contact with the hospital, will be followed up telephonically by headquarters personnel. Based on past experience, approximately 100 such cases are expected. The objective of these follow-ups will be to complete the questionnaire. If in the process of completing the questionnaire, it is determined that the accident meets the selection criteria presented below, a full in-depth investigation will be assigned.

Case Selection Criteria:

a. All Cases for which the hazard pattern reported in response to question 5 (after HIEI has exercised quality control) is a through d or j through k, will be assigned for in-depth investigation.

b. All cases for which the answer to question 6 is a. yes, will be assigned for in-depth investigation.

It is expected that, overall, there will be approximately 150 cases assigned.

Because of the necessity of completing stage one of the data collection, it is expected that some case assignments may be up to two weeks after thetreatment date.

## IV. Rationale for Study Design

This study is being conducted in stages because very detailed information is required on only a small portion of the injuries, and because emergency room data collection requires very little turnaround time and allows a very high response rate.

It has been determined through statistical adjustment techniques that the majority of home playground equipment injuries and three-fourths of public playground equipment injuries result from falls. Because the three major pieces of information needed on falls are fairly simple, it has been decided to get this

information through the emergency room questionnaire. These pieces of information are: the event leading up to the fall, the approximate height of the fall, and the surface the victim landed on. Unless some other factor of interest is involved, such as structural failure, fall cases will not be assigned for full in-depth investigation. Other important hazards associated with playground equipment include:

1. impact with a moving component of the equipment,
2. pinch points and entrapment of body parts between or in moving components,
3. protruding bolts or hardware,
4. sharp edges and points,
5. structural failure.

Each of these hazards will need to be addressed regardless of which regulatory option is chosen. There will be a provision in the public playground equipment standard for each of these hazards, and there are still some open questions about these hazards as they relate to home playground equipment. Cases involving these hazards will be assigned for in-depth investigation.

## NEISS Surveillance Data

The National Electronic Injury Surveillance System, operated by the U.S. Consumer Product Safety Commission's Directorate for Hazard Identification and Analysis, has been fully operational since July 1, 1972. Designed to develop statistically valid, nationally representative product-related injury data, NEISS is a computer-based network of 119 statistically selected hospital emergency rooms located throughout the country.

NEISS utilizes teletype terminals in the emergency rooms which transmit surveillance data to a central computer. Each injury reported indicates the type of product involved and provides information about the victim and the injury--age, sex, injury diagnosis, body part involved, locale, date of treatment, and whether the victim was treated and released, was hospitalized, or was dead on arrival at the emergency room.

The participating hospitals in NEISS are a probability sample of all hospital emergency rooms in the United States. Therefore, injuries reported in these hospitals can be inflated to estimate all product-related injuries treated in hospital emergency rooms within the United States. The inflation factors or weights vary among participating hospitals and are based on the inverse of the probability of the hospital being selected in the sample.

The two-stage sample design was used in the selection of hospitals within NEISS. In the first stage, geographic areas of the nation were selected, based on probability proportional to population size. The second stage included the selection of hospitals from within those areas selected in the first stage. These hospitals were selected based on probability proporional to the number of annual emergency visits to the hospitals.

NEISS collects two levels of injury data-- surveillance and investigation. The surveillance data are comprised of the following data elements:

1. Date of Treatment
2. Age of Patient
3. Sex of Patient
4. Injury Diagnosis/Body Part
5. Disposition
6. Product Code
7. Second Product Involvement
8. Accident Locale or Type
9. Remarks/Comments

The data are extracted from the emergency department records, coded, and transmitted daily to CPSC through a network of telecommunications terminals located in the participating hospitals. These data are then used to generate national estimates.

## In-Depth Investigations

An in-depth investigation is usually a personal interview with the victim and/or the family or witnesses. During in-depth investigations, surveillance data are verified and additional information is gathered about the accident sequence, the victim, the environment, and the product involved. A manual for investigators (CPSC 9010.24) has been published, which outlines for investigators the basic information to be gathered. In addition this document contains product specific investigations guidelines prepared with input from the analytical staff who eventually interpret the data.

Because cases for this study were selected from a 100 percent sample of NEISS over a specific time period, they are statistically representative of injuries meeting the selection criteria, i.e. non-falls.

In depth investigations conducted as part of this study were performed using the following special guidelines.

## Investigation Guidelines

NOTE: FOLLOW ALL NORMAL INVESTIGATIVE GUIDELINES. THESE ADDITIONAL GUIDELINES ARE PROVED ONLY TO CLARIFY POINTS OF PARTICULAR IMPORTANCE TO THIS STUDY.

### All Cases

1. Note the surface under the equipment regardless of whether it is related to the accident or not. We hope to be able to use this information for a rough measure of exposure.

2. Determine the component or components involved.

3. Measure and describe fully the total piece of equipment and the component or components involved.

4. Measure the distance between the components of the equipment.

5. Measure the distance to other pieces of equipment or to obstructions.

6. Determine how many children were using the equipment at the time of the accident. Determine their ages, sizes.

7. Determine if the victim was familiar with this particular piece of equipment, the overall playground layout.

8. Determine whether adults were supervising play at the time of the accident.

9. Try to determine just what the child was doing, or thought he was doing at the time of the accident. Was he attempting a new game or a new trick at the time? Was there a structured game going on, such as tag, follow the leader, etc.?

10. It is very important to photograph the specific component of the equipment involved in the injury, and to get a detailed photograph of the exact portion of the component which inflicted the injury.

Impact Cases

1. Carefully describe the activities of the victim prior to and at the time of the accident.
   a. Was the victim walking or running between, in front of, or behind the component when struck?
   b. Was the victim pushed into the path of the component?
   c. Was the victim struck by an occupied or unoccupied component?
   d. Was the victim struck by the component or by the occupant? (E.g., the feet of a child on a swing.)
   e. Was the victim either getting off or getting onto the component which struck him?

Protrusion Cases

1. Describe and measure the projection/protrusion involved, length, diameter, etc.

2. Determine how contact was made with the protrusion, i.e. did the victim fall against it? Was the victim snagged by it in passing, etc.?

3. Determine whether the protrusion was a part of the equipment which would normally be exposed. Was the equipment broken, damaged, or modified to expose the protrusion. Was there or had there been any form of protective covering over the protrusion?

Sharp Edge Cases

1. Determine how the contact with the sharp edge occurred.

2. Examine the edge or point involved and make a judgement as to the sharpness.

Pinch Points - Body Part Entrapment - Clothing Entrapment Cases

1. Describe in detail how the body part or piece of clothing became entrapped.

2. Measure the relevant dimensions of the portion of the equipment which was involved, to include if possible, angle, lengths, diameter, distance, etc.

3. If clothing was involved, describe and photograph it.

Structural Failure Cases

1. Determine how equipment failed.

2. Find out how many children were on the equipment at the time it failed and their weights.

3. Determine if the equipment actually broke, or it tipped over because of instability or inadequate anchoring.

4. Determine the component which failed.

5. Determine the age of the equipment.

6. Determine the cause of the failure, wear, lack of maintenance, faulty assembly, or faulty design or construction. Describe.

The Commission also conducts in-depth investigations as the second level of NEISS data collection. These cases are selected from day to day surveillance reports using selection criteria provided by data analysts responsible for the product in question. This assignment procedure also bases case selection and assignment on the availability and work load of CPSC area office or contractor investigators. These cases, although not statistically selected, provide information about how a product is involved in accidents, and identify problem areas in the product and in the interaction between the user and the product.

Any deaths reported through the hospital surveillance system are also assigned for in-depth investigation.

In addition, consumer complaints, newspaper clippings, and records of Hot Line calls are reviewed by appropriate analytical personnel and cases which are of interest are hand selected for in-depth investigation.

The Commission has investigations on file dating back to 1965. These investigations may be utilized in analyzing the epidemiology of accidents in cases where such information is still relevant.

Presently, in-depth investigations are conducted by CPSC field staff and by private contractors. From 1970 until the Commission's establishment in May of 1973, investigations were conducted by the Food and Drug Administration's Bureau of Product Safety. Other investigations utilized by the Commission were conducted prior to 1970 by the former National Commission on Product Safety and by injury study units in the U.S. Public Health Service.

## Death Certificates

The procurement of death certificates is directed through the Division of Data Collection, Directorate of Hazard Identification and Analysis. Copies of death certificates for all external causes of death assumed to be product-related (e.g., burns, falls, and electrocutions) are received from participating health jurisdictions on a month-to-month basis. The death certificates are furnished to the Commission on a confidential basis and with the exception of printed summaries are not available to persons outside the Commission.

The Commission collects only death certificates that are product-related and classified according to the International Classification of Diseases-Adapted (IDCA) as accidental deaths. Data collected through the Death Certificate project are a minimum and understate the actual total of product-related deaths for the following reasons:

1) Not all Death Certificates identify the product and, therefore are not included in the count.

2) There are gaps in the data base in prior years for certain health jurisdictions due to non-participation.

3) There are also health jurisdictions which delay submitting reports, which often reduces the number of Death Certificates obtained for any recent time period.

Information from death certificates identified the fatal consequences of injuries associated with a product. This not only indicates that it is possible for the product to cause death, but also provides data about how fatal incidents occur. In addition, this data base provides an "at least" count of fatalities associated with the product.

## Appendix D

## LISTING OF 293 SPECIAL STUDY CASES REPORTED THROUGH NEISS HOSPITAL EMERGENCY ROOMS

KEY TO ABBREVIATIONS AND TERMS USED IN THIS LISTING

AGE - Ages are presented by age groups in years.

SEX - M = male
F = female

DIAGNOSIS (DIAG)

| | |
|---|---|
| Cont-Abr | = Contusion/Abrasion |
| Laceratn | = Laceration |
| Fractr | = Fracture |
| Strn-Spr | = Strain/Sprain |
| Disloc | = Dislocation |
| Puncture | = Puncture |
| Hematm | = Hematoma |
| Fornbdy | = Foreign Body |
| Concsn | = Concussion |
| Avulsion | = Avulsion |

BODY PART (BDYPT)

| | |
|---|---|
| Head | = Head, face, eye, ear, neck |
| Utrnk | = Upper trunk |
| Ltrnk | = Lower trunk |
| Uparm | = Upper arm |
| Lwarm | = Lower arm |
| Upleg | = Upper leg |
| Lwleg | = Lower leg |
| Hand | = Hand and finger |
| Foot | = Foot and toe |
| Alprt | = All parts of the body |

DISPOSITION (DISP)

| | |
|---|---|
| T & R | = Treated and Released |
| Hosp | = Hospitalized |

HAZARD PATTERN (HAZPAT)

| | |
|---|---|
| Impact-Equip | = Impact with moving equipment |
| Pinchpt | = Finger or other body part caught in pinch point |
| Protrusn | = Contact with protruding bolts, screws, or other hardware |
| Edg/Pnt | = Contact with sharp edge or sharp point |
| Surf-Fall | = Fell from equipment to surface below |
| Strksame | = Fell from equipment and struck another part of the same piece of equipment |
| Strkanthr | = Fell from equipment and struck another (separate) piece of equipment |
| Ran-into | = Fell or ran into or against stationary equipment |
| Equipjump | = Jumped from equipment |
| Nonresp | = Non-response |

CONDITION (COND)

| | |
|---|---|
| Bk | = Previously broken or broke at time of accident |
| Nb | = Not broken |
| ?? | = Condition unknown |

TYPE OF EQUIPMENT (TYPE)

| | |
|---|---|
| Swing | = swings only |
| Sw-set | = swing set |
| Seesaw | = seesaw |
| Slide | = slide |
| Mrry-go | = merry-go-rounds |
| Climber | = climbing apparatus |
| Sprngact | = spring action riding equipment |
| Tire/rop | = rope or tire swing |
| Sandbox | = sandbox |
| Other | = other |
| Nonresp | = nonresponse |

DISTANCE - Distances are expressed in feet for fall injuries.

SURFACE

| | |
|---|---|
| Grass | = grass |
| Earth | = bare earth |
| Sand | = sand |
| Gravel | = gravel |
| Concrt | = cement or concrete |
| Asphlt | = asphalt or macadam |
| Rubmat | = rubber matting |
| Sawdst | = sawdust |
| Tanbrk | = tanbark |
| Gr & erth | = grass and earth |
| Ea & grvl | = earth and gravel |
| Snd & asp | = sand and asphalt |
| Snd & grv | = sand and gravel |
| Gr & sand | = grass and sand |
| Con & asp | = concrete and asphalt |
| Con & rub | = concrete and rubber matting |
| Gr & grvl | = grass and gravel |
| Grv & con | = gravel and concrete |
| Nonresp | = non-response |

LOCATION (LOC)

| | |
|---|---|
| Apt | = apartment complex playground |
| Park | = public playground/park |
| Schl | = school playground |
| Dayc | = day-care center |
| Vllge | = children's village |
| Chrch | = church |

WEIGHT - The weight (estimated number of injur represented) is given to two decima places.

NOTE: This listing presents the information gathered through the special study questionnaire and information collected on the study cases through normal NEISS surveillance procedures.

NATIONAL ELECTRONIC INJURY SURVEILLANCE SYSTEM

SPECIAL STUDY ON PLAYGROUND EQUIPMENT

| AGE | SEX | DIAG | BODYPT | DISP | HAZPAT | CONS | MATL | TYPE | DISTANCE | SURFACE | LOC | WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5-10 | M | CONT-ABR | LWLEG | T+R | SURF_FALL | ?? | UNKN | UNKNOWN | ?? | UNKN | SCHL | 26.87 |
| 5-10 | M | CONT-ABR | LWLEG | T+R | SURF_FALL | ?? | UNKN | UNKNOWN | ?? | UNKN | PARK | 26.87 |
| 11-14 | M | CONT-ABR | HEAD | HOSP | UNKNOWN | ?? | UNKN | SWING | NA | UNKN | PARK | 26.15 |
| 5-7 | M | CONT-ABR | LWLEG | T+R | UNKNOWN | NS | WOOD | SWING | ?? | EARTH | DAYC | 5.28 |
| 3-4 | F | LACERATN | HEAD | T+R | IMPACT_EQUIP | ?? | UNKN | SWING | NA | UNKN | PARK | 16.12 |
| 0-1 | F | CONT-ABR | HEAD | T+R | IMPACT_EQUIP | NS | METAL | SWING | NA | GRASS | PARK | 15.97 |
| 0-1 | M | LACERATN | HEAD | T+R | IMPACT_EQUIP | NS | WOOD | SWING | NA | GRASS | APT | 2.59 |
| 15UP | M | LACERATN | HEAD | T+R | IMPACT_EQUIP | NS | METAL | SWING | NA | GRASS | SCHL | 15.88 |
| 5-7 | M | CONT-ABR | HEAD | T+R | IMPACT_EQUIP | SK | WOOD | SWING | NA | EARTH | SCHL | 31.46 |
| 3-4 | M | LACERATN | HEAD | T+R | IMPACT_EQUIP | NS | METAL | SWING | NA | EARTH | SCHL | 67.98 |
| 5-7 | F | LACERATN | HEAD | T+R | IMPACT_EQUIP | NS | METAL | SWING | NA | EARTH | DAYC | 4.98 |
| 0-1 | F | LACERATN | HEAD | T+R | IMPACT_EQUIP | NS | METAL | SWING | NA | EARTH | PARK | 18.06 |
| 0-1 | F | LACERATN | HEAD | T+R | IMPACT_EQUIP | NS | METAL | SWING | NA | EARTH | APT | 34.47 |
| 0-1 | M | LACERATN | HEAD | T+R | IMPACT_EQUIP | NS | WOOD | SWING | NA | EARTH | PARK | 2.59 |
| 0-1 | M | CONT-ABR | HEAD | T+R | IMPACT_EQUIP | NS | WOOD | SWING | NA | CONCRT | PARK | 8.29 |
| 11-14 | M | LACERATN | HEAD | T+R | IMPACT_EQUIP | NS | METAL | SWING | NA | CONCRT | APT | 5.62 |
| 5-7 | M | LACERATN | HEAD | T+R | IMPACT_EQUIP | ?? | WOOD | SWING | NA | CONCRT | SCHL | 18.12 |
| 5-10 | F | CONT-ABR | HEAD | T+R | IMPACT_EQUIP | NS | METAL | SWING | NA | ASPHLT | SCHL | 48.53 |
| 0-1 | M | LACERATN | HEAD | T+R | IMPACT_EQUIP | NS | METAL | SWING | NA | RUBMAT | PARK | 15.88 |
| 3-4 | F | LACERATN | HEAD | T+R | IMPACT_EQUIP | NS | METAL | SWING | NA | GR+ERTH | PARK | 64.40 |
| 5-10 | M | LACERATN | LTRNK | HOSP | PROTRUSN | SK | METAL | SWING | NA | GRASS | APT | 5.62 |
| 5-10 | M | CONT-ABR | LWARM | T+R | SURF_FALL | NS | METAL | SWING | ?? | UNKN | APT | 8.67 |
| 5-7 | M | FRACTR | LWARM | HOSP | SURF_FALL | ?? | UNKN | SWING | ?? | UNKN | SCHL | 15.97 |
| 15UP | F | STRN_SPR | HAND | T+R | SURF_FALL | NS | UNKN | SWING | ?? | UNKN | PARK | 15.97 |
| 5-7 | F | CONT-ABR | LWARM | T+R | SURF_FALL | NS | METAL | SWING | 03 | GRASS | SCHL | 21.82 |
| 5-10 | F | FRACTR | LWARM | T+R | SURF_FALL | ?? | METAL | SWING | ?? | GRASS | APT | 2.59 |
| 3-4 | M | LACERATN | HEAD | T+R | SURF_FALL | ?? | METAL | SWING | 02 | GRASS | PARK | 40.42 |
| 11-14 | M | STRN_SPR | LWLEG | T+R | SURF_FALL | NS | METAL | SWING | 02 | GRASS | SCHL | 1.98 |
| 11-14 | F | CONT-ABR | LTRNK | T+R | SURF_FALL | SK | METAL | SWING | 06 | EARTH | SCHL | 51.15 |
| 11-14 | M | CONT-ABR | LWARM | T+R | SURF_FALL | NS | METAL | SWING | 06 | EARTH | PARK | 13.68 |
| 5-10 | F | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | SWING | 03 | EARTH | DAYC | 34.65 |
| 5-7 | M | FRACTR | LWARM | T+R | SURF_FALL | ?? | METAL | SWING | ?? | EARTH | PARK | 63.60 |
| 5-7 | M | FRACTR | LWLEG | HOSP | SURF_FALL | NS | METAL | SWING | 06 | EARTH | SCHL | 14.43 |
| 0-1 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SWING | ?? | EARTH | PARK | 4.98 |
| 0-1 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SWING | 03 | EARTH | PARK | 7.57 |
| 5-10 | M | STRN_SPR | FOOT | T+R | SURF_FALL | NS | METAL | SWING | 03 | EARTH | APT | 13.49 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | ?? | UNKN | SWING | ?? | SAND | SCHL | 3.62 |
| 11-14 | F | CONT-ABR | HEAD | T+R | SURF_FALL | ?? | UNKN | SWING | ?? | SAND | PARK | 16.12 |
| 3-4 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SWING | ?? | SAND | PARK | 4.98 |
| 5-7 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SWING | ?? | SAND | SCHL | 5.66 |
| 3-4 | F | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SWING | ?? | SAND | PARK | 26.15 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | ?? | UNKN | SWING | ?? | GRAVEL | SCHL | 2.59 |
| 5-10 | F | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | SWING | ?? | GRAVEL | SCHL | 40.58 |
| 5-10 | F | LACERATN | HEAD | T+R | SURF_FALL | NS | UNKN | SWING | 02 | GRAVEL | PARK | 20.80 |
| 5-7 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SWING | 02 | GRAVEL | SCHL | 258.46 |
| 0-1 | F | DISLOC | HEAD | T+R | SURF_FALL | ?? | METAL | SWING | 02 | CONCRT | PARK | 13.49 |
| 11-14 | M | FRACTR | LWARM | HOSP | SURF_FALL | NS | METAL | SWING | 03 | CONCRT | SCHL | 16.12 |
| 5-10 | F | LACERATN | HEAD | T+R | SURF_FALL | SK | WOOD | SWING | ?? | CONCRT | APT | 5.62 |
| 5-10 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SWING | ?? | CONCRT | SCHL | 7.53 |
| 5-10 | F | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SWING | ?? | CONCRT | SCHL | 7.53 |
| 3-4 | M | PUNCTURE | HEAD | T+R | SURF_FALL | NS | METAL | SWING | 02 | CONCRT | APT | 34.47 |
| 11-14 | M | STRN_SPR | LWARM | T+R | SURF_FALL | NS | METAL | SWING | 07 | CONCRT | SCHL | 16.32 |
| 5-7 | M | STRN_SPR | UTRNK | T+R | SURF_FALL | NS | METAL | SWING | 01 | CONCRT | PARK | 5.66 |
| 11-14 | ? | CONT-ABR | LWARM | T+R | SURF_FALL | SK | METAL | SWING | 03 | ASPHLT | SCHL | 11.56 |
| 3-4 | F | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SWING | ?? | ASPHLT | PARK | 26.15 |
| 5-7 | ? | CONT-ABR | HEAD | T+R | STRKSAME | NS | METAL | SWING | 06 | EA+GRVL | PARK | 7.57 |
| 5-7 | M | LACERATN | HEAD | T+R | RAN_INTO | NS | METAL | SWING | NA | GRASS | PARK | 5.62 |
| 5-7 | F | LACERATN | HEAD | T+R | RAN_INTO | NS | METAL | SWING | NA | EARTH | PARK | 10.37 |
| 3-4 | M | LACERATN | HEAD | T+R | RAN_INTO | NS | METAL | SWING | 03 | SAND | PARK | 4.89 |
| 5-10 | M | CONT-ABR | LWLEG | T+R | EQUIPJUMP | NS | METAL | SWING | ?? | EARTH | SCHL | 15.55 |
| 5-10 | M | STRN_SPR | FOOT | T+R | EQUIPJUMP | NS | METAL | SWING | 09 | EARTH | PARK | 4.98 |
| 11-14 | M | STRN_SPR | HEAD | T+R | EQUIPJUMP | NS | METAL | SWING | ?? | SAND | PARK | 4.98 |
| 11-14 | F | CONT-ABR | LWLEG | T+R | EQUIPJUMP | NS | METAL | SWING | ?? | CONCRT | SCHL | 19.83 |
| 5-10 | F | CONT-ABR | HEAD | T+R | EQUIPJUMP | NS | METAL | SWING | 04 | SND+ASP | SCHL | 14.43 |
| 0-1 | M | LACERATN | HEAD | T+R | NONRESP | NA | WOOD | SWING | NA | GRASS | APT | 13.11 |
| 3-4 | F | FRACTR | HEAD | T+R | UNKNOWN | NS | METAL | SW_SET | ?? | CONCRT | APT | 3.62 |
| 5-7 | M | LACERATN | HEAD | T+R | IMPACT_EQUIP | ?? | WOOD | SW_SET | NA | GRASS | APT | 2.59 |
| 3-4 | M | HEMATN | HEAD | T+R | IMPACT_EQUIP | NS | METAL | SW_SET | 02 | EARTH | APT | 56.41 |
| 5-10 | M | CONT-ABR | LWARM | T+R | SURF_FALL | NS | METAL | SW_SET | ?? | GRASS | SCHL | 10.70 |
| 0-1 | M | CONT-ABR | LTRNK | T+R | SURF_FALL | NS | METAL | SW_SET | 05 | GRASS | PARK | 31.46 |

NATIONAL ELECTRONIC INJURY SURVEILLANCE SYSTEM

SPECIAL STUDY ON PLAYGROUND EQUIPMENT

| AGE | SEX | DIAG | BODYPT | DISP | MAZPAT | COND | MATL | TYPE | DISTANCE | SURFACE | LOC | WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11-14 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | SW_SET | ?? | GRASS | VLLGE | 26.15 |
| 8-10 | F | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | SW_SET | 07 | GRASS | APT | 14.80 |
| 5-7 | M | STRN_SPR | LWARM | T+R | SURF_FALL | NS | METAL | SW_SET | ?? | GRASS | SCHL | 13.49 |
| 3-4 | M | STRN_SPR | LWARM | T+R | SURF_FALL | NS | METAL | SW_SET | ?? | EARTH | APT | 4.90 |
| 5-7 | F | STRN_SPR | LWARM | T+R | SURF_FALL | NS | METAL | SW_SET | ?? | EARTH | PARK | 8.78 |
| 5-7 | M | FRACTR | UPARM | HOSP | SURF_FALL | NS | METAL | SW_SET | ?? | SAND | SCHL | 5.62 |
| 11-14 | F | HEMATM | LWLEG | T+R | SURF_FALL | NS | METAL | SW_SET | ?? | SAND | SCHL | 5.62 |
| 5-7 | F | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SW_SET | 03 | SAND | APT | 10.63 |
| 3-4 | F | FRACTR | HEAD | T+R | SURF_FALL | ?? | UNKN | SW_SET | 03 | CONCRT | SCHL | 20.40 |
| 3-4 | M | CONT-ABR | HEAD | T+R | SURF_FALL | ?? | UNKN | SW_SET | ?? | ASPHLT | SCHL | 11.52 |
| 3-4 | F | LACERATN | HEAD | T+R | STRKANTHR | NS | METAL | SW_SET | ?? | SAND | PARK | 9.24 |
| 11-14 | F | CONT-ABR | FOOT | T+R | EQUIPJUMP | NS | METAL | SW_SET | ?? | GRASS | SCHL | 7.57 |
| 8-10 | M | CONT-ABR | HEAD | T+R | EQUIPJUMP | NS | METAL | SW_SET | ?? | ASPHLT | SCHL | 28.99 |
| 5-7 | F | CONT-ABR | HEAD | T+R | UNKNOWN | NS | UNKN | SEESAW | ?? | ASPHLT | SCHL | 10.58 |
| 11-14 | M | LACERATN | HEAD | T+R | IMPACT_EQUIP | ?? | METAL | SEESAW | NA | UNKN | PARK | 16.12 |
| 5-7 | M | FRACTR | LWARM | T+R | IMPACT_EQUIP | NS | UNKN | SEESAW | NA | CONCRT | SCHL | 14.43 |
| 5-7 | M | CONT-ABR | HEAD | T+R | IMPACT_EQUIP | NS | WOOD | SEESAW | NA | ASPHLT | PARK | 10.95 |
| 11-14 | M | FRACTR | LWARM | T+R | IMPACT_EQUIP | NS | UNKN | SEESAW | NA | ASPHLT | SCHL | 9.76 |
| 5-7 | F | FORNBDY | LTRNK | T+R | EDG/PNT | NS | WOOD | SEESAW | NA | EARTH | SCHL | 2.59 |
| 5-7 | F | FORNBDY | LWLEG | T+R | EDG/PNT | NS | WOOD | SEESAW | NA | SND+GRV | SCHL | 6.79 |
| 5-7 | F | CONT-ABR | LWLEG | T+R | SURF_FALL | NS | METAL | SEESAW | ?? | UNKN | APT | 5.62 |
| 3-4 | F | CONT-ABR | LWLEG | T+R | SURF_FALL | NS | METAL | SEESAW | 05 | GRASS | PARK | 16.32 |
| 5-7 | F | CONT-ABR | HEAD | HOSP | SURF_FALL | NS | WOOD | SEESAW | 07 | EARTH | PARK | 40.42 |
| 3-4 | M | FRACTR | LWLEG | HOSP | SURF_FALL | NS | UNKN | SEESAW | 04 | EARTH | PARK | 4.98 |
| 8-10 | F | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | SEESAW | 03 | EARTH | SCHL | 51.35 |
| 0-1 | M | CONCSN | HEAD | T+R | SURF_FALL | NS | WOOD | SEESAW | 02 | ASPHLT | SCHL | 16.32 |
| 5-7 | F | FRACTR | LWARM | T+R | SURF_FALL | NS | WOOD | SEESAW | 02 | ASPHLT | SCHL | 31.46 |
| 8-10 | F | CONT-ABR | HEAD | T+R | STRKSAME | NS | WOOD | SEESAW | ?? | SAND | SCHL | 38.67 |
| 11-14 | M | LACERATN | HEAD | T+R | RAN_INTO | NS | WOOD | SEESAW | NA | UNKN | PARK | 5.57 |
| 8-10 | M | FRACTR | LWARM | HOSP | NONRESP | NR | ROPE | SEESAW | NR | NONRSP | PARK | 41.19 |
| 8-10 | M | STRN_SPR | LWLEG | T+R | UNKNOWN | NS | METAL | SLIDE | ?? | UNKN | SCHL | 15.55 |
| 5-7 | F | CONT-ABR | HEAD | T+R | PROTRUSN | NS | METAL | SLIDE | NA | EARTH | APT | 67.90 |
| 8-10 | F | STRN_SPR | FOOT | T+R | PROTRUSN | NS | METAL | SLIDE | NA | EARTH | PARK | 15.97 |
| 5-7 | M | STRN_SPR | LWLEG | T+R | SURF_FALL | NS | UNKN | SLIDE | ?? | UNKN | PARK | 26.87 |
| 3-4 | M | CONT-ABR | FOOT | T+R | SURF_FALL | NS | METAL | SLIDE | ?? | GRASS | APT | 1.95 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | SLIDE | 08 | GRASS | PARK | 25.79 |
| 5-7 | M | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | SLIDE | 07 | GRASS | SCHL | 1.95 |
| 11-14 | M | FRACTR | LWLEG | T+R | SURF_FALL | SK | METAL | SLIDE | ?? | GRASS | INST | 1.95 |
| 8-10 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SLIDE | ?? | GRASS | PARK | 40.42 |
| 3-4 | F | LACERATN | HEAD | HOSP | SURF_FALL | NS | METAL | SLIDE | 04 | GRASS | APT | 8.67 |
| 5-7 | M | STRN_SPR | FOOT | T+R | SURF_FALL | NS | METAL | SLIDE | ?? | GRASS | PARK | 5.62 |
| 5-7 | F | CONT-ABR | LWARM | T+R | SURF_FALL | NS | METAL | SLIDE | ?? | EARTH | APT | 4.90 |
| 5-7 | M | FRACTR | LWLEG | T+R | SURF_FALL | NS | METAL | SLIDE | NA | EARTH | SCHL | 5.66 |
| 11-14 | M | STRN_SPR | LWLEG | T+R | SURF_FALL | ?? | METAL | SLIDE | ?? | EARTH | PARK | 13.18 |
| 5-7 | M | CONCSN | HEAD | HOSP | SURF_FALL | NS | METAL | SLIDE | 06 | SAND | APT | 18.06 |
| 8-10 | M | CONT-ABR | LWARM | T+R | SURF_FALL | NS | METAL | SLIDE | ?? | SAND | SCHL | 34.47 |
| 11-14 | F | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | SLIDE | 06 | SAND | PARK | 6.79 |
| 11-14 | M | CONT-ABR | HAND | T+R | SURF_FALL | NS | METAL | SLIDE | ?? | SAND | SCHL | 13.11 |
| 1SUP | F | CONT-ABR | UTRNK | T+R | SURF_FALL | NS | METAL | SLIDE | 05 | SAND | PARK | 5.23 |
| 3-4 | M | FRACTR | LWARM | T+R | SURF_FALL | ?? | METAL | SLIDE | 12 | SAND | SCHL | 15.97 |
| 3-4 | M | HEMATM | LWARM | T+R | SURF_FALL | NS | METAL | SLIDE | ?? | SAND | DAYC | 9.26 |
| 5-7 | M | FRACTR | LWLEG | T+R | SURF_FALL | NS | METAL | SLIDE | ?? | GRAVEL | PARK | 29.86 |
| 3-4 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SLIDE | ?? | GRAVEL | APT | 8.67 |
| 5-7 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SLIDE | 06 | GRAVEL | SCHL | 29.86 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | SLIDE | 05 | CONCRT | SCHL | 9.76 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | SLIDE | 06 | CONCRT | SCHL | 42.80 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | UNKN | SLIDE | 03 | CONCRT | PARK | 13.18 |
| 0-1 | M | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | SLIDE | ?? | CONCRT | PARK | 9.37 |
| 3-4 | F | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | SLIDE | 07 | CONCRT | SCHL | 20.80 |
| 3-4 | M | FRACTR | LWARM | HOSP | SURF_FALL | NS | METAL | SLIDE | 06 | RUBMAT | SCHL | 19.71 |
| 5-7 | M | FRACTR | HEAD | T+R | SURF_FALL | NS | WOOD | SLIDE | 08 | GR+SAND | APT | 31.46 |
| 5-7 | M | STRN_SPR | UPLEG | T+R | SURF_FALL | NS | METAL | SLIDE | 04 | SND+ASP | SCHL | 8.67 |
| 0-1 | M | CONT-ABR | LWLEG | T+R | SURF_FALL | NS | METAL | SLIDE | 08 | CON+ASP | PARK | 18.06 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | UNKN | SLIDE | 05 | CON+RUB | SCHL | 4.99 |
| 8-10 | F | CONT-ABR | LWLEG | T+R | STRKSAME | NS | UNKN | SLIDE | ?? | UNKN | PARK | 5.62 |
| 8-10 | M | CONT-ABR | HEAD | T+R | STRKSAME | NS | METAL | SLIDE | 01 | SAND | SCHL | 34.47 |
| 11-14 | F | STRN_SPR | HAND | T+R | STRKSAME | NS | METAL | SLIDE | ?? | GRAVEL | SCHL | 9.79 |
| 0-1 | M | LACERATN | HEAD | T+R | RAN_INTO | NS | METAL | SLIDE | NA | GRASS | PARK | 9.37 |
| 11-14 | F | STRN_SPR | HAND | T+R | RAN_INTO | NS | METAL | SLIDE | NA | CONCRT | PARK | 13.06 |
| 3-4 | M | CONT-ABR | HEAD | T+R | RAN_INTO | NS | WOOD | SLIDE | NA | SAWDST | SCHL | 34.47 |



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NATIONAL ELECTRONIC INJURY SURVEILLANCE SYSTEM

SPECIAL STUDY ON PLAYGROUND EQUIPMENT

| AGE | SEX | DIAG | BDYPT | DISP | HAZPAT | COND | MATL | TYPE | DISTANCE | SURFACE | LOC | WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5-7 | F | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 04 | SAND | SCHL | 10.54 |
| 8-10 | M | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 08 | SAND | SCHL | 6.98 |
| 8-10 | F | FRACTR | UPARM | HOSP | SURF_FALL | NS | METAL | CLIMBER | ?? | SAND | PARK | 16.32 |
| 11-14 | M | FRACTR | UTRNK | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | SAND | SCHL | 6.98 |
| 5-7 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | SAND | SCHL | 10.42 |
| 11-14 | F | STRN_SPR | LTRNK | T+R | SURF_FALL | NS | METAL | CLIMBER | 05 | SAND | PARK | 5.70 |
| 8-10 | F | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 05 | GRAVEL | SCHL | 13.11 |
| 5-7 | F | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | 05 | GRAVEL | SCHL | 6.79 |
| 8-10 | F | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | 04 | GRAVEL | SCHL | 20.99 |
| 8-10 | M | STRN_SPR | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | 08 | GRAVEL | SCHL | 13.11 |
| 3-4 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | FIBRG | CLIMBER | ?? | CONCRT | DAYC | 18.92 |
| 5-7 | F | CONT-ABR | HEAD | T+R | SURF_FALL | SK | METAL | CLIMBER | ?? | CONCRT | SCHL | 29.89 |
| 8-10 | F | STRN_SPR | LWLEG | T+R | SURF_FALL | ?? | METAL | CLIMBER | ?? | CONCRT | SCHL | 10.53 |
| 5-7 | F | STRN_SPR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | CONCRT | SCHL | 14.63 |
| 5-7 | F | CONCSN | HEAD | HOSP | SURF_FALL | ?? | METAL | CLIMBER | ?? | ASPHLT | SCHL | 20.89 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | WOOD | CLIMBER | 05 | ASPHLT | SCHL | 15.92 |
| 11-14 | F | CONT-ABR | UTRNK | T+R | SURF_FALL | NS | WOOD | CLIMBER | ?? | ASPHLT | SCHL | 10.58 |
| 5-7 | M | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 03 | ASPHLT | SCHL | 28.89 |
| 8-10 | F | HEMATM | LWARM | T+R | SURF_FALL | ?? | UNKN | CLIMBER | ?? | ASPHLT | SCHL | 11.52 |
| 3-4 | M | LACERATN | HEAD | T+R | SURF_FALL | ?? | METAL | CLIMBER | ?? | ASPHLT | SCHL | 19.88 |
| 8-10 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | 03 | ASPHLT | SCHL | 33.46 |
| 8-10 | F | FRACTR | FOOT | T+R | SURF_FALL | NS | METAL | CLIMBER | 02 | RUBMAT | PARK | 21.82 |
| 8-10 | F | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 08 | SANDST | SCHL | 34.47 |
| 8-10 | F | FRACTR | LWARM | T+R | SURF_FALL | NS | UNKN | CLIMBER | ?? | SANDST | SCHL | 34.47 |
| 3-4 | F | HEMATM | HEAD | T+R | SURF_FALL | ?? | WOOD | CLIMBER | 04 | OTHER | DAYC | 31.37 |
| 3-4 | F | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 03 | GR+ERTH | DAYC | 94.18 |
| 8-10 | M | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 06 | GR+SAND | APT | 15.55 |
| 3-4 | F | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | 05 | GR+GRVL | PARK | 26.15 |
| 5-7 | M | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 05 | TANBRK | SCHL | 8.85 |
| 1SUP | F | STRN_SPR | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | 04 | SND+GRV | PARK | 13.49 |
| 8-10 | M | CONT-ABR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 12 | GRV+CON | PARK | 5.66 |
| 3-4 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | WOOD | CLIMBER | 04 | UNKN | SCHL | 11.54 |
| 8-10 | M | CONT-ABR | UTRNK | T+R | STRKSAME | NS | METAL | CLIMBER | ?? | UNKN | PARK | 288.46 |
| 8-10 | F | CONT-ABR | HEAD | T+R | STRKSAME | NS | METAL | CLIMBER | ?? | UNKN | PARK | 88.76 |
| 5-7 | M | LACERATN | HEAD | T+R | STRKSAME | NS | METAL | CLIMBER | ?? | UNKN | SCHL | 31.46 |
| 8-10 | F | STRN_SPR | LWLEG | T+R | STRKSAME | ?? | UNKN | CLIMBER | ?? | UNKN | SCHL | 16.32 |
| 5-7 | M | FRACTR | LWARM | T+R | STRKSAME | NS | METAL | CLIMBER | ?? | GRASS | SCHL | 40.58 |
| 8-10 | M | CONT-ABR | HEAD | T+R | STRKSAME | NS | METAL | CLIMBER | 05 | EARTH | SCHL | 14.43 |
| 3-10 | M | FRACTR | LWARM | T+R | STRKSAME | NS | METAL | CLIMBER | 03 | EARTH | SCHL | 34.65 |
| 5-7 | M | LACERATN | HEAD | T+R | STRKSAME | NS | METAL | CLIMBER | 02 | EARTH | SCHL | 34.65 |
| 5-7 | M | CONT-ABR | HEAD | T+R | STRKSAME | NS | METAL | CLIMBER | ?? | SAND | SCHL | 94.18 |
| 3-4 | F | FRACTR | HEAD | T+R | STRKSAME | NS | METAL | CLIMBER | 04 | SAND | DAYC | 94.18 |
| 5-7 | M | CONT-ABR | UTRNK | T+R | STRKSAME | NS | METAL | CLIMBER | 03 | CONCRT | SCHL | 14.43 |
| 11-14 | F | CONT-ABR | LWLEG | T+R | STRKSAME | NS | METAL | CLIMBER | 05 | WATER | SCHL | 34.47 |
| 5-7 | M | LACERATN | HEAD | T+R | STRKSAME | NS | METAL | CLIMBER | ?? | EA+GRVL | DAYC | 15.55 |
| 11-14 | M | HEMATM | HEAD | T+R | RAN_INTO | NS | METAL | CLIMBER | NA | UNKN | SCHL | 514.38 |
| 5-7 | M | FRACTR | HEAD | T+R | RAN_INTO | NS | METAL | CLIMBER | NA | SAND | PARK | 5.62 |
| 8-10 | M | STRN_SPR | LWARM | T+R | RAN_INTO | NS | METAL | CLIMBER | ?? | SAND | SCHL | 6.98 |
| 5-7 | M | LACERATN | HEAD | T+R | RAN_INTO | NS | METAL | CLIMBER | NA | CONCRT | PARK | 3.62 |
| 11-14 | M | HEMATM | LWLEG | T+R | RAN_INTO | NS | METAL | CLIMBER | NA | SANDST | SCHL | 34.47 |
| 5-7 | F | FRACTR | HAND | T+R | EQUIPJUMP | NS | UNKN | CLIMBER | ?? | UNKN | SCHL | 20.80 |
| 8-10 | M | OTHER | UTRNK | T+R | EQUIPJUMP | NS | METAL | CLIMBER | ?? | GRASS | APT | 14.43 |
| 11-14 | M | CONCSN | HEAD | T+R | EQUIPJUMP | NS | METAL | CLIMBER | 02 | EARTH | SCHL | 14.43 |
| 8-10 | M | FRACTR | LWARM | HOSP | EQUIPJUMP | NS | METAL | CLIMBER | 06 | SAND | SCHL | 14.43 |
| 5-7 | M | STRN_SPR | LWLEG | T+R | EQUIPJUMP | NS | METAL | CLIMBER | 02 | RUBMAT | SCHL | 10.42 |
| 5-7 | M | STRN_SPR | FOOT | T+R | EQUIPJUMP | NS | WOOD | CLIMBER | ?? | SANDST | SCHL | 34.47 |
| 3-4 | M | CONT-ABR | HEAD | T+R | NONRESP | NR | WOOD | CLIMBER | NR | GRASS | CHRCH | 29.88 |
| 11-14 | F | FRACTR | LWLEG | T+R | NONRESP | NR | UNKN | CLIMBER | NR | GRASS | SCHL | 94.18 |
| 5-7 | F | FRACTR | LWARM | T+R | NONRESP | NR | ROPE | CLIMBER | NR | NONRSP | PARK | 9.70 |
| 8-10 | M | FRACTR | LWARM | HOSP | NONRESP | NR | ROPE | CLIMBER | NR | NONRSP | PARK | 4.89 |
| 5-7 | F | FRACTR | LWARM | T+R | NONRESP | NR | ROPE | CLIMBER | NR | NONRSP | PARK | 19.88 |
| 1SUP | F | STRN_SPR | LWLEG | T+R | NONRESP | NR | ROPE | CLIMBER | NR | NONRSP | PARK | 30.09 |
| 8-10 | F | CONT-ABR | HAND | T+R | IMPACT_EQUIP | NS | METAL | SPRNGACT | NA | TANBRK | SCHL | 34.47 |
| 3-4 | M | CONT-ABR | LWARM | T+R | SURF_FALL | NS | METAL | SPRNGACT | 02 | EARTH | APT | 29.88 |
| 5-7 | F | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | SPRNGACT | ?? | SAND | PARK | 15.97 |
| 11-14 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | RUBBR | TIRE/ROP | 02 | EARTH | SCHL | 3.95 |
| 1SUP | M | FRACTR | LWARM | T+R | SURF_FALL | NS | ROPE | TIRE/ROP | ?? | SAND | SCHL | 10.58 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | RUBBR | TIRE/ROP | ?? | SANDST | SCHL | 34.47 |
| 11-14 | M | CONT-ABR | HAND | T+R | SURF_FALL | NS | CHAIN | TIRE/ROP | 05 | SANDST | SCHL | 34.47 |
| 5-7 | M | FRACTR | LWARM | T+R | NONRESP | NR | ROPE | SANDBOX | NR | NONRSP | DAYC | 1.95 |

NATIONAL ELECTRONIC INJURY SURVEILLANCE SYSTEM

SPECIAL STUDY ON PLAYGROUND EQUIPMENT

| AGE | SEX | DIAG | BDYPT | DISP | HAZPAT | COND | MATL | TYPE | DISTANCE | SURFACE | LOC | WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5-7 | F | FRACTR | LWARM | HOSP | EQUIP_JUMP | NS | METAL | SLIDE | 02 | SAND | PARK | 14.43 |
| 8-10 | M | LACERATN | HEAD | T+R | STRKANTHR | ?? | WOOD | SLIDE | ?? | UNKN | SCHL | 30.09 |
| 11-14 | F | CONT-ABR | UTRNK | T+R | UNKNOWN | NS | METAL | MRRY-GO | 02 | SAND | SCHL | 13.11 |
| 3-4 | M | HEMATM | HEAD | T+R | IMPACT_EQUIP | NS | METAL | MRRY-GO | NA | SAND | PARK | 14.43 |
| 5-7 | M | FRACTR | LWLEG | T+R | PINCHPT | NS | METAL | MRRY-GO | NA | EARTH | PARK | 86.76 |
| 5-7 | M | STRN_SPR | LWLEG | T+R | SURF_FALL | ?? | UNKN | MRRY-GO | ?? | UNKN | SCHL | 62.83 |
| 8-10 | M | CONCSN | HEAD | HOSP | SURF_FALL | NS | METAL | MRRY-GO | 02 | GRASS | SCHL | 56.41 |
| 5-7 | M | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | MRRY-GO | 06 | GRASS | PARK | 6.98 |
| 3-4 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | MRRY-GO | ?? | EARTH | APT | 5.57 |
| 8-10 | F | CONT-ABR | LWARM | T+R | SURF_FALL | NS | METAL | MRRY-GO | 02 | EARTH | SCHL | 56.41 |
| 11-14 | F | LACERATN | LWLEG | T+R | SURF_FALL | NS | METAL | MRRY-GO | 02 | EARTH | PARK | 2.59 |
| 11-14 | F | IOI | LTRNK | HOSP | SURF_FALL | NS | METAL | MRRY-GO | ?? | EARTH | SCHL | 16.12 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | MRRY-GO | 02 | GRAVEL | PARK | 129.60 |
| 5-7 | M | FRACTR | FOOT | T+R | SURF_FALL | BK | METAL | MRRY-GO | 01 | ASPHLT | SCHL | 51.35 |
| 8-10 | M | CONT-ABR | UPLEG | T+R | STRKSAME | ?? | METAL | MRRY-GO | ?? | UNKN | SCHL | 15.55 |
| 11-14 | M | LACERATN | HEAD | T+R | STRKSAME | NS | METAL | MRRY-GO | 01 | GRAVEL | SCHL | 6.79 |
| 11-14 | F | CONT-ABR | FOOT | T+R | EQUIP_JUMP | NS | METAL | MRRY-GO | ?? | UNKN | PARK | 15.97 |
| 5-7 | M | FRACTR | UPLEG | HOSP | OTH_IMPACT | NS | METAL | MRRY-GO | NA | SAND | PARK | 15.97 |
| 5-7 | F | CONCSN | HEAD | T+R | UNKNOWN | ?? | METAL | CLIMBER | ?? | UNKN | SCHL | 86.76 |
| 5-7 | M | LACERATN | HEAD | T+R | UNKNOWN | NS | METAL | CLIMBER | 05 | SAND | SCHL | 13.11 |
| 5-7 | M | LACERATN | HEAD | T+R | UNKNOWN | NS | METAL | CLIMBER | 04 | CONCRT | SCHL | 15.55 |
| 8-10 | M | LACERATN | UTRNK | T+R | PROTRUSN | NS | METAL | CLIMBER | ?? | UNKN | SCHL | 64.40 |
| 8-10 | M | LACERATN | UPLEG | T+R | EDG/PNT | ?? | METAL | CLIMBER | NA | CONCRT | SCHL | 5.62 |
| 5-7 | F | CONCSN | HEAD | HOSP | SURF_FALL | ?? | WOOD | CLIMBER | 05 | UNKN | PARK | 5.62 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | UNKN | SCHL | 13.11 |
| 5-7 | F | CONT-ABR | HAND | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | UNKN | SCHL | 34.47 |
| 8-10 | F | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | UNKN | PARK | 10.37 |
| 8-10 | M | CONT-ABR | UTRNK | T+R | SURF_FALL | NS | WOOD | CLIMBER | 06 | UNKN | SCHL | 34.47 |
| 5-7 | M | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 04 | UNKN | SCHL | 42.83 |
| 5-7 | M | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | UNKN | SCHL | 13.68 |
| 8-10 | F | FRACTR | LWARM | T+R | SURF_FALL | ?? | METAL | CLIMBER | ?? | UNKN | SCHL | 14.80 |
| 8-10 | M | FRACTR | LWARM | HOSP | SURF_FALL | ?? | UNKN | CLIMBER | ?? | UNKN | SCHL | 3.62 |
| 5-7 | M | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | UNKN | SCHL | 14.43 |
| 5-7 | F | STRN_SPR | LWLEG | T+R | SURF_FALL | ?? | UNKN | CLIMBER | ?? | UNKN | SCHL | 62.83 |
| 8-10 | M | STRN_SPR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 05 | UNKN | SCHL | 34.47 |
| 11-14 | F | STRN_SPR | LWARM | T+R | SURF_FALL | ?? | METAL | CLIMBER | ?? | UNKN | SCHL | 26.87 |
| 5-7 | M | CONT-ABR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 01 | GRASS | SCHL | 51.35 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | WOOD | CLIMBER | 04 | GRASS | PARK | 15.55 |
| 5-7 | F | FRACTR | LTRNK | T+R | SURF_FALL | NS | AL | CLIMBER | ?? | GRASS | DAYC | 5.62 |
| 5-7 | F | FRACTR | UPARM | HOSP | SURF_FALL | NS | METAL | CLIMBER | 04 | GRASS | SCHL | 14.43 |
| 8-10 | F | FRACTR | UPARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 07 | GRASS | SCHL | 13.11 |
| 8-10 | F | CONCSN | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | 03 | EARTH | SCHL | 16.32 |
| 11-14 | M | CONCSN | HEAD | HOSP | SURF_FALL | NS | METAL | CLIMBER | 08 | EARTH | SCHL | 16.32 |
| 8-10 | F | CONT-ABR | UTRNK | T+R | SURF_FALL | NS | METAL | CLIMBER | 03 | EARTH | SCHL | 5.66 |
| 5-7 | M | CONT-ABR | FOOT | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | EARTH | SCHL | 34.47 |
| 5-7 | F | CONT-ABR | HEAD | T+R | SURF_FALL | ?? | METAL | CLIMBER | 10 | EARTH | SCHL | 5.79 |
| 8-10 | F | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | EARTH | PARK | 4.90 |
| 11-14 | F | CONT-ABR | LWARM | T+R | SURF_FALL | ?? | UNKN | CLIMBER | ?? | EARTH | SCHL | 10.58 |
| 11-14 | F | CONT-ABR | LWLEG | T+R | SURF_FALL | NS | METAL | CLIMBER | 05 | EARTH | SCHL | 16.32 |
| 3-4 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | 04 | EARTH | PARK | 10.83 |
| 5-7 | F | CONT-ABR | HEAD | T+R | SURF_FALL | NS | UNKN | CLIMBER | 06 | EARTH | PARK | 40.42 |
| 5-7 | M | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 08 | EARTH | SCHL | 2.59 |
| 8-10 | M | FRACTR | UPARM | HOSP | SURF_FALL | NS | METAL | CLIMBER | 06 | EARTH | SCHL | 34.47 |
| 11-14 | F | FRACTR | HAND | T+R | SURF_FALL | NS | METAL | CLIMBER | 02 | EARTH | SCHL | 21.82 |
| 8-10 | M | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 04 | EARTH | PARK | 40.42 |
| 5-7 | F | LACERATN | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | 05 | EARTH | SCHL | 14.43 |
| 11-14 | M | STRN_SPR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | EARTH | SCHL | 5.62 |
| 5-7 | M | TRN_SPR | LWLEG | T+R | SURF_FALL | NS | RUBBR | CLIMBER | <1 | EARTH | SCHL | 51.35 |
| 5-7 | M | STRN_SPR | LWARM | T+R | SURF_FALL | NS | WOOD | CLIMBER | 04 | EARTH | SCHL | 34.05 |
| 8-10 | M | STRN_SPR | LWLEG | T+R | SURF_FALL | NS | METAL | CLIMBER | 03 | EARTH | PARK | 11.96 |
| 8-10 | F | CONT-ABR | HAND | T+R | SURF_FALL | NS | METAL | CLIMBER | 03 | SAND | SCHL | 5.62 |
| 5-7 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | SAND | PARK | 4.90 |
| 5-7 | M | CONT-ABR | LTRNK | T+R | SURF_FALL | NS | WOOD | CLIMBER | 06 | SAND | PARK | 34.47 |
| 5-7 | F | CONT-ABR | HAND | T+R | SURF_FALL | BK | METAL | CLIMBER | 04 | SAND | SCHL | 34.18 |
| 8-10 | M | CONT-ABR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | SAND | SCHL | 34.18 |
| 11-14 | F | CONT-ABR | ALPRT | T+R | SURF_FALL | ?? | METAL | CLIMBER | ?? | SAND | DAYC | 15.32 |
| 3-4 | M | CONT-ABR | HEAD | T+R | SURF_FALL | NS | METAL | CLIMBER | 04 | SAND | DAYC | 8.67 |
| 8-10 | F | DISLOC | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | SAND | PARK | 25.79 |
| 5-7 | M | FRACTR | LWARM | T+R | SURF_FALL | NS | METAL | CLIMBER | ?? | SAND | PARK | 4.90 |
| 5-7 | M | FRACTR | UPARM | T+R | SURF_FALL | NS | METAL | CLIMBER | 05 | SAND | SCHL | 34.47 |



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NATIONAL ELECTRONIC INJURY SURVEILLANCE SYSTEM

SPECIAL STUDY ON PLAYGROUND EQUIPMENT

| AGE | SEX | DIAG | BDYPT | DISP | HAZPAT | COND | MATL | TYPE | DISTANCE | SURFACE | LOC | HEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1SUP | F | CONCSN | HEAD | T+R | NONRESP | NR | ROPE | NONRESP | NR | NONRSP | PARK | 9.30 |
| 5-7 | F | CONT-ABR | HEAD | T+R | NONRESP | NR | ROPE | NONRESP | NR | NONRSP | PARK | 5.66 |
| 5-7 | M | CONT-ABR | LWLEG | T+R | NONRESP | NR | ROPE | NONRESP | NR | NONRSP | PARK | 34.47 |
| 11-14 | F | CONT-ABR | HEAD | HOSP | NONRESP | NR | ROPE | NONRESP | NR | NONRSP | PARK | 1.95 |
| 5-7 | M | FRACTR | LWARM | T+R | NONRESP | NR | ROPE | NONRESP | NR | NONRSP | SCHL | 34.47 |
| 5-7 | F | LACERATN | HEAD | T+R | NONRESP | NR | ROPE | NONRESP | NR | NONRSP | PARK | 76.61 |
| 8-10 | M | STRN_SPR | LWARM | T+R | NONRESP | NR | ROPE | NONRESP | NR | NONRSP | PARK | 6.79 |
| 5-7 | F | AVULSION | HAND | T+R | EDG/PNT | SK | METAL | OTHER | NA | ASPHLT | PARK | 9.37 |
| 8-10 | M | AVULSION | HAND | HOSP | PINCHPT | NB | WOOD | OTHER | NA | SAND | SCHL | 56.41 |
| 8-10 | F | STRN_SPR | LWLEG | T+R | SURF_FALL | NB | UNKN | OTHER | ?? | EARTH | PARK | 1.95 |
| 11-14 | F | CONT-ABR | UTRNK | T+R | SURF_FALL | NB | WOOD | OTHER | 04 | CONCRT | PARK | 5.66 |
| 5-7 | M | CONT-ABR | LTRNK | T+R | EQUIPJUMP | NB | WOOD | OTHER | 09 | UNKN | SCHL | 15.97 |
| 11-14 | F | STRN_SPR | LWARM | T+R | EQUIPJUMP | ?? | RUBBR | OTHER | ?? | EARTH | SCHL | 34.65 |



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