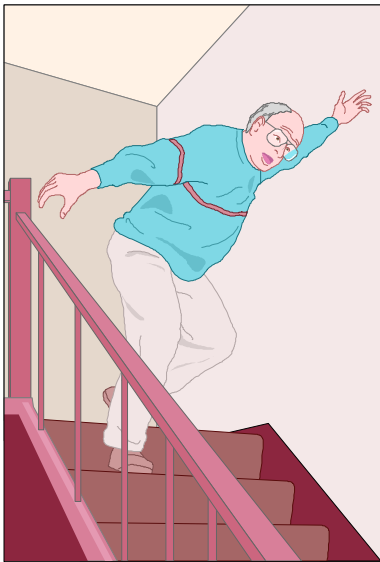


Facts & Prevention Strategies

Fall Injuries in Pennsylvania



1994

An Injury Profile Monograph

DEPARTMENT OF
HEALTH

...in pursuit of good health

A Fence or an Ambulance?

A Prevention Parable Attributed to John Malins

*'Twas a dangerous cliff, as they freely confessed,
Though to walk near its crest was so pleasant;
But over its terrible edge there had slipped
A duke, and full many a peasant.*

*The people said something would have to be done,
But their projects did not at all tally.
Some said "Put a fence 'round the edge of the cliff,"
Some, "An ambulance down in the valley."*

*The lament of the crowd was profound and was loud,
As their hearts overflowed with their pity;
But the cry for the ambulance carried the day
As it spread through the neighboring city.
A collection was made, to accumulate aid,
And the dwellers in highway and alley
Gave dollars or cents - not to furnish a fence -
But an ambulance down in the valley.*

*"For the cliff is all right if you're careful," they said:
"And if folks ever slip and are dropping,
It isn't the slipping that hurts them so much
As the shock down below when they're stopping."*

*So for years (we have heard), as these mishaps occurred
Quick forth would the rescuers sally,
To pick up the victims who fell from the cliff,
With the ambulance down in the valley.*

*Said one, as his plea, "It's a marvel to me
That you'd give so much greater attention to repairing results than to curing the cause;
You had much better aim at Prevention.*

*For the mischief, of course, should be stopped at its source,
Come, neighbors and friends, let us rally,
It is far better sense to rely on a fence
Than an ambulance down in the valley."*

*"He is wrong in his head," the majority said;
"He would end all our earnest endeavor.*

*He's a man who would shirk this responsible work
But we will support it forever.*

*Aren't we picking up all, just as fast as they fall,
And giving them care liberally?*

*A superfluous fence is of no consequence,
If the ambulance works in the valley."*

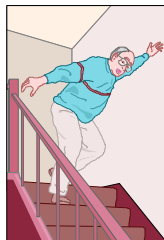


**Better guide well the young than reclaim them when old,
For the voice of true wisdom is calling,
"To rescue the fallen is good, but 'tis best
To prevent other people from falling."
Better close up the source of temptation and crime
Than deliver from dungeon or galley;
Better put a strong fence 'round the top of the cliff
Than an ambulance down in the valley.**



Facts & Prevention Strategies

Fall Injuries in Pennsylvania, 1994



An Injury Profile Monograph

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June, 1998

Acknowledgments

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Table of Contents

<u>Content</u>	<u>Page</u>
Executive summary	1
Fact sheet	2
Introduction	3
Hospitalized fall injuries in Pennsylvania	4
Demographics.....	4
Fall specific mechanism	5
Severity.....	7
Hospital length of stay.....	7
Hospital charges (intensity of care)	8
Time and place of injuries.....	9
Diagnoses	9
Death rates	10
Recommendations and prevention strategies	12
Primary prevention	12
Secondary prevention.....	13
Tertiary prevention	13
Appendix and detailed tables	14
Technical notes & methods	27
References	29

List of Figures

Figure 1	Hospital discharges for fall injuries by single year of age, Pennsylvania, 1994	4
Figure 2	Rates of hospital discharges for fall injuries by gender and age group, Pennsylvania, 1994	5
Figure 3	Hospital discharges for fall injuries by specific mechanism, Pennsylvania, 1994	6
Figure 4	Hospital discharges for fall injuries by mean severity score and age group, Pennsylvania, 1994	7
Figure 5	Hospital discharges for fall injuries by intensity of care and specific mechanism, Pennsylvania 1994	8
Figure 6	Hospital discharges for fall injuries by payer source and age group, Pennsylvania, 1994	9
Figure 7	Distribution of fall-related primary diagnoses fractures, Pennsylvania, 1994	10

List of Tables

Table 1	Hospital discharges for fall injuries by age group and gender, number and rate, Pennsylvania 1994	15
Table 2	Hospital discharges for fall injuries by age group and gender, black race, number and rate, Pennsylvania 1994.....	16
Table 3	Hospital discharges for fall injuries by age group and gender, white race, number and rate, Pennsylvania 1994	17
Table 4	Hospital discharges for fall injuries by age group, gender, race and specific mechanism, number and percentages, Pennsylvania 1994.....	18
Table 5	Hospitalized deaths for fall injuries by age group and gender, number and rate, Pennsylvania 1994	18
Table 6	Hospitalized deaths for fall injuries by age group and gender, black race, number and rate, Pennsylvania 1994.....	20
Table 7	Hospitalized deaths for fall injuries by age group and gender, white race, number and rate, Pennsylvania 1994	21
Table 8	Hospital discharges for fall injuries by selected variables and specific mechanism, number and percentages, Pennsylvania 1994.....	22
Table 9	Hospital discharges for fall injuries by nature of injury, number and percentages, Pennsylvania 1994	23
Table 10	Hospital discharges for fall fracture injuries by body site of the fractures, number and percentage, Pennsylvania 1994.....	24
Table 11	Hospital discharges for fall injuries by county of residence, number and rate, Pennsylvania 1994	25
Table 12	Hospitalized deaths for fall injuries by county of residence, number and rate, Pennsylvania 1994	26

Executive Summary

This monograph, the third in a series, reports on the epidemiology and hospital charges for fall related cases discharged from Pennsylvania hospitals during 1994. The data are derived from the Statewide Hospital Discharge Data compiled by the Pennsylvania Health Care Cost Containment Council from all non-federal hospitals in the state. The report covers fall discharges related to stairs or steps, ladders or scaffolding, from or out of building or other structures, into holes or other openings in surface, from one level to another, on the same level from slipping, tripping, or stumbling, or from collision, pushing, or shoving. Data on patients suffering falls who died without being admitted to a hospital are generally excluded.

A total of 60,701 hospital discharges related to fall injuries (503.6 per 100,000 persons) were reported by Pennsylvania hospitals. While most cases (97.7%) were nonfatal, 2.3% died in the hospital. The mean age of all cases was 64 years (median=73). Patients stayed in the hospital for an average 7.5 days (median=5). The majority of patients stayed for one day in the hospital while the longest hospital stay was 516 days.

The hospital discharge rate for males was 383.8 per 100,000 persons compared to 610.8 for females. With regards to age, the hospital discharge rates followed a bimodal pattern with a peak in persons under one year of age and the second one for persons 65 years of age or older. The rate for whites was higher than blacks (477.7 vs. 347.5). This difference was mainly a result of the higher fall injury rate in white females compared to black females (590.1 vs. 346.9); the rates in white and black males were similar (356.4 vs. 348.1). Falls on same level and falls related to stairs or height were the most common specific mechanisms.

Fractures, dislocations, sprains and strains, accounted for approximately 65 percent of all the different primary diagnoses. More specifically, fractures of the femur accounted for 45 percent of all the hospitalized discharges for fall injuries.

Total charges associated with these hospitalizations amounted to over $\frac{3}{4}$ of a billion dollars. About $\frac{3}{4}$ of these charges (\$586 million) were borne by government payment sources.

The use of handrails on stairs, safety devices such as grab bars in the tub or shower or next to toilet, and window guards can reduce fatalities and hospitalizations related to falls. Other preventive measures include proper footwear; avoiding the polishing of floors which are likely to get wet; eliminating loose rugs on polished floors; avoiding the use of baby-walkers; and learning about home safety and fall injury prevention through sessions for adults and parents of infants and young children.

Fact Sheet - Fall Injuries in Pennsylvania, 1994

- A total of 60,701 hospital fall injury discharges were reported in Pennsylvania for a rate of 503.6 per 100,000 persons.
- Injury due to fall was the leading cause of injury hospitalization in 1994.
- The rate of fall injury for females was almost twice that of males (610.8 vs. 383.8 per 100,000 persons).
- White females were almost twice as likely to be hospitalized for fall injuries as black females (590.1 vs. 346.9).
- The rate for children under five years of age was similar to that of persons in their middle forties (241.3 vs. 266.7).
- Fall injuries were the leading cause of injury related hospitalization for children under aged 14.
- The rate of fall injuries increased rapidly after the age of 65 for females and after the age of 75 for males.
- Fall on the same level was the most common specific mechanism for fall related hospitalizations in Pennsylvania.
- The overall in-hospital case fatality rate for fall injuries in Pennsylvania was 2.3%.
- About one-fourth of the hospital discharges for fall injuries were serious (Injury Severity Score = 8-15) .
- Fractures were the leading principal diagnosis category (60.1%). The neck (top end below the ball) of the femur (61.2%) was the most common fracture site among white females over 65 years of age.
- A total of 59,898 hospital days were incurred by persons hospitalized in Pennsylvania who sustained fall injuries. Hospitalization stays averaged 7.5 days/person (median=5) among fall victims.
- The major payer source for fall injuries was Medicare, accounting for 60% of the total cases and 66% of the total hospital charges.

Introduction

Fall-related injuries are second only to traffic injuries as a cause of unintentional injury death across all ages. Falls are the most common cause of injuries and hospital admissions for trauma. Each year, one person in 20 is treated in the emergency room for a fall-related injury.¹ In the US, one-third of all deaths from falls occur among persons aged 85 and older; 59 percent of all fall deaths occur among persons aged 75 and older.¹

During 1994, a total of 1,661 Pennsylvania residents died in the hospital as a result of fall-related injuries; a population rate of 13.8 per 100,000 persons. Among children under age 1 and adults age 65 and older, falls were the leading cause of injury-related hospitalization in Pennsylvania.

In the United States one of every three persons over age 65 suffers a fall injury each year.² Factors contributing to falls include visual impairment, neurological and musculoskeletal disabilities (osteoporosis, loss of bone density, and muscle weakness), difficulties in gait and balance, and inappropriate (psychoactive) or misuse of medications. Environmental hazards such as poor lighting, lack of handrails on stairs, clutter, loose rugs, and slippery surfaces (floors and bath tubs) play a major role in fall-related injuries among the elderly.

Preschool children are at a particular risk, partly because of their exposure and partly because of their rapidly progressive physical and mental development.³ Among infants, baby walkers-related falls account for more injuries than any other juvenile product.⁴ Among toddlers, fatal falls are usually associated with falls from windows or stairs. Sharp corners on furniture, coffee tables, and non-resilient playground surfaces are also important factors in child fall-related injuries.⁴

Purpose of monograph

This monograph has been prepared to provide detailed population-based data on fall injuries discharged from all non-federal hospitals in Pennsylvania. The data is derived from 1994 hospital discharge data supplied by the Pennsylvania Health Care Cost Containment Council (PA HCCCC). This information may be used to characterize the problem of fall-related injuries and to advance fall injury prevention in the commonwealth.

Overview of the monograph

The monograph includes both written summaries and illustrations from the analysis of the 1994 Pennsylvania hospital discharges data. Emphasis has been put on the fall-specific mechanisms where most of the fall-related injuries occurred. The first section includes selected results from the analysis. The next section presents recommendations and prevention strategies. Detailed reference tables are presented in the last section along with technical notes on methods that provide information on the case definition, data analysis, and data limitations.

Hospitalized Fall Injuries in Pennsylvania

This section describes the distribution of demographics, fall types, diagnoses, and hospital charges for fall-related injuries treated and discharged from Pennsylvania hospitals during 1994. It covers fall injury-related discharges from stairs, steps, ladders, scaffolding, buildings, or other structures, into a hole or other opening in surface, from one level to another, on the same level from slipping, tripping, or stumbling, and from collision, pushing, or shoving.

Demographics

In 1994, a total of 60,701 persons (rate=503.6 per 100,000 persons) were discharged from Pennsylvania hospitals due to injuries sustained from a fall. Falls comprised 43% of all injury related hospital discharges. Females comprised 63.0 percent of the cases, and 85.0 percent were whites. The average age of all the cases was 64.0 (median=73).

For the general population, hospital discharges by age follow a bimodal pattern with one peak in children under one year of age and second among persons age 65 or older (Figure 1).

Figure 1
Hospital discharges for fall injuries by single year of age, Pennsylvania, 1994

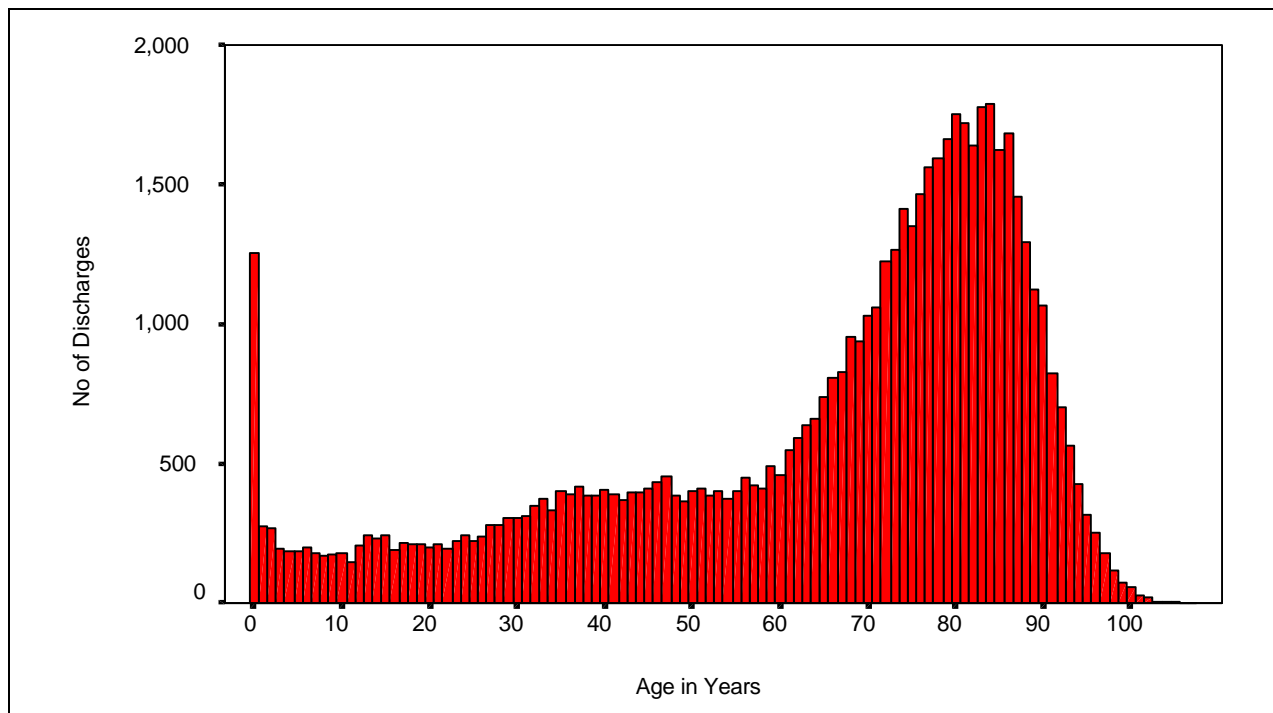
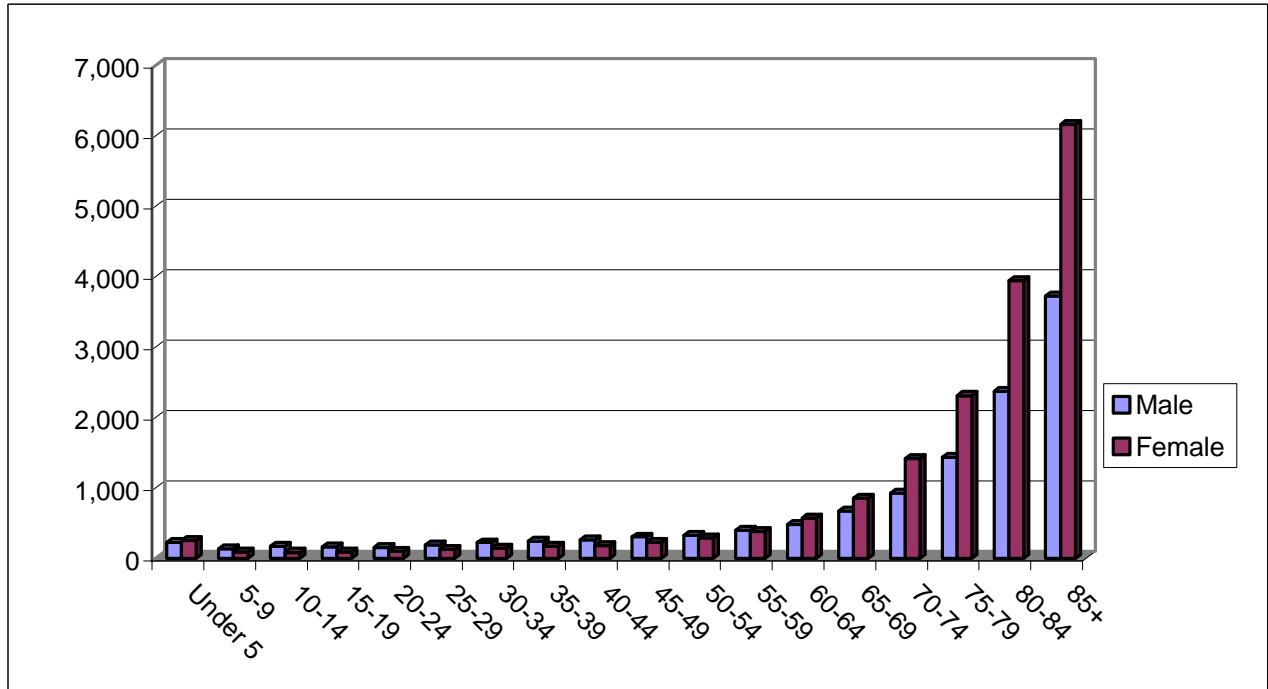


Figure 2
Rates of hospital discharges for fall injuries
by gender and age group,
Pennsylvania, 1994



The hospital discharge rate for females was 610.8 per 100,000 persons compared to 383.8 per 100,000 persons for males (Table 1). The overall rate for blacks was 347.5 per 100,000 persons (Table 2) while for whites the overall rate was 477.7 per 100,000 persons (Table 3).

Fall specific mechanism

Fall on the same level was the most common specific cause of fall-related hospitalization accounting for 36.2 percent of all falls, while 23.5 percent of the falls were related to stairs or height. More than a third (38.5%) of the cases were classified as other or unspecified falls (Figure 3).

Fall on the same level

This group includes falls on the same floor from slipping, tripping, or stumbling, from collision, pushing, or shoving, by or with other person. There were 21,992 (36.2 %) hospital discharges in this category in Pennsylvania in 1994 (Table 8). Whites comprised 86.4 percent and blacks 6.3 percent. Females accounted for 64.9, while the white-female group accounted for 56.7 percent of all the fall related injuries on the same level (Table 4). More than 60 percent of the fall related injuries in this category involved persons aged 65 or older. All cases were reported as unintentional. The average injury severity score of fall injuries on the same level was 6.2 (median=4). The average length of stay at the hospital for discharges from fall on the same level was 6.8 days (median=5).

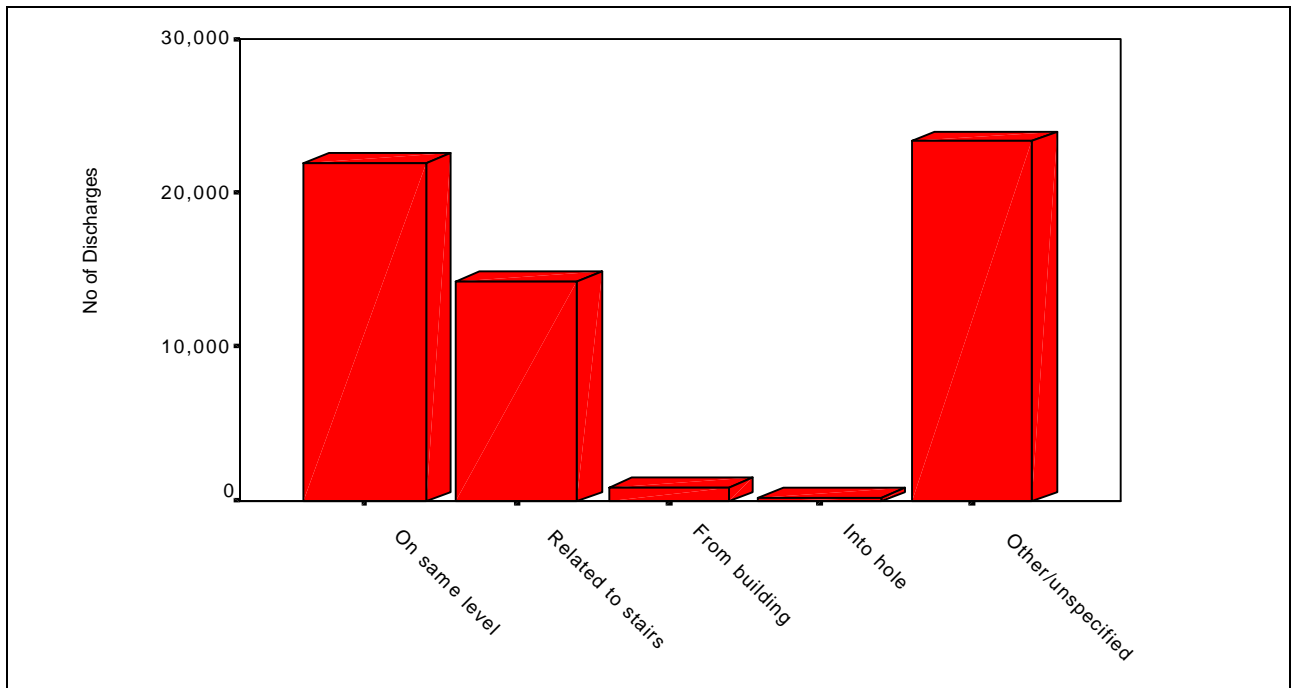
The average charge for discharges due to fall on the same floor was \$12,015 (sd=\$15,235). Charges totaled more than \$264 million. The average charge per day for discharges due to injuries from fall on the same floor was \$2,344. The major payer source for discharges due to injuries on the same floor was Medicare (Table 8).

Fall related to stairs or height

This group includes fall on or from stairs or step, on or from ladders or scaffolding, falls from one level to another, suicide and self-inflicted injuries by jumping from a high place, pushing from a high place, falling from a high place, and undetermined whether the fall was accidentally or purposely inflicted. In 1994, there were 14,252 (23.48%) hospital discharges in Pennsylvania resulting from fall injuries related to stairs or height. Most patients were female (54.6%) and white (82.9%) (Table 8). Almost 52 percent of the hospital discharges were people aged 65 or older, and children under 5 years old comprised 6.5 percent.

The average injury severity score for severity for injuries from falls related to stairs or height was 6.4 (median=4). The average length of stay at the hospital for discharges from fall related to stair or height was 6.9 days (median=4). The average hospital charge was \$14,160 (median=\$8,417, sd=\$26,088), and the total charges were approximately \$202 million. The average charge per day was \$2,586. Medicare was the major payer of discharges from fall-related to stairs and height (Table 8).

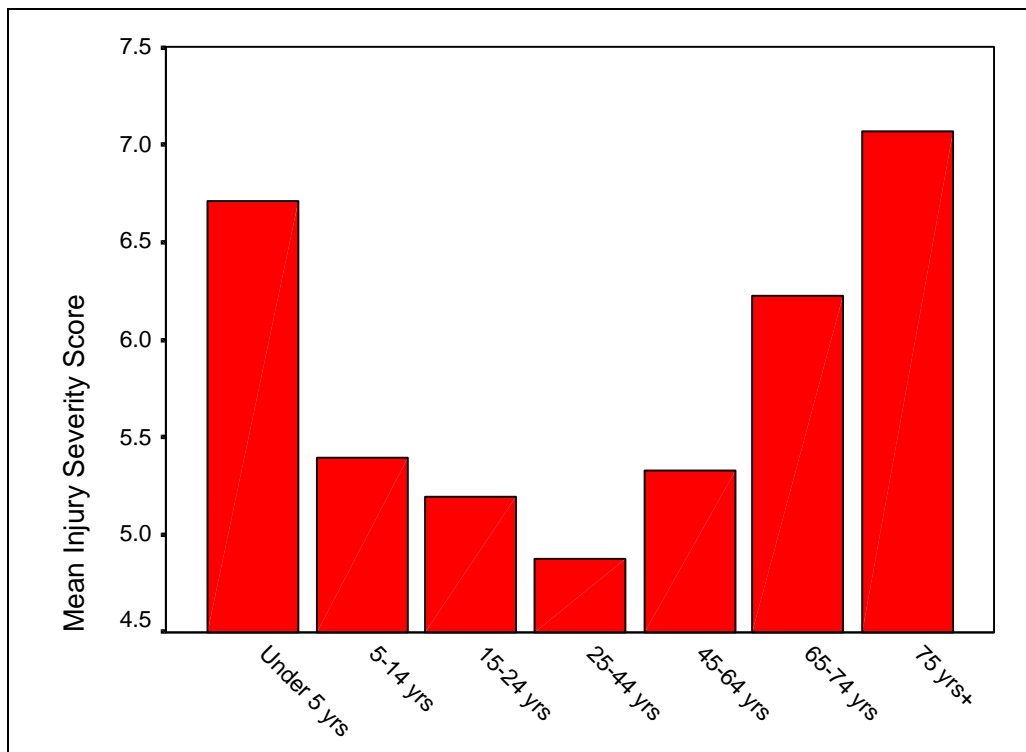
**Figure 3
Hospital discharges for fall injuries
by specific mechanism,
Pennsylvania, 1994**



Severity

Fifty percent of the population had an injury severity score of 5 or less. Thirty-nine percent of the fall-related injuries were assigned an injury severity score of 9. Severity of fall-injury varied significantly by cause, age group, sex and race. Almost half (48.3%) of the females had serious (8-15) fall related injuries while males tended to have more moderate (4-7 ISS) injuries (41.3%). The injuries among whites were more serious than those that occurred among blacks. Persons under age five or older than age 65 also had more serious injuries (8-15 ISS) than the other age groups and the most severe (16+ ISS) fall-related injuries were reported among those aged 75 or older (45.4%)(summarized in Figure 4).

Figure 4
Hospital discharges for fall injuries by mean injury severity score (ISS) and age group, Pennsylvania, 1994



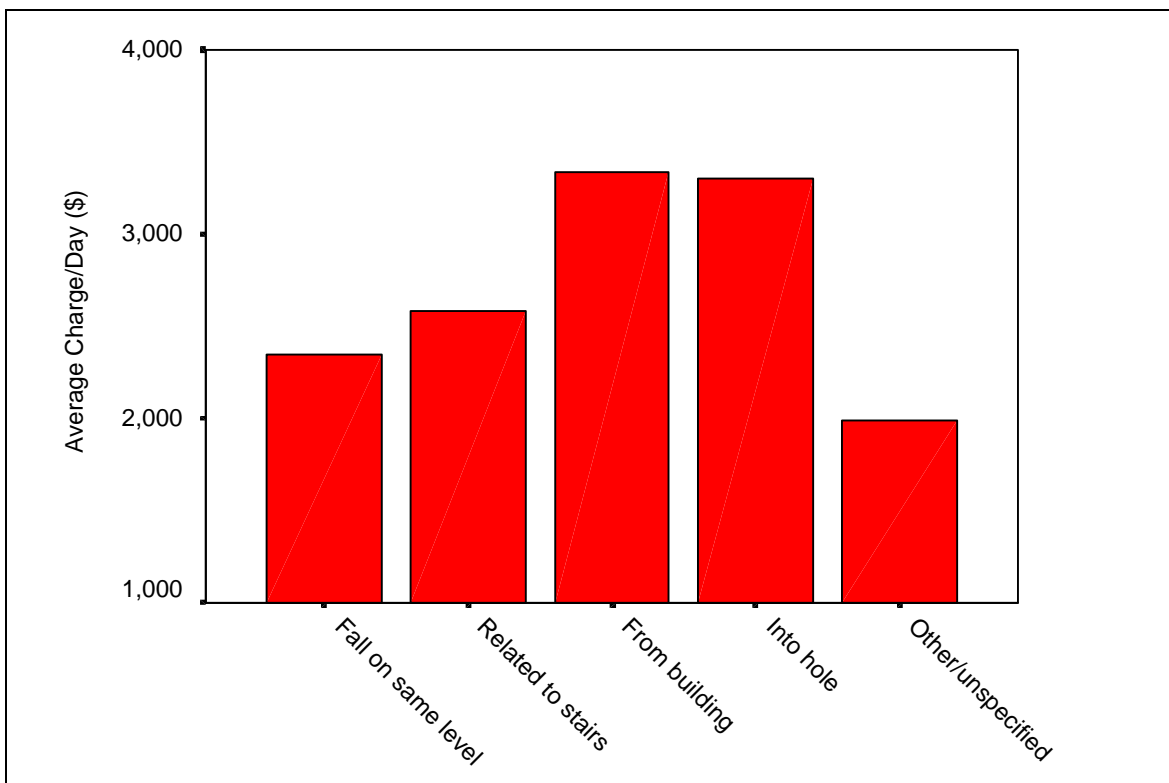
Hospital length of stay

Overall, patients stayed at the hospital for an average of 7.5 days (median=5) and a total of 59,898 hospital days. The longest hospital stay was for 516 days. This patient accrued over half-a-million dollars in total charges. The average length of stay for children under five years of age was 2.6 (sd=4.2, median=1) days compared to an average of 9.1 days (sd=9.2, median=7) for persons 65 years of age or older.

Hospital charges

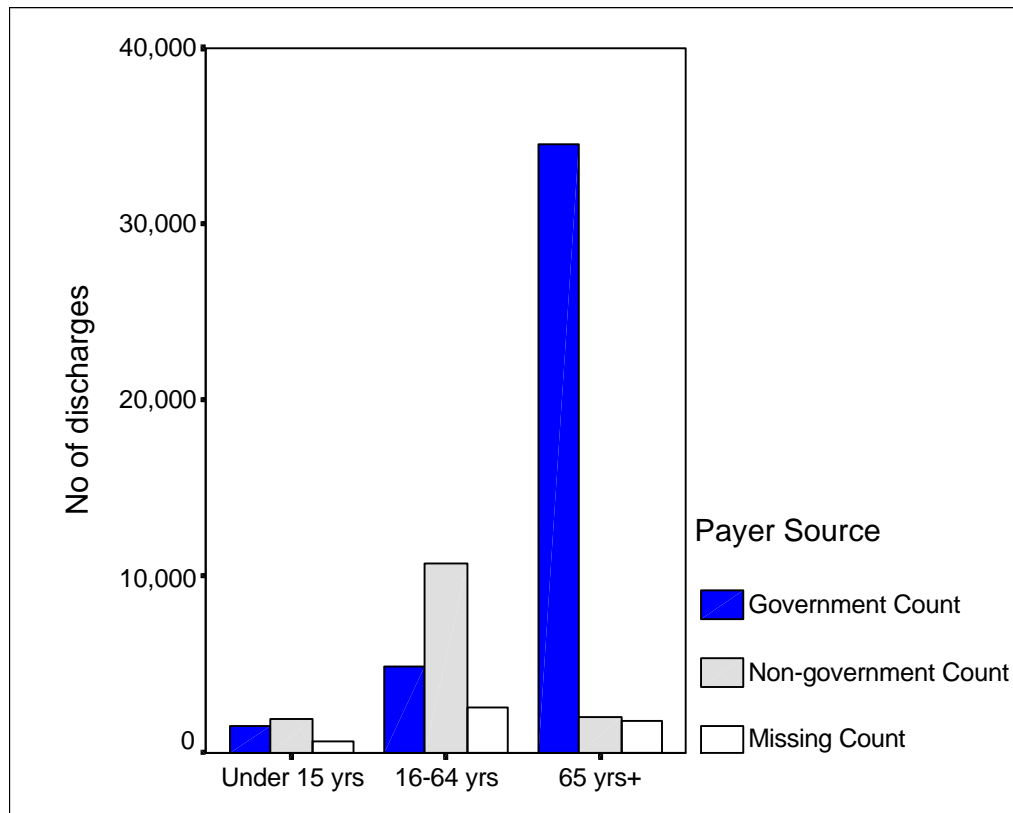
Total charges associated with fall-related hospitalizations totaled more than $\frac{3}{4}$ of a billion dollars. The average charge for fall related injury was \$13,161 per case. The maximum amount paid for a single case was over one-million dollars. The average charge per hospital day, an indicator of the intensity of the treatment, was \$2,282 (Figure 5). The major payer was the government (73.6% of the

Figure 5
Hospital discharges for fall injuries by intensity of care
and specific mechanism,
Pennsylvania 1994



cases) which was charged \$586 million for all the fall-related injuries, predominantly in the older age-groups (Figure 6).

Figure 6
Hospital discharges for fall injuries
by payer source and age group,
Pennsylvania 1994



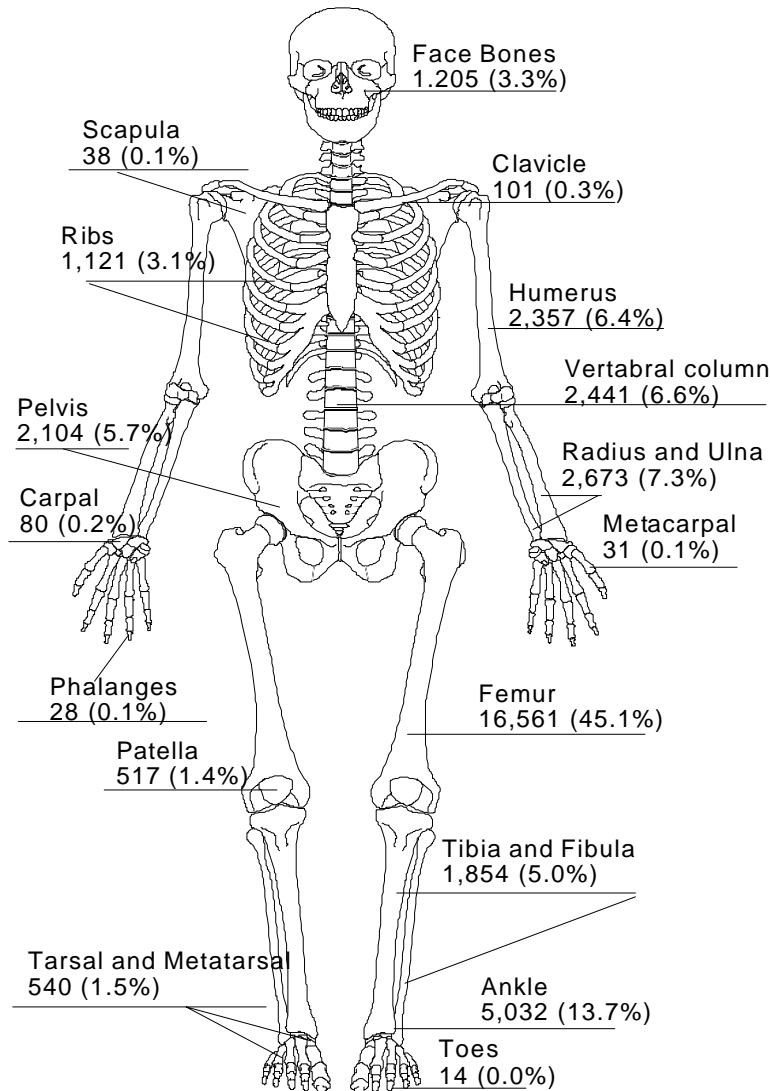
Time of injuries

More than thirty percent of the fall-related injuries were reported in the period between January and March. More than half (59%) of the fall-related injuries among those aged 65 or older occurred between January and March. Falls on the same level (45%) occurred more often during the winter, while falls from building or other structure (35.9%) and falls into hole or other opening (45%) were more likely to occur during July to September.

Diagnoses

The leading principal diagnosis category among fall patients was fractures (60.5%). Figure 7 shows the distribution of the specific fracture site for all fall-related fractures reported as the primary diagnosis. Among the most common fracture sites, fractures of the femur, 39.5 percent occurred from falls on the same floor. The average length of stay for femur fractures was 10.0 days (sd=7.9, median=8) and the mean cost for each case was \$17,361 (sd=\$15,262, median=\$14,507). The total charges for all fractures of the neck of femur were \$260,721 million, which was 44.4 percent of the total hospital charges of all the fall-related injuries.

Figure 7
Distribution of fall-related primary diagnoses fractures,
Pennsylvania, 1994



Hospitalized death rates

The overall hospital death rate for cases admitted to a hospital for a fall-related injury was 13.8 per 100,000 persons (Table 5). Females had a higher overall hospital death rate compared to males (14.7 vs. 12.8 per 100,000 persons). However, males had the higher hospital death rates across all age groups except the group under 5 years of age where girls had almost twice the death rates compared to boys (6.1 vs. 2.9 per 100,000 persons) [but the frequency was relatively low (12 males and 24 females)]. Whites had almost 1.6 times the hospital death rate compared to blacks (13.6 vs. 8.7 per

100,000 persons) (Table 6-7). However, at the extremes of age, where many fatal falls occur, rates were not much different between blacks and whites.

Intent grouping

Almost all of the fall-related injuries, 60,528 cases (99.7%), were classified as unintentional injuries. There were 92 cases (0.2%) that were self-inflicted, while only 18 cases were reported as assault.

Recommendations and Prevention Strategies

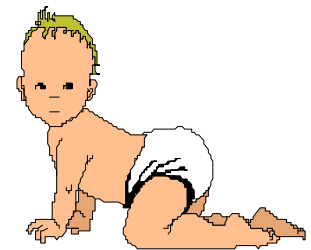
A. Primary prevention strategies (pre-event actions):

- Install window guards on all residential windows above the ground floor.
- Install stair gates on all stairwells.
- Install adequate lighting with light switches at the top and bottom of the stairs or a movement sensitive light.
- Install secure, graspable handrails on one or both sides of all stairs.
- Do not polish floors which are likely to get wet (kitchen, bathroom, laundry, entrances).
- Use slip-resistant rugs and secure throw rugs to floor surfaces by placing rubber mesh or double sided sticky tape under the rug.
- Use slip-resistant mats or tapes in the bath tub and shower.
- Install safety devices for the elderly including grab bars in the tub or shower or next to the toilet.
- Complete a home safety checklist for fall-related prevention.
- Initiate day care home safety inspection programs in day care centers.
- Conduct annual self-assessments for fall risk, especially in the elderly.



Interventions for infants and young children

- Avoid using baby walkers or only use “walkers” which lack wheels.
- Do not leave infants alone on bed or other unguarded elevated surface.
- Use rounded contact points on tables, cabinet corners, and stair edges.
- Use wood chips or rubber padding rather than sand, grass, or synthetic matting on playground surface areas .
- Wear sneakers while engaged in playground activities.
- Decrease the height of playground equipment.
- Install window guards or grills on upstairs windows.⁵



- **Interventions for elderly people**

- Adapt daily activities to new medical conditions, such as osteoporosis and vision impairment.⁶
- Conduct physical activity/exercise to maintain muscle mass and retain the equilibrium.⁶
- Seek physician and pharmacist advice to avoid over use of medications and medications that may lead to frequent nightly bathroom visits.
- Avoid misuse of alcohol.
- Use soft sole shoes with rounded heels and flat cleat surfaces with no enclosures.⁷
- Do frequent repositioning of ladders rather than stretching while working from the ladder.⁷



B. Secondary prevention strategies (reduce the impact of the injury that has already occurred):

- Install alarms at floor level or devices that can be worn on the body.⁴
- Use body padding such as knee pads for athletes or hip pads for older adults.⁴
- Install energy absorbing surfaces below windows, or playground, or on nursing home floor.⁴ .
- Build playground slides into hills to reduce height of falls.



C. Tertiary prevention strategies (post-event care of the injury):

- Call 911 immediately for an ambulance or helicopter for immediate transport to the emergency department.
 - Seek out and diligently use quality rehabilitation services.
- Post the telephone number of the emergency department on all phones.⁶



Appendix

Table 1
Hospital Discharges for Fall Injuries
By Age Group and Gender, Number and Rate
Pennsylvania, 1994

Age Group (years)	Male		Female		Total	
	Number	Rate*	Number	Rate*	Number	Rate*
Under 5	928	223.2	1,028	260.4	1,956	241.3
5-9	556	134.9	355	90.5	911	113.3
10-14	675	169.0	337	88.8	1,012	129.9
15-19	697	164.3	375	90.6	1,072	127.9
20-24	672	159.8	402	97.2	1,074	128.7
25-29	798	191.3	530	127.2	1,328	159.3
30-34	1,008	222.1	668	144.1	1,676	182.7
35-39	1,148	248.7	830	174.4	1,978	211.0
40-44	1,150	264.2	811	180.0	1,961	221.4
45-49	1,137	304.8	909	230.7	2,046	266.7
50-54	1,005	328.0	968	293.1	1,973	309.9
55-59	1,052	397.8	1,123	380.9	2,175	388.9
60-64	1,221	486.8	1,681	573.3	2,902	533.4
65-69	1,638	672.2	2,628	855.5	4,266	774.4
70-74	1,924	926.7	4,070	1,419.4	5,994	1,212.5
75-79	2,153	1435.7	5,487	2,313.8	7,640	1,973.6
80-84	2,100	2,366.7	6,579	3,949.3	8,679	3,399.3
85+	2,355	3,725.0	9,480	6,161.3	11,835	5,451.8
All Ages	22,217	383.8	38,261	610.8	60,478	501.8

Source: PA HCCCC.

* Per 100,000 population, 1994; totals exclude missing data.

Table 2
Hospital Discharges for Fall Injuries
By Age Group and Gender, Black Race, Number and Rate
Pennsylvania, 1994

Age Group (years)	Male		Female		Total	
	Number	Rate*	Number	Rate*	Number	Rate*
Under 5	116	203.4	98	176.3	214	190.0
5-9	59	117.1	34	68.8	93	93.2
10-14	86	188.4	36	80.5	122	135.0
15-19	58	124.6	45	97.8	103	111.3
20-24	77	164.7	61	132.2	138	148.6
25-29	136	303.3	103	223.4	239	262.8
30-34	135	310.5	113	235.1	248	270.9
35-39	180	447.3	122	258.8	302	345.6
40-44	156	447.2	109	258.6	265	344.0
45-49	156	562.6	104	296.4	260	413.9
50-54	107	489.1	100	345.2	207	407.1
55-59	103	550.9	88	344.4	191	431.7
60-64	78	462.9	117	488.7	195	478.1
65-69	106	680.9	139	636.6	245	655.0
70-74	95	771.4	181	980.6	276	896.8
75-79	84	983.5	189	1,320.5	273	1,194.5
80-84	81	1,646.3	202	2,041.0	283	1,910.0
85+	66	1,903.7	283	3,189.5	349	2,828.2
All Ages	1,879	348.1	2,124	346.9	4,003	347.5

Source: PA HCCCC.

* Per 100,000 population, 1994; totals exclude missing data.

Table 3**Hospital Discharges for Fall Injuries
By Age Group and Gender, White Race, Number and Rate
Pennsylvania, 1994**

Age Group (years)	Male		Female		Total	
	Number	Rate*	Number	Rate*	Number	Rate*
Under 5	721	206.2	870	262.5	1,591	233.6
5-9	428	120.9	288	85.8	716	103.8
10-14	510	147.0	268	81.8	778	115.3
15-19	576	155.9	292	81.1	868	119.0
20-24	522	206.2	308	85.6	830	114.5
25-29	587	161.2	389	106.9	976	134.1
30-34	773	191.7	511	125.1	1,284	158.2
35-39	875	211.1	640	151.8	1,515	181.2
40-44	907	230.2	624	155.4	1,531	192.4
45-49	893	262.6	726	205.7	1,619	233.6
50-54	801	285.7	777	261.7	1,578	273.4
55-59	858	353.7	951	357.4	1,809	355.6
60-64	1,046	451.2	1,418	531.2	2,464	494.0
65-69	1,386	610.8	2,257	794.9	3,643	713.1
70-74	1,666	856.4	3,559	1,332.1	5,225	1,131.7
75-79	1,901	1,348.8	4,833	2,175.9	6,734	1,854.9
80-84	1,844	2,209.3	5,819	3,726.1	7,663	3,197.8
85+	2,100	3,533.3	8,320	5,756.4	10,420	5,108.6
All Ages	18,394	356.4	32,850	590.1	51,244	477.7

Source: PA HCCCC.

* Per 100,000 population, 1994; totals exclude missing data.

Table 4

**Hospital Discharges for Fall Injuries
By Age Group, Gender, Race and Specific Mechanism, Number and Percentages
Pennsylvania, 1994**

	Fall on same level		Fall related to stairs or height		Fall from building/other structure		Fall into hole or other opening		Other and unspecified falls		Total Count	
	Count	Row%	Count	Row%	Count	Row%	Count	Row%	Count	Row%		
Males												
White												
Under 5 yrs	192	27	319	44	32	4	3	0	175	24	721	
5-14 yrs	328	35	373	40	29	3	8	1	200	21	938	
15-24 yrs	471	43	303	28	79	7	18	2	227	21	1,098	
25-44 yrs	1,031	33	1,185	38	252	8	45	1	629	20	3,142	
45-64 yrs	1,354	38	1,151	32	127	4	24	1	942	26	3,598	
65-74 yrs	1,129	37	774	25	36	1	10	0	1,103	36	3,052	
75 yrs+	1,979	34	1,160	20	17	0	4	0	2,685	46	5,845	
Group Total	6,484	35	5,265	29	572	3	112	1	5,961	32	18,394	
Black												
Under 5 yrs	14	12	71	61	12	10			19	16	116	
5-14 yrs	54	37	53	37	6	4			32	22	145	
15-24 yrs	61	45	33	24	7	5			34	25	135	
25-44 yrs	207	34	203	33	52	9	6	1	139	23	607	
45-64 yrs	164	37	153	34	7	2	2	0	118	27	444	
65-74 yrs	44	22	65	32	3	1	1	0	88	44	201	
75 yrs+	55	24	72	31					104	45	231	
Group Total	599	32	650	35	87	5	9	0	534	28	1,879	
Females												
White												
Under 5 yrs	213	24	333	38	23	3	1	0	300	34	870	
5-14 yrs	168	30	248	45	10	2	4	1	126	23	556	
15-24 yrs	273	46	115	19	13	2	12	2	187	31	600	
25-44 yrs	1,103	51	443	20	35	2	11	1	572	26	2,164	
45-64 yrs	1,819	47	863	22	9	0	12	0	1,169	30	3,872	
65-74 yrs	2,342	40	1,132	19	12	0	13	0	2,317	40	5,816	
75 yrs+	6,455	34	3,331	18	13	0	7	0	9,166	48	18,972	
Group Total	12,373	38	6,465	20	115	0	60	0	13,837	42	32,850	
Black												
Under 5 yrs	13	13	66	67	6	6			13	13	98	
5-14 yrs	15	21	42	60	4	6			9	13	70	
15-24 yrs	36	34	44	42					26	25	106	
25-44 yrs	208	47	135	30	7	2	1	0	96	21	447	
45-64 yrs	184	45	105	26	4	1	2	0	114	28	409	
65-74 yrs	116	36	91	28	1	0			112	35	320	
75 yrs+	214	32	159	24					301	45	674	
Group Total	786	37	642	30	22	1	3	0	671	32	2,124	
Table Total	20,242		13,022		796		184		21,003		55,247	

Source PA HCCC.
Totals exclude missing data.

Table 5
Hospitalized Deaths for Fall Injuries
By Age Group and Gender, Number and Rate
Pennsylvania, 1994

Age Group (years)	Male		Female		Total	
	Number	Rate*	Number	Rate*	Number	Rate*
Under 5	12	2.9	24	6.1	36	4.4
5-9	4	-	3	-	7	.9
10-14	8	2.0	2	-	10	1.3
15-19	3	-	2	-	5	.6
20-24	5	1.2	0	-	5	.6
25-29	3	-	0	-	3	-
30-34	14	3.1	3	-	17	1.9
35-39	13	2.8	9	1.9	22	2.3
40-44	12	2.8	6	1.3	18	2.0
45-49	15	4.0	8	2.0	23	3.0
50-54	16	5.2	15	4.5	31	4.9
55-59	19	7.2	18	6.1	37	6.6
60-64	39	15.5	24	8.2	63	11.6
65-69	56	23.0	40	13.0	96	17.4
70-74	78	37.6	84	29.3	162	32.8
75-79	100	66.7	123	51.9	223	57.6
80-84	129	145.4	181	108.7	310	121.4
85+	212	335.5	381	247.6	593	273.2
All Ages	738	12.8	923	14.7	1,661	13.8

Source: PA HCCCC.

* Per 100,000 population, 1994; totals exclude missing data.

- Not computed for number of hospitalization <5.

Table 6
Hospitalized Deaths for Fall Injuries
By Age Group and Gender, Black Race, Number and Rate
Pennsylvania, 1994

Age Group (years)	Male		Female		Total	
	Number	Rate*	Number	Rate*	Number	Rate*
Under 5	1	-	1	-	2	-
5-9	1	-	0	-	1	-
10-14	0	-	0	-	0	-
15-19	0	-	0	-	0	-
20-24	1	-	0	-	1	-
25-29	1	-	0	-	1	-
30-34	4	-	1	-	5	5.5
35-39	4	-	1	-	5	5.7
40-44	1	-	1	-	2	-
45-49	3	-	0	-	3	-
50-54	2	-	1	-	3	-
55-59	4	-	2	-	6	13.6
60-64	3	-	1	-	4	-
65-69	2	-	5	22.9	7	18.7
70-74	3	-	2	-	5	16.2
75-79	3	-	6	41.9	9	39.4
80-84	6	122.0	10	101.0	16	108.0
85+	10	288.4	20	225.4	30	243.1
All Ages	49	9.1	51	8.3	100	8.7

Source: PA HCCCC.

* Per 100,000 population, 1994; totals exclude missing data.

- Not computed for number of hospitalization <5.

Table 7**Hospitalized Deaths for Fall Injuries
By Age Group and Gender, White Race, Number and Rate
Pennsylvania, 1994**

Age Group (years)	Male		Female		Total	
	Number	Rate*	Number	Rate*	Number	Rate*
Under 5	11	3.1	23	6.9	34	5.0
5-9	3	-	3	-	6	.9
10-14	8	2.3	1	-	9	1.3
15-19	3	-	2	-	5	.7
20-24	4	-	0	-	4	-
25-29	2	-	0	-	2	-
30-34	9	2.2	2	-	11	1.4
35-39	9	2.2	8	1.9	17	2.0
40-44	8	2.0	5	1.2	13	1.6
45-49	11	3.2	8	2.3	19	2.7
50-54	13	4.6	14	4.7	27	4.7
55-59	14	5.8	15	5.6	29	5.7
60-64	34	14.7	22	8.2	56	11.2
65-69	50	22.0	29	10.2	79	15.5
70-74	70	36.0	76	28.4	146	31.6
75-79	96	68.1	109	49.1	205	56.5
80-84	112	134.2	158	101.2	270	112.7
85+	186	313.0	342	236.6	528	258.9
All Ages	643	12.5	817	14.7	1,460	13.6

Source: PA HCCCC.

* Per 100,000 population, 1994; totals exclude missing data.

- Not computed for number of hospitalization <5.

Table 8

**Hospital Discharges for Fall Injuries
By Selected Variables and Specific Mechanism, Number and Percentages
Pennsylvania, 1994**

Variable	On same level	Related to stairs or height	From building/other structure	Into hole or other opening	Other & unspecified
Number	21,992	14,252	894	201	23,361
Demographics					
Average Age (years)	63	57	35	40	70
Median Age (years)	71	66	33	37	77
% Females	64.9	54.6	17.4	34.3	69.0
% White	86.5	82.9	77.3	86.4	86.5
% < 5 year	2.5	6.5	9.7	2.5	2.6
% 65 years or older	60.4	51.8	10.3	18.4	75.4
Length of Stay and Severity					
No. Hospital days	146,773	97,115	5,970	2,018	199,967
Average LOS (days)	7	7	7	10	9
Median LOS (days)	5	4	4	4	6
Longest LOS (day)	275	245	104	123	516
Average ISS	6.2 (Moderate)	6.4 (Moderate)	7.5 (Serious)	7 (Moderate)	6.3 (Moderate)
Median ISS	4 (Moderate)	4 (Moderate)	5 (Moderate)	4 (Moderate)	8 (Serious)
Economic Impact					
Average charge	\$12,015	\$14,160	\$18,888	\$26,012	\$13,302
Median charge	\$8,688	\$8,417	\$9,262	\$7,525	\$9,322
Average charge/day	\$2,344	\$2,586	\$3,339	\$3,298	\$1,987
Total charges (millions)	\$264	\$202	\$17	\$5	\$311
% Government	34.5	20.9	0.8	0.2	43.6

%: Column percentages.

Source: PA HCCCC.

Table 9**Hospital Discharges for Fall Injuries
By Nature of Injury, Number and Percentages
Pennsylvania, 1994**

Nature of Injury	ICD9-Code	Number	%
Fractures, Dislocations, Sprains & Strains	(800-848)	39,337	64.8
Intracranial Injury	(850-854)	2,312	3.8
Internal Injury to Chest, Abdomen & Pelvis	(860-869)	716	1.2
Open Wound	(870-897)	535	.9
Injury to Blood Vessels	(900-904)	25	.0
Late Effects	(905-909)	3	.0
Superficial, Contusion & Crushing Injury	(910-929)	1,301	2.1
Foreign Bodies	(930-939)	9	.0
Burns	(940-949)	13	.0
Injury to Nerves & Spinal Cord	(950-957)	174	.3
Traumatic Complications	(958-959)	234	.4
Poisonings	(960-979)	32	.1
Toxic Effects of Non-Medicinal	(980-989)	9	.0
Other & Unspecified Effects	(990-995)	23	.0
Other Injuries and Invalid	Outside 800-995	15,978	26.3
Total		60,701	100.0

Source: PA HCCCC.

Table 10

**Hospital Discharges for Fall Fracture Injuries
By Body Site of the Fractures, Number and Percentages
Pennsylvania, 1994**

Site of the Fractures	ICD9-Code	Number	%
Femur	(820-821)	16,561	45.1
Ankle	(824)	5,032	13.7
Radius and Ulna	(813)	2,673	7.3
Vertebral column	(805-806)	2,441	6.6
Humorous	(812)	2,357	6.4
Pelvis	(808)	2,104	5.7
Tibia and Fibula	(823)	1,854	5.0
Skull (fractures of the skull)	(802)	1,205	3.3
Ribs	(807)	1,121	3.1
Tarsal and Metatarsal	(825)	540	1.5
Patella	(822)	517	1.4
Clavicle	(810)	101	.3
Carpal	(814)	80	.2
Scapula	(811)	38	.1
Metacarpal	(815)	31	.1
Phalanges	(816)	28	.1
Multiple fractures of lower limb	(827)	31	.1
Multiple fractures of upper limb	(817-819)	12	.0
Toes	(826)	14	.0
Total		36,740	100.0

Source: PA HCCCC.

Table 11

**Hospital Discharges for Fall Injuries
By County of Residence, Number and Rate
Pennsylvania, 1994**

County	Number	Rate*	County	Number	Rate*
Adams	328	393.0	Lackawanna	1,546	715.7
Allegheny	7,396	560.0	Lancaster	1,727	390.1
Armstrong	508	681.0	Lawrence	548	567.4
Beaver	797	423.3	Lebanon	545	468.1
Bedford	230	469.5	Lehigh	1,275	428.0
Berks	1,463	420.8	Luzerne	2,302	702.4
Blair	877	665.3	Lycoming	402	332.4
Bradford	516	831.5	McKean	1,119	2,305.8
Bucks	2,093	369.0	Mercer	632	517.4
Butler	700	432.4	Mifflin	214	455.2
Cambria	881	548.1	Monroe	433	386.2
Cameron	17	294.0	Montgomery	3,021	431.4
Carbon	305	518.1	Montour	137	752.0
Centre	130	100.1	Northampton	1,247	489.0
Chester	1,962	493.8	Northumberland	509	531.7
Clarion	175	415.4	Perry	133	308.5
Clearfield	349	439.6	Philadelphia	7,568	496.5
Clinton	123	328.6	Pike	50	140.9
Columbia	375	586.9	Potter	60	351.7
Crawford	439	498.9	Schuylkill	830	541.2
Cumberland	830	405.6	Snyder	164	435.0
Dauphin	1,024	417.0	Somerset	381	482.1
Delaware	2,773	505.7	Sullivan	67	1,100.5
Elk	155	440.7	Susquehanna	798	1,921.5
Erie	1,092	389.6	Tioga	152	362.8
Fayette	783	534.3	Union	190	509.4
Forest	45	935.2	Venango	301	508.3
Franklin	371	294.4	Warren	182	403.9
Fulton	146	1,023.7	Washington	1,215	583.8
Greene	94	234.0	Wayne	190	440.7
Huntingdon	189	424.4	Westmoreland	1,878	498.9
Indiana	291	321.1	Wyoming	167	568.9
Jefferson	171	366.8	York	1,320	368.9
Juniata	92	428.9	Total	59,023	489.7

Source: PA HCCCC.

*Per 100,000 population, 1994.

Totals exclude missing data

Table 12

**Hospitalized Deaths from Fall Injuries
By County of Residence, Number and Rate
Pennsylvania, 1994**

County	Number	Rate*	County	Number	Rate*
Adams	10	12.0	Lackawanna	36	16.7
Allegheny	261	19.8	Lancaster	57	12.9
Armstrong	12	16.1	Lawrence	13	13.5
Beaver	16	8.5	Lebanon	16	13.7
Bedford	4	-	Lehigh	37	12.4
Berks	30	8.6	Luzerne	68	20.7
Blair	17	12.9	Lycoming	12	9.9
Bradford	14	22.6	McKean	51	105.1
Bucks	46	8.1	Mercer	12	9.8
Butler	14	8.6	Mifflin	3	-
Cambria	25	15.6	Monroe	18	16.1
Cameron	0	-	Montgomery	85	12.1
Carbon	7	11.9	Montour	7	38.4
Centre	6	4.6	Northampton	30	11.8
Chester	33	8.3	Northumberland	15	15.7
Clarion	5	11.9	Perry	3	-
Clearfield	5	6.3	Philadelphia	215	14.1
Clinton	4	-	Pike	1	-
Columbia	8	12.5	Potter	3	-
Crawford	11	12.5	Schuylkill	26	17.0
Cumberland	21	10.3	Snyder	3	-
Dauphin	36	14.7	Somerset	10	12.7
Delaware	60	10.9	Sullivan	1	-
Elk	3	-	Susquehanna	21	50.6
Erie	26	9.3	Tioga	4	-
Fayette	18	12.3	Union	3	-
Forest	0	-	Venango	5	8.4
Franklin	8	6.3	Warren	2	-
Fulton	5	35.1	Washington	29	13.9
Greene	0	-	Wayne	2	-
Huntingdon	4	-	Westmoreland	47	12.5
Indiana	7	7.7	Wyoming	3	-
Jefferson	6	12.9	York	39	10.9
Juniata	2	-	Total	1,601	13.3

Source: PA HCCCC.

* Per 100,000 population, 1994.

- Not computed for number of hospitalization <5.

Technical Notes and Methods

Definitions

Fall Related Injury - A fall related injury was defined as any discharge with an ICD-9-CM E-code as specified below. These includes falls on/from stairs or steps, fall on/from ladders or scaffolding, fall from/out of building or other structure, fall into hole or other opening in surface, other fall from one level to another, fall on the same level from slipping, tripping, or stumbling, from collision, pushing, or shoving, and fracture.

ICD-9-CM Categories, Washington State injury agent and intent grouping

Agent of injury	Unintentional	Self Inflicted	Assault	Other/Unknown
Fall	880.0-886.9; 888	857.0-.9	968.1	987.0-.9

The cause of specific mechanism of fall was defined based on the following E codes:

Fall on the same level:	E885; E886.(0,9)
Fall related to stairs or height	E880.(0,1,9); E881.(0,1); E884.(0,1,2,3,4,5,6,9); E957.(0,1,2,9); E968.1; E987.(0,1,2,9)
Fall from building/other structure	E882
Fall into hole or other opening	E883.(0,1,2,9)
Other and unspecified falls	E804.(0,1,2,3,8,9); E833.(0,1,2,3,4,5,6,8,9); E834.(0,1,2,3,4,5,6,8,9); E835.(0,1,2,3,4,5,6,7,8,9); E843.(0,1,2,3,4,5,6,7,8,9); E888; E988.0

Hospital charges – Hospital charges associated with the hospital stay. Because actual payments were made after the hospital discharge, the payer source was actually the expected source (not all charges were actually collected).

The Injury Severity Score (ISS) – The ISS ranks injury severity mainly in terms of threat to life. An ISS of 1-3 is considered “minor,” 4-7 is considered “moderate,” 8-15 is considered “serious,” and 16 and 75 is considered “severe to critical.” The ISS was computed from the primary and secondary diagnosis fields. In this report the ISS was derived by automated translation of the ICD-9 diagnoses using Trianalytics’ Tricode[®] software.

Median – In a sample of observations ordered from lowest to highest, the median is the middle observation if n is odd and the average of the two middle observations if n is even.

SD – Standard deviation of an estimate, computed by taking the square root of the variance. It is a measure of how widely dispersed the observed values are around the point of central tendency.

Data Analysis

Data analysis was performed using SPSS on a personal computer. Discharges rates were computed using the estimated 1994 population of Pennsylvania published in the Pennsylvania Vital Annual Report [Pennsylvania Department of Health, 1996]. Rates were not calculated for discharges less than 5.

Limitations

The 1994 hospital discharge database included those persons discharged in the year under study. Persons may have been injured in 1994 but not discharged until later; conversely, some persons may have been injured in 1993 and discharged in 1994. Because of the offsetting nature of these temporal situations, no adjustment was made.

The hospital discharge database included non-Pennsylvania residents hospitalized for injury in Pennsylvania hospitals. Because we have not sought records of Pennsylvania residents hospitalized in other states, it is assumed that the numbers gained and lost through this assumption are about the same.

The coding of “Other and Unspecified falls” although it counts for 38.5 percent of all the cases, is not informative as to the type of fall.

The hospital discharge database included persons who may have been admitted to one hospital and discharged to another hospital and discharged again in the same calendar year. This double counting probably results in an inflation of the incidence data.

There was no verification of the cause of injuries reported by hospitals in the PHCCCC data. While it is possible that some reports of fall related injuries may have been miscoded (false positives), it is probably more likely that a greater number of actual fall related injuries may not have been properly identified and coded correctly (false negatives).

Because the data were derived from hospital billing data there was no information on the injured person’s health status and no information about the medications that person was taking; this information is very important especially for the elderly population.

Information regarding Hispanic origin was available, but the numbers were too small for meaningful analysis (675 cases). Similarly, other racial categories existed, but the frequency of any subgroup other than white or blacks was quite low (157 “Asian or Pacific Islanders,” 29 “Native American or Eskimo” and 4,105 unknown).

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