Fall Injuries among Older Adults in Oregon

Injury Prevention and Epidemiology Program
State Public Health Division
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Executive Summary

Unintentional falls are a major cause of injury and death among older adults. Nearly one in three seniors falls each year and 20-30% of those who fall suffer injuries. Falls are the 10th leading cause of death among Oregonians ages 65 and older. In 2005 Oregon ranked 11th in the U.S. in rate of fatal falls among older adults.

- The fall fatality rate among Oregon seniors, 65.5 per 100,000, was 71% greater than the national average between 2001 and 2005.
- The fall-related hospitalization rate among seniors, 1,193 per 100,000, was similar to that at the national level. The average annual hospitalization rate among women (1,514 per 100,000) is nearly twice the rate for men (771 per 100,000).
- The rate of both fatal falls and fall hospitalizations increases with age.
- Falls are the leading cause of hip fractures and traumatic brain injuries (TBI) among Oregon's seniors. Approximately 50% of seniors hospitalized for falls are diagnosed with a hip fracture, and 8% are diagnosed with a TBI.
- Nearly 60% of seniors hospitalized for falls between 2002 and 2006 were discharged into long-term care (approximately 3,265 seniors each year).
- In Oregon, between 2001 and 2005, the average annual charges for hospitalization of seniors due to fall injuries were $101,021,400. Medicare was the primary payer for 78%.

Recommendations

Many falls are preventable. Oregon can reduce the burden of falls incurred by individuals and society if communities implement a nine component fall prevention strategy.

In the Community:

1. Implement evidence-based group exercise that decreases falls, and increases strength, mobility, coordination, balance, and overall physical fitness.
2. Educate older adults and their families about falls.
3. Conduct environmental assessments to reduce fall hazards and improve safety in the homes of older adults and in institutions.

In the Healthcare Sector:

4. Screen each senior for falls at every primary care visit.
5. Promote regular eye exams for seniors.
6. Conduct medication review and assess for dangerous interactions in primary care, pharmacies, and other settings.
7. Conduct fall assessment in annual primary care visits for those aged 55 and older to enable prevention before a fall occurs.

In Public Health:

8. Institute sentinel fall surveillance in Oregon emergency departments to gather circumstantial information needed to focus and tailor prevention strategies.
9. Obtain resources necessary to implement community based primary prevention strategies and public health surveillance and research.

Introduction

Literature Review

Unintentional falls are a major cause of morbidity and mortality in the United States, especially among older adults. They are the leading cause of both fatal and nonfatal unintentional injuries for persons ages 65 and older.[5,9,12] Approximately 30% of Americans ages 65 and older will fall at least once every year, and 20-30% of those who fall will suffer injuries.[1-10,18] Although seniors make up only 12.4% of the entire U.S. population (National Center for Health Statistics population estimates for 2006), they accounted for 69.1% of all injury hospitalizations due to unintentional falls in 2006, and 80.4% of all deaths due to unintentional falls in 2005.[12] Due to a variety of factors, including a greater prevalence of frailty, chronic disease, sensory and cognitive impairments, and medication use, seniors are more likely to suffer severe injuries from falling than younger persons.[5] Compared to children less than five years of age (another age group with a high incidence of fall-related injuries), seniors are ten times more likely to be hospitalized, and eight times more likely to die as a result of a fall.[9]

Older adults who fall often experience a functional decline in activities of daily living, or ADLs, loss of independence, and are at greater risk of institutionalization than those who do not fall.[9] Hip fractures are a major consequence associated with non-fatal falls and the leading fall-related injury resulting in hospitalization. More than 90% of hip fractures among seniors are associated with falls, and one fourth of those who sustain such a fracture die within one year.[9,10] Falls are a leading cause of immobility; those who survive a hip fracture are often discharged into long-term care facilities.[2,3,4,7]

Falls are also the leading cause of traumatic brain injuries (TBI) among older adults. Annually, more than 64,000 individuals over the age of 65 sustain a traumatic brain injury due to a fall.[10] Adults ages 75 and older have the highest rates of TBI-related hospitalization and death.[11] The psychological impact of falls can also be tremendous. Post-fall anxiety syndrome, or a severe fear of falling, can lead seniors to become over-cautious and restrict their activities, which in turn may contribute to an increase in muscle weakness or stiffness that further increases the likelihood of another fall.[4,7]

While the rate of non-fatal fall hospitalizations for those ages 65 and older in the U.S. has changed little, the rate of fatal fall injuries has increased in the last decade.[12,1,3] The 'Elder Fall Prevention Act of 2003,' estimates that by 2030 the population of persons ages 65 and older will double; by 2050 the number of people ages 85 and older will quadruple. As this population grows, the burden of falls and costs to society will grow. The direct costs from falls in the U.S., or costs amassed by Medicaid and Medicare from hospitalizations, medications, treatments and rehabilitation, are expected to exceed $32 billion in 2020.[10] Further, this figure does not include the indirect costs incurred by society or the individual, which may include lost of productivity and the ability to perform the normal functions of living.

Opportunities to reduce the burden of falls exist. The U.S. Public Health Service has estimated that two-thirds of the deaths due to falls could be prevented.[4] However, fall data that describe details of the circumstances and risk factors under which falls occur are essential tools necessary to develop successful fall reduction programs and monitor the problem. This report is the first

comprehensive analysis of the limited data that are available in Oregon that describes fall injuries among seniors. It is a first step in the work necessary to build and appropriately target fall prevention in the state.

An Overview of Fall Injury among Seniors Ages 65 and Older in Oregon:
Oregon's senior population is estimated to have increased 10.4% between 1997 and 2006. According to 2006 population estimates from the National Center for Health Statistics (NCHS), 13% of Oregon's population, or 478,180 people, were 65 years of age or older.[13] Further, an estimated 95% of these seniors were community dwelling, living independently outside of care facilities.[*] The majority of Oregon seniors lived in Multnomah County, but Curry County had the greatest proportion of seniors, with 26.5% of the total population age 65 or older. In eight of Oregon's 36 counties seniors represented at least 20% of the population (see Appendix B, Tables 4 and 6 for county level data). By 2020, Oregon's Office of Economic Analysis predicts the population of older adults will increase 53%, comprising 16.8% of Oregon's population.

In 2005, Oregon had the tenth highest age adjusted rate of unintentional fatal fall injuries in the United States; for seniors ages 65 and older, Oregon ranked eleventh in fatal falls.[12] Unintentional injuries were the fifth leading cause of death for all Oregonians, and unintentional falls the second leading cause of unintentional injury deaths between 2001 and 2005. The impact of falls on the senior population was even greater (Table 1). Unintentional falls were the leading cause of unintentional injury deaths for persons ages 65 and older, and the tenth leading cause of death due to all causes in this age group. The burden of fall mortality also increased with age within this population (Appendix B, Table 1).

Table 1: Leading causes of death among Oregonians 65 and older, 2001-2005

Cause of Death	***Rank***	***Average Annual Frequency***	***Average Annual Rate Per 100,000***
Heart disease	1	5,888	1295.3
Malignant neoplasms	2	5,181	1139.7
Cerebrovascular disease	3	2,252	495.3
Chronic lower respiratory diseases	4	1,578	347.1
Alzheimer's disease	5	1,151	253.1
Diabetes mellitus	6	797	175.2
Influenza and Pneumonia	7	534	117.4
Hypertension	8	322	70.7
Parkinson's disease	9	298	65.6
Unintentional falls	10	297	65.3

Unintentional falls were also the leading cause of injury hospitalizations for all Oregonians. Nearly 7,800 people were hospitalized annually between 2002 and 2006 due to unintentional falls, and 70% of those were 65 years of age or older (Table 2).

[*] Based on 2005 American Community Survey and NCHS population estimates

Table 2: Leading Causes of Injury Hospitalizations for Oregonians 65 and older, 2002-2006

External Cause of Injury	*Rank*	*Average Annual Frequency*	*Average Annual Rate Per 100,000*
Unintentional falls	1	5,492	1,189.4
Occupant in motor vehicle traffic accident	2	256	55.4
Unintentional poisoning	3	184	39.9
Adverse effects of drugs	4	150	32.4
Overexertion	5	107	23.1
Other transport injury	6	66	14.3
Unintentionally struck by or against object	7	61	13.2
Self-inflicted poisoning	8	54	11.7
Injury from natural or environmental causes	9	34	7.3
Pedestrian injured in motor vehicle accident	10	31	6.7

Data Sources and Methods

This report summarizes analysis of data from mortality records, hospital discharge records and Oregon's Behavioral Risk Factor Surveillance System. Oregon population estimates used in all rate calculations were obtained from the NCHS "2006 US Census Populations with Bridged Race Categories" population estimates file. All point estimates used for comparison employ 95% confidence intervals (CIs). 95% CIs are shown in brackets in tables throughout the report.

Data on fatal fall injuries are collected from death certificates. The information contained in death certificates is gathered from funeral directors, physicians and medical examiners. Hospital medical records personnel and county registrars report information to ensure that all death certificates are complete and accurate. Then, the data are sent to the State registrar for final checks of completeness and accuracy, and compiled into electronic databases. Deaths of Oregon residents occurring out of state are included in the database. Agreements between the U.S. states and Canadian provinces allow provinces to forward death certificate data to the decedent's state of residence in the U.S.

The electronic mortality database was de-duplicated by matching decedents on name, sex, race, social security number, date of birth, date of death, and underlying cause of death. Duplicate entries were deleted from the database. All Oregon residents ages 65 years and older at the time of their death, for the years 2001 to 2005, with an ICD-10 underlying cause of death coded between W00-W19, were included in this analysis.

The Oregon Hospital Discharge Index (HDI) is used to examine data on fall-related injury hospitalizations. The Oregon Association of Hospitals and Health Systems (OAHHS) collects hospital discharge data for the entire State of Oregon for the purposes of public health surveillance and hospital policy analysis. All de-identified hospital discharges are available for analysis; however, data on race and ethnicity are not included.

Duplicate records, matched on dates of admissions and discharge, external cause of injury and other diagnoses, and date of birth were deleted. De-duplicated hospital discharge records from the years 2002 to 2006 for Oregon residents ages 65 and older were used in this analysis. The case definition for hospitalized fall was based on the *Consensus Recommendations for Using*

Hospital Discharge Data for Injury Surveillance.[13] Discharges from Vancouver, Washington hospitals were left in the analysis if they were Oregon residents; however, anyone discharged from a Veteran's Administration hospital was excluded, as the federal government does not contribute data to the state HDI dataset. The HDI database was reduced to an injury subset by selecting all records with a principle diagnosis of ICD-9 CM 800-909.2, 909.4, 909.9, 910-994.9, 995.5-995.59 or 995.80-995.85. The dataset was further reduced to include only cases with external cause of injury codes E880-E886 and E888, the codes for unintentional falls. The first external cause of injury code listed in the dataset was used in the selection process; however, if the first external cause of injury code was invalid, the second external cause of injury code was used in the selection of cases.

The 2006 Behavioral Risk Factor Surveillance System (BRFSS) survey data were used to describe risk behaviors and fall outcomes for the senior population in Oregon. Respondents aged 45 and older were asked whether they had fallen in the past three months, and if so, if they were injured in the fall. A fall was defined as "a person unintentionally coming to rest on the ground or another lower level," and a fall-related injury was defined as an injury resulting in a person limiting his/her "regular activities for at least a day or seeing a doctor." Response data used in this analysis were limited to the responses of those 65 years of age and older at the time of the survey. The BRFSS surveys are a collaborative project of the Centers for Disease Control and Prevention and the U.S. states and territories designed to measure behavioral risk factors in the adult population.

Fatal Fall Injuries

Occurrence of Fatal Fall Injuries

The average annual fall-related fatality was 71% higher than the national rate.

Annually, over 290 fatal fall injuries occurred between 2001 and 2005. The average annual rate of fall fatality among Oregonians 65 years of age and older, 65.5 per 100,000 [95% CI: 57.7, 72.8], was over 70% greater than the national average of 38.3 per 100,000 [95% CI: 32.6, 44.0] (Table 3). Consistent with patterns on the national level, males in Oregon had higher rates of fatal falls than females between 2001 and 2005, and the rate of fatal fall injuries increased with age (Figure 1). For a complete annual summary of frequency and rates see Appendix B, Table 3.

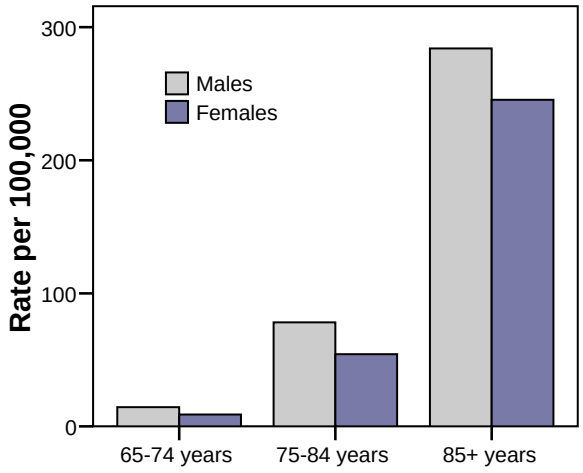
Table 3: Average annual fall fatality rates per 100,000 among seniors by sex and age group for Oregon and the U.S., 2001-2005*†

Age Group	*Sex*		
	Males	Females	Total
United States			
65-74 years	15.0 [13.0, 16.9]	8.3 [7.3, 9.2]	11.3 [10.0, 12.7]
75-84 years	51.6 [44.1, 59.1]	33.5 [28.7, 38.4]	40.8 [34.9, 46.7]
85 and over	167.2 [140.2, 194.3]	123.1 [103.0, 143.1]	136.5 [114.4, 158.7]
Total 65+	42.2 [36.0, 48.4]	35.4 [30.1, 40.8]	38.3 [32.6, 44.0]
Oregon			
65-74 years	14.5 [9.6, 19.4]	8.9 [5.6, 12.1]	11.5 [9.9, 13.0]
75-84 years	77.9 [72.8, 83.5]	54.2 [37.3, 71.0]	64.2 [55.3, 73.1]
85 and over	283.2 [238.1, 326.5]	245.4 [210.9, 279.1]	258.2 [229.2, 285.7]
Total 65+	66.3 [61.2, 70.9]	64.7 [52.0, 77.2]	65.5 [57.7, 72.8]

*National rates obtained from the CDC's Web-based Injury Statistics Query and Reporting System †95% Confidence Intervals for average rates enclosed in brackets

An average of 130 males and 167 females ages 65 and older died each year due to fatal fall injuries. However, like noted in the literature, the rate of deaths due to falls for Oregon males was slightly higher than that for females. The average annual rate of fatal fall injuries among senior males was 66.3 deaths per 100,000 [95% CI: 61.2, 70.9], while the rate for senior females was 64.7 deaths per 100,000 [95% CI: 52.0, 77.2]. The difference in fatal fall rate between males and females also increased with age.

Figure 1: Fall fatality rate among Oregon seniors by sex and age group, 2001-2005

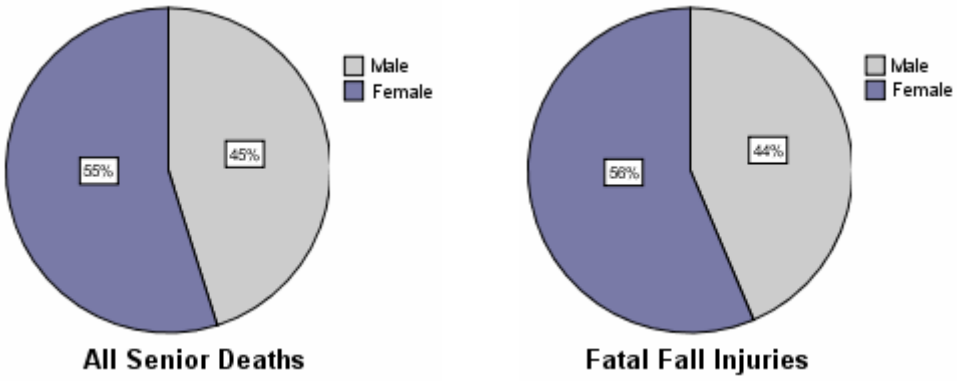


Descriptive Analysis

Sex:

Oregon's male and female seniors died of falls in the same proportion as they died of all other causes between 2001 and 2005 (Figure 2). Further, in both groups there were larger numbers of females; for every four males there were five females.

Figure 2: All cause fatality compared to fall-related fatality among Oregon seniors by sex, 2001-2005



Racial and Ethnic Distribution:

Nearly 98% of all fatal fall injuries were among white, non-Hispanic Oregonians (Table 4). In the five years between 2001 and 2005, very few of the people who died in Oregon due to falls were of other races and ethnic groups. However, this distribution was similar to the entire population of Oregonians ages 65 and older who died during this time period.

Table 4: Racial distribution of Oregon seniors with fatal fall injuries, 2001-2005

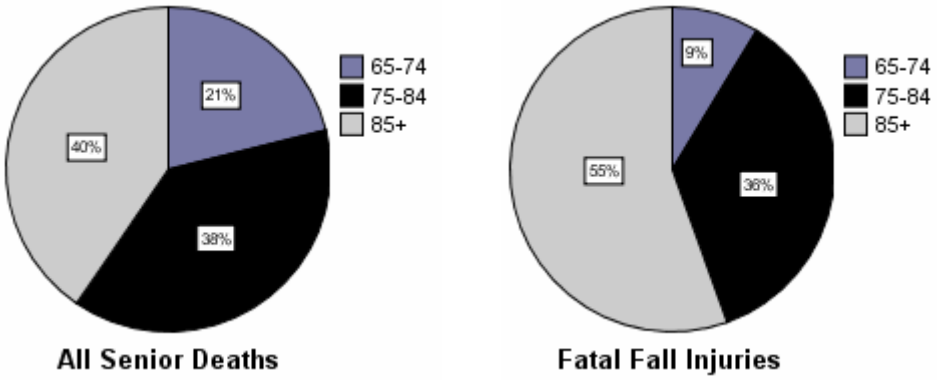
Race	***Frequency***	***Percent of Fall-related Deaths***	***Percent of all Senior Deaths***	***Rate per 100,000***
Non-Hispanic White	1,447	97.4	96.6	67.3
African American	6	0.4	0.9	28.7*
Hispanic	10	0.7	0.8	24.8*
American Indian/Native Alaskan	7	0.5	0.6	45.3*
Asian or Pacific Islander	15	1.0	1.0	31.9*

*Rates based on 20 or fewer deaths may be unstable

Age at Death:

Oregonians who died of fatal fall injuries were significantly older, on average, than those who died of other causes (Figure 3). Of all the seniors who died between 2001 and 2005, 40% were 85 years of age and older; however, 55% of seniors who died of falls during this time period were 85 or older at the time of their death. The average age at death for Oregon seniors with fatal fall injuries between 2001 and 2005 was 85 years, while the average age for all causes was 82 years. In both groups females were generally older than males at their time of death. The average age for women who died of fatal falls was 87 years versus 83 for all causes; the average age for men was 84 years versus 80 for all causes.

Figure 3: All cause fatality compared to fall-related fatality among Oregon seniors by age at death, 2001-2005



Type of Fatal Fall Injuries

The majority the death certificates of fatal fall injury victims (54%) were coded with an unspecified type; however, 30% of unspecified falls took place on a level surface (Table 5). The most common falls in which a type was specified were those resulting from tripping, slipping or stumbling on a level surface (25%), or falls involving beds (6%), stairs or steps (6%), and wheelchairs (3%). Among males, falls from ladders were common as well (4% of male fall-related deaths).

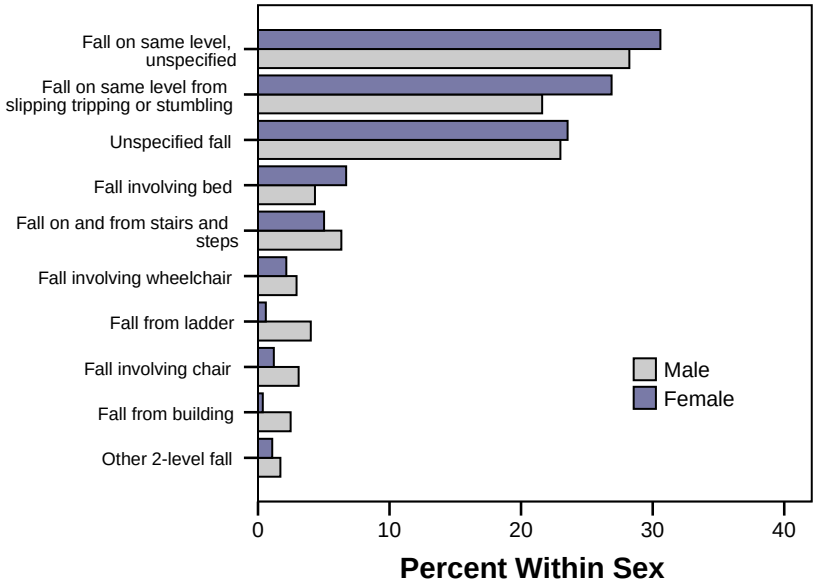
Table 5: Type of fatal fall injuries among Oregon seniors, 2001-2005

Type of Fall	***Rank***			***Average Annual Frequency***			***Average Annual Rate per 100,000***		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
Fall on same level, unspecified	1	1	1	37	51	88	18.7	19.8	19.3
Fall on same level from tripping, slipping, or stumbling	3	2	2	28	45	73	14.3	17.4	16.1
Unspecified fall	2	3	3	30	39	69	15.2	15.2	15.2
Fall from bed	5	4	4	6	11	17	2.9	4.3	3.7
Fall on or from stairs or steps	4	5	4	8	8	17	4.2	3.2	3.7
Fall involving a wheelchair	7	6	6	4	4	7	1.9	1.4	1.6
Fall from a ladder*	6	10	7	5	1	6	2.7	0.4	1.4
Fall involving a chair	7	7	7	4	2	6	2.0	0.8	1.3
Fall from building*	9	12	9	3	1	4	1.6	0.2	0.8
Two-level fall, unspecified*	10	8	9	2	2	4	1.1	0.7	0.9
All other external causes				3	3	6	1.5	1.1	1.3
Total				130	167	297	66.3	64.7	65.3

*Rates based on 20 or fewer deaths may be unstable

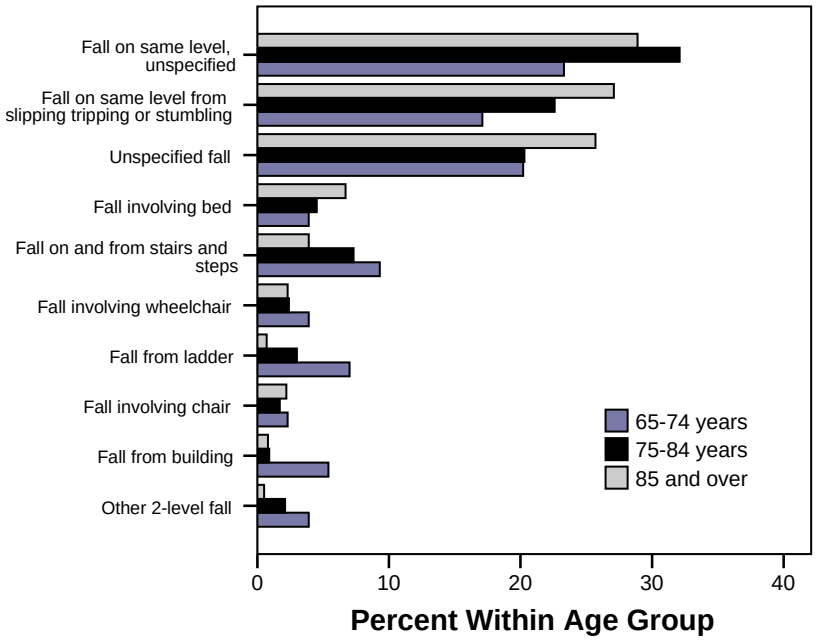
The type of fall experienced by senior Oregonians with fatal fall injuries differed depending upon the individual's sex and age group. Significantly greater proportions of senior women had falls on level surfaces due to tripping or stumbling, or experienced falls involving beds than men (Figure 4). On the other hand, more of the senior men fell from ladders, chairs, or buildings.

Figure 4: Type of fatal fall among Oregon seniors by sex, 2001-2005



In addition, greater proportions of seniors ages 85 years and older died of falls that were caused by tripping and stumbling on a level surface, involved a bed, or falls where the type was not specified on the death certificate (Figure 5), while greater proportions of the seniors ages 65-74 years died of falls involving stairs or steps, ladders, buildings or other two level environments. The similarities between the falls among older seniors and women versus younger seniors and men reflect the fact that women were older at their time of death than men.

Figure 5: Type of fatal fall among Oregon seniors by age group, 2001-2005

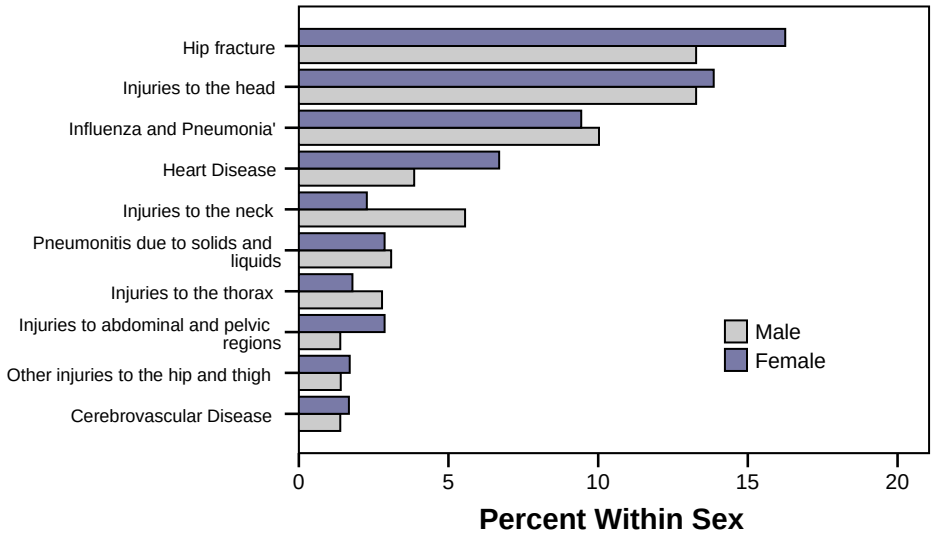


Other Factors Contributing to Fall Fatalities

Individuals may have multiple conditions that contribute to their death. Death certificates record an immediate cause of death, an underlying cause, and other significant conditions contributing to a death. In order to capture the variety of conditions that contribute to these deaths, up to seven contributing factors listed in the mortality data set were examined. The first contributing factor listed was considered the "primary" factor contributing to the death. The primary contributing factor that occurred most frequently in all fall-related deaths among Oregon seniors was fracture of the hip, followed by injuries to the head (15% and 14% of all deaths respectively). Injuries to the neck, thorax, abdominal and pelvic regions, as well as other hip and thigh injuries were also commonly diagnosed as primary factors contributing to fall-related deaths of seniors. Other non-injury primary contributing factors commonly diagnosed included influenza and pneumonia, heart disease, pneumonitis due to solids and liquids and cerebrovascular disease. Among the non-injury factors, pneumonia had the greatest impact, diagnosed as a contributing factor in 12% of the fall deaths, usually the primary contributing factor (in 144 or 82% of the pneumonia-related fall deaths). Therefore, it is likely that the majority of these seniors became ill during the recovery process, succumbing to pneumonia after their fall.

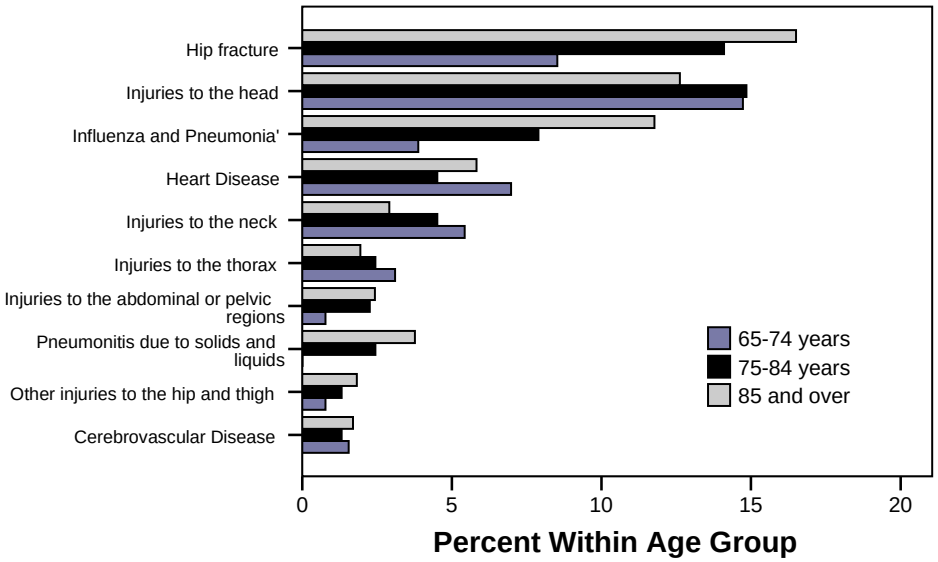
Injuries and conditions contributing to fall-related deaths differed by sex and age group. Among women the most frequent factor listed as the primary contributing factor in fall deaths was hip fracture (16% of all deaths among women); however, for senior men in Oregon, head injuries were just as common as hip fractures, both occurring 13% of the time (Figure 6). Further, a greater proportion of women had injuries to the abdominal or pelvic region listed as a primary contributing factor (3% vs. 1% of men), while more of the men were diagnosed with injuries to the neck (6% vs. 2% of women).

Figure 6: Leading primary contributing factors in deaths of Oregon seniors with fatal fall injuries by sex, 2001-2005



Hip fractures were the most common primary contributing factor listed in the fall-related death mortality data set among seniors ages 85+ (17% of deaths), while injuries to the head were the leading primary contributing factor among those aged 65-74 and 75-84 years, (15% of deaths) (Figure 7).

Figure 7: Leading primary contributing factors in deaths of Oregon seniors with fatal fall injuries by age group, 2001-2005



Hip fractures and head injury sustained in a fall are the most commonly listed multiple factors (all seven contributing factors examined) that contribute to death. Most fatal falls due to tripping on a level surface, falling from wheelchairs, chairs and beds, or due to unspecified circumstances resulted in hip fractures (see bolded percentages in Table 6). Most of the fatal falls from stairs or steps, ladders, other two-level environments and level surface falls resulted in traumatic brain injuries.

Table 6: Proportion of fall types resulting in commonly reported multiple contributing factors in Oregon senior fall fatalities, 2001-2005*

Injury	***Type of Fall***								
	Same level, tripping / stumbling	From wheel-chair	From bed	From chair	From stairs and steps	From ladder	Other 2-level	Other same level	Unspecified
TBI	29.6%	16.2%	10.7%	26.7%	**55.4%**	**45.2%**	**65.0%**	**40.5%**	25.1%
Hip fracture	**47.9%**	**45.9%**	**54.8%**	**30.0%**	6.0%	6.5%	10.0%	32.1%	**40.8%**
Neck injury	3.0%	10.8%	3.6%	10.0%	19.3%	9.7%	15.0%	6.6%	3.2%
Thorax injury	5.2%	2.7%	3.6%	16.7%	6.0%	12.9%	0.0%	4.3%	6.15
Injury to abdominal or pelvic region	5.2%	8.1%	8.3%	13.3%	4.8%	3.2%	0.0%	4.8%	9.2%

*Column percents do not add up do 100 due to decedents with multiple injuries

Hip Fractures and Traumatic Brain Injuries:
Hip fractures were listed as a contributing factor in 37% of the fall-related deaths among seniors, but in only 1.3% of all senior deaths between 2001 and 2005. Hip fractures contributed to more fall-related deaths among women than men (41% versus 32% respectively). The proportion of seniors with hip fractures listed as a contributing factor in their fall-related death also increased with age, regardless of sex.

Head injuries were the second most common contributing factor in fall deaths. Thirty-three percent of seniors who died of fall-related injuries had a traumatic brain injury listed as contributing to their death, while TBIs were a contributing factor in only 1% of deaths due to all causes among seniors between 2001 and 2005. Unlike hip fractures, more men with fatal fall injuries had TBIs compared to women (37% versus 29% respectively), and the number decreased with increasing age regardless of sex.

Circumstances of Fatal Fall Injury

Location of Fall Injury and Time Elapsed Between Fall and Death:
Most of the falls occurred in the decedent's home (61%), with another 11% taking place in residential institutions, such as nursing homes or other long-term care facilities. The remaining falls took place in other locations (17%) or had unknown or missing location data (10%). Those with injuries to the head, neck or thorax resulting from their fall were more likely to have been hospitalized for those injuries, later dying in the hospital. Those with injuries to the abdomen, lower back or lumbar spine were more likely to have died outside of a hospital.

61% of fatal falls occur at home.

The median number of days between the fall injury and resulting death was eight; the range in time was 0 to 1,119 days, or approximately three years. This time interval increased with age. The median time interval between injury and death for those ages 65 to 74 years was three days, for those ages 75-84 it was six days, and for those ages 85 and older nine days.

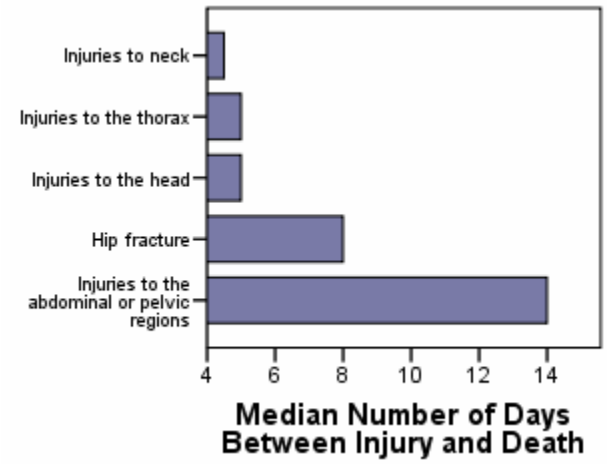
Those whose falls involved a chair had the highest median number of days between injury and death, while those whose falls involved a bed had the second longest median number of days and the widest range of days between injury and death (Table 7). On the other hand, those who suffered injuries by falling from ladders, or stairs or steps had the shortest median days between injury and death, as well as the narrowest ranges.

Table 7: Average number of days between fall injury and death among Oregon seniors by fall type, 2001-2005

Type of Fall	***Median***	***Minimum***	***Maximum***
Fall involving chair	13	0	165
Fall involving bed	11	0	1,119
Unspecified fall	9	0	400
Fall on same level from slipping tripping or stumbling	8	0	349
Other fall on same level	7	0	367
Fall involving wheelchair	7	0	367
Fall on and from stairs and steps	5	0	78
Fall on or from ladder	5	0	57

Those with primary contributing factors of head, neck and thorax injuries had significantly lower median numbers of days between injury and death than those with hip fractures and injuries to their abdominal and pelvic regions (Figure 8). Most of those who died within a week of falling expired in a hospital (76%), while the majority (74%) of those who died more than a month after their injury died at home or in a residential facility.

Figure 8: Median days elapsed between fall injury and death by selected primary contributing factors among Oregon seniors, 2001-2005



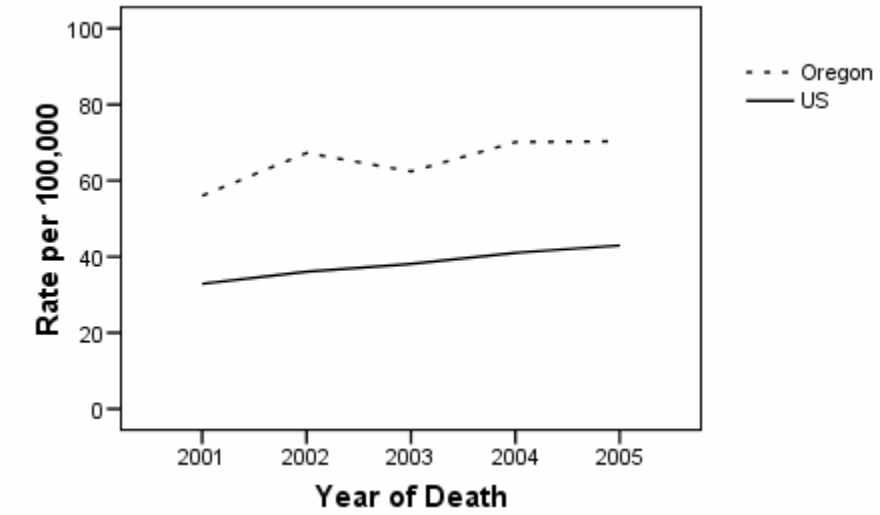
Overall, the time elapsed between the fall injury and resulting death reflects the relative severity of fall injuries. Men, who are younger than women on average, also experience shorter time periods between injury and death than women, and generally suffer more severe injuries from multi-level falls. On the other hand, women, who are older and more often experience less severe injuries from single level falls, experience longer periods of time between their injuries and deaths.

Trends in Fatal Fall Injuries

The rate of fatal fall injuries among Oregonians is much higher than, and at times nearly double, the national average (Figure 9). However, for both the U.S. and Oregon, rates of fatal fall injuries increased between 2001 and 2005.

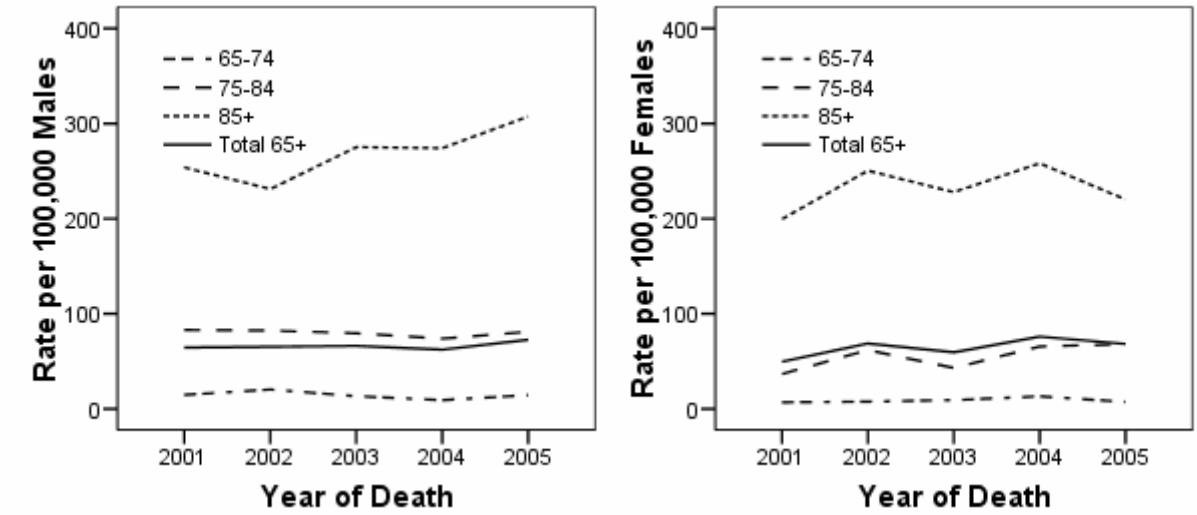
When stratified by age and sex, the rates for males were slightly higher than those for females in Oregon among all senior age groups (Figure 10). Rates for women in all age groups and younger senior men changed little between 2001 and 2005, while the rate for males 85 and over increased. For both sexes, the rate of fatal falls increased with age, and was greatest for persons ages 85 and older. Both males and females 85 and older had more than two times the rate of fatal falls than persons 65 to 84 years of age.

Figure 9: Rate of fatal fall injuries among residents ages 65 and older, Oregon & US, 2001-2005



†National rates obtained from the CDC's Web-based Injury Statistics Query and Reporting System

Figure 10: Rate of fatal fall injuries among Oregon seniors by sex and age group, 2001-2005



Consistent with the literature and national trends, the rate of fatal fall injuries for Oregon seniors increased in the past five years, but Oregon's average annual rate was nearly double the national average. The difference in the rate of fatal fall injuries at the state versus the national level was mainly attributable to higher rates among the oldest seniors. The fatal fall rates for seniors aged 65 to 74 were similar to those at the national level; however, Oregonians 75 years of age and older had rates of fatal falls that were approximately 70% higher than the national averages, regardless of sex. The increasing trend in Oregon was mainly attributable to an increase in fall fatalities among males ages 85 and older, and females ages 75 to 84. Rates among senior males 85 and older rose approximately 28% between 2001 and 2005, while those among senior females 75 to 84 years rose nearly 81%. All other rates varied little between 2001 and 2005.

Fall-related Injury Hospitalizations

Occurrence of Fall-related Injury Hospitalizations

An average of 5,492 Oregon seniors were admitted to hospitals for fall-related injuries each year between 2002 and 2006, producing an average annual rate of 1,193 hospitalizations per 100,000 Oregon seniors [95% CI: 1174, 1205]. This was comparable to the national rate of 1,139 fall hospitalizations per 100,000 seniors. Further, Oregon's senior fall hospitalization rates were similar to the U.S. rates regardless of sex or age group (Table 8).

About 5,500 seniors are hospitalized for fall-related injuries each year in Oregon.

Table 8: Average annual rates of fall-related injury hospitalizations among Oregon's senior population by sex and age group versus national rates, 2002-2006*†

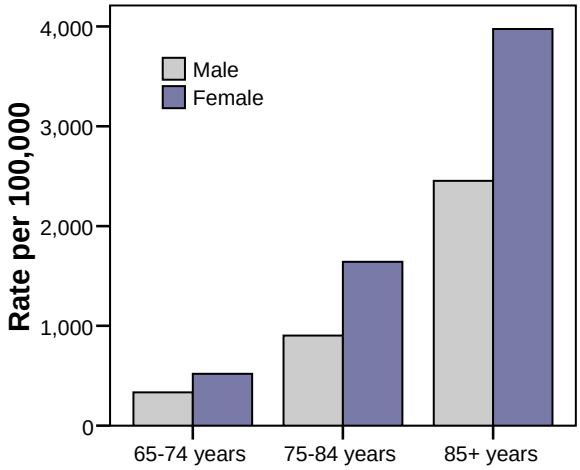
	Rate of fall-related Hospitalizations in OR			***Rate of fall-related Hospitalizations in the U.S.***		
Age Group	Males	Females	Total	Males	Females	Total
65-74 years	337	522	435	346	488	423
	[318, 351]	[487, 553]	[410, 456]	[292, 400]	[427, 549]	[371, 475]
75-84 years	902	1,635	1,327	956	1,561	1,318
	[874, 931]	[1567, 1716]	[1294, 1367]	[827, 1086]	[1426, 1695]	[1194, 1441]
85 and over	2,470	4,006	3,490	2,564	3,733	3,371
	[2319, 2588]	[3779, 4170]	[3301, 3626]	[2450, 2677]	[3468, 3999]	[3164, 3578]
Total 65+	771	1,514	1,193	776	1,397	1,139
	[752, 784]	[1491, 1531]	[1174, 1205]	[691, 862]	[1271, 1523]	[1033, 1244]

*95% Confidence Intervals for average rates enclosed in brackets

†National rates obtained from the CDC's Web-based Injury Statistics Query and Reporting System

Oregon seniors, as well as seniors nationwide, had rates of hospitalization due to fall-related injuries that increased with age. Rates were also greater among women (Figure 11). In Oregon, the rate of fall-related hospitalization among women is nearly double that among males.

Figure 11: Rate of fall-related injury hospitalizations among Oregon seniors by sex and age group, 2002-2006



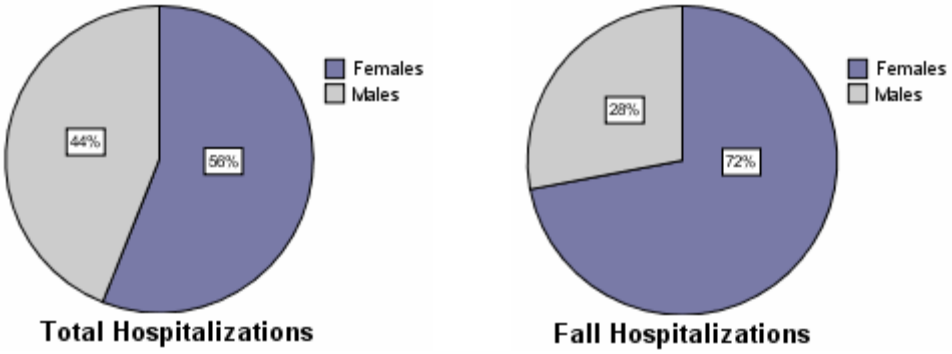
Between 2002 and 2006, males were hospitalized an average of 1,535 times each year for fall-related injuries; females were hospitalized an average of 3,957 times each year. The rate of fall-related hospitalizations among Oregon senior females, 1,514 hospitalizations per 100,000 [95% CI: 1491, 1531], was nearly double that of males, 771 hospitalizations per 100,000 [95% CI: 752, 784].

Limitations of Oregon Hospitalization Data:
These data may under-estimate the number of fall hospitalizations by 20-25%. Seventeen percent of all injury hospitalization records (approximately 1,370) do not include an indication of the cause of the injury. Additionally, approximately 80% of injury hospitalizations among Oregon seniors were the result of unintentional falls. The actual number of fall-related injury hospitalizations each year may have been closer to 6,597, resulting in a rate of 1,433 fall hospitalizations per 100,000 seniors. The rate of fall hospitalization among Oregon seniors may be as much as 25% higher than the national rate.

Descriptive Analysis

Sex:
Women are hospitalized more often than men (Figure 12). Fifty-six percent of all hospitalized seniors were female; 44% were male. This difference is even greater for fall hospitalizations. Seventy-two percent of fall-related hospitalizations occurred among females, while only 28% occurred among males. For every man hospitalized for a fall there are 2.5 women; however, for every senior man hospitalized for all causes there were 1.3 women hospitalized.

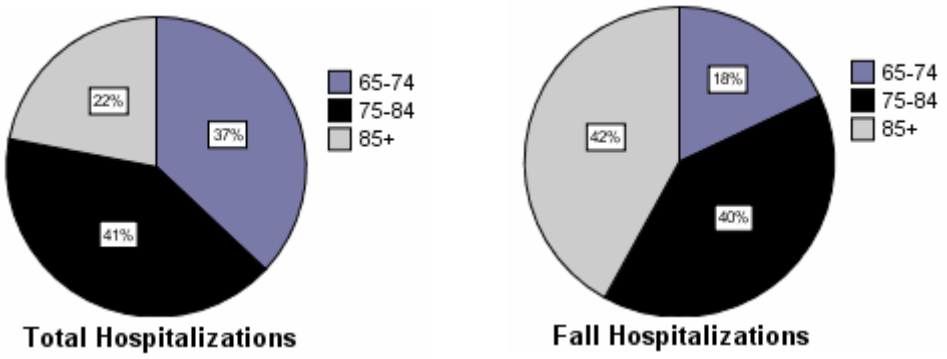
Figure 12: All cause hospitalization compared to fall-related hospitalization among Oregon seniors, 2002-2006



Age at Time of Hospitalization:
Like with fatal fall injuries, the senior population hospitalized for falls were older than the population of seniors hospitalized for all causes (Figure 13). Those who were hospitalized for falls averaged 82 years at the time of injury, while those who died from falls averaged 85 years. On average, women who were hospitalized were older than men. The majority of people hospitalized for falls are 85 and older, while the majority of those hospitalized for all causes are 75-84.

The average age of seniors who were hospitalized for fall related injuries was 82.

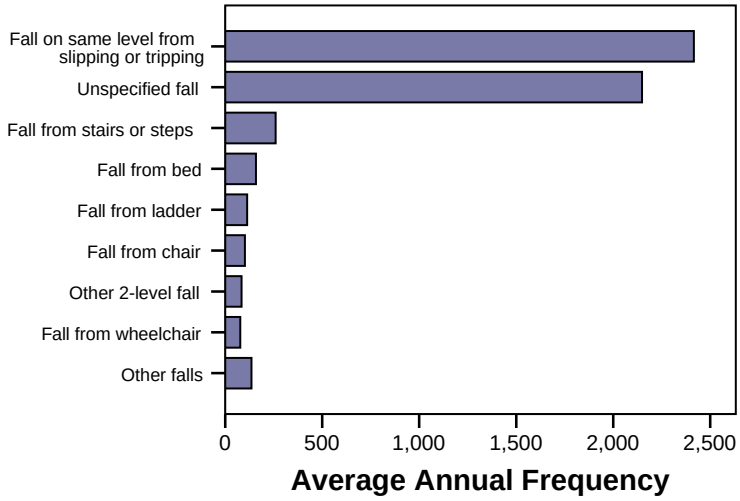
Figure 13: All cause hospitalization compared to fall-related hospitalization among Oregon seniors by age group, 2002-2006



Types of Fall-related Injury Hospitalizations

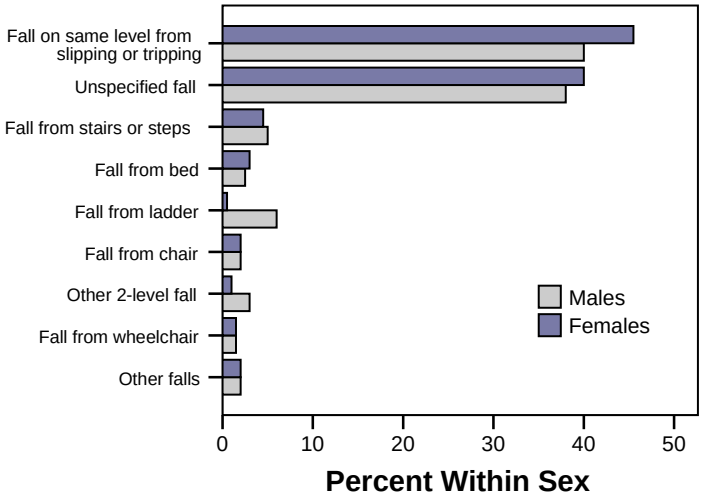
The most frequently noted type of fall resulting in hospitalization among Oregon seniors was slipping or tripping on a level surface; over 2,400 falls of this type occurred each year (Figure 14). Nearly 40% of the fall hospitalization records (2,148 falls records), did not specify the type of fall. Falls from stairs or steps, bed, ladders and chairs, each resulted in more than 100 hospitalizations each year. Falls from wheelchairs and other two-level falls resulted in more than 50 hospitalizations each year.

Figure 14: Frequency of fall types among injury hospitalizations among Oregon seniors, 2002-2006



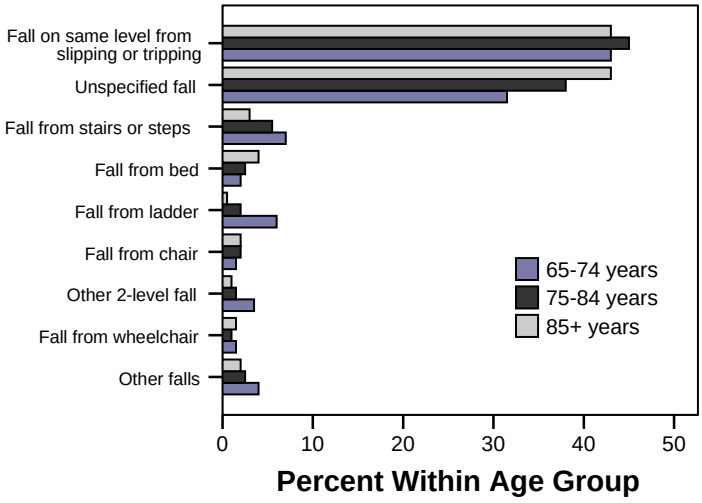
Men and women were observed to have different types of falls (Figure 15). Significantly greater proportions of women were hospitalized for falls caused by tripping or slipping on a level surface as well as falls with no specified type. Greater proportions of men were hospitalized for falls from ladders and other two-level falls.

Figure 15: Fall-related injury hospitalizations among Oregon seniors by type of fall and sex, 2002-2006



The type of fall also differed by age group (Figure 16). People are more likely to fall from beds as they get older; older persons are also more likely to have unspecified falls. Seniors 65 to 74 years of age experienced a significantly larger proportion of "other" fall types than older seniors. As people age, the number of falls associated with ladders, and stairs and steps each independently decreases.

Figure 16: Fall-related injury hospitalizations among Oregon seniors by type of fall and age group, 2002-2006



There was little documentation of the circumstances surrounding falls and fall injuries in the mortality and hospitalization datasets, especially details of conditions that precipitated the falls. In both datasets more senior males and those in the younger age groups experienced falls from ladders, stairs or steps and other two-level falls, while greater proportions of senior women, and those in older age groups fell on the same level. The fact that both female and older seniors had similar patterns in fall type may have been due to the age distribution within these datasets: men that fell tended to be younger than the women. Further, more men experienced two-level falls. This fact may explain why men died of falls at a greater rate than women despite the fact that women were hospitalized for falls at a greater rate than men.

Diagnoses in Fall-related Injury Hospitalizations

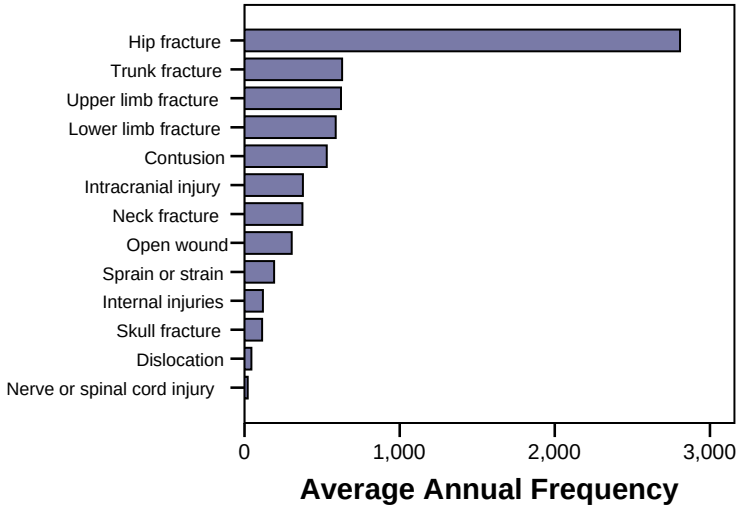
Falls were the leading cause of all fractures among seniors between 2002 and 2006. Unintentional falls caused 77% of all fractures among Oregon seniors. Among fall-related hospitalizations, 76% had a single fracture, most commonly a hip fracture (50%), 9% had two fractures, and 2% were diagnosed with three or more fractures at the time of hospitalization.

Unintentional falls caused 77% of all fractures among Oregon seniors.

Figure 17 summarizes the injuries suffered by seniors hospitalized for falls between 2002 and 2006. The most frequently diagnosed injury in fall-related hospitalizations among Oregon seniors were hip fractures. Just over 2,800 seniors were hospitalized for hip fractures due to falls each year. The next most common injuries were fractures of the trunk region, upper limbs and lower limbs, each diagnosed more than 500 times each year. There were also 375 diagnoses of both intracranial injuries and neck fractures, as well as just over 100 diagnoses of skull fractures and internal injuries to the abdominal, thoracic or pelvic regions. Spinal cord injuries due to falls were less common in seniors, with approximately 22 diagnosed each year. Other injuries included contusions, dislocations, open wounds and sprain and strains.

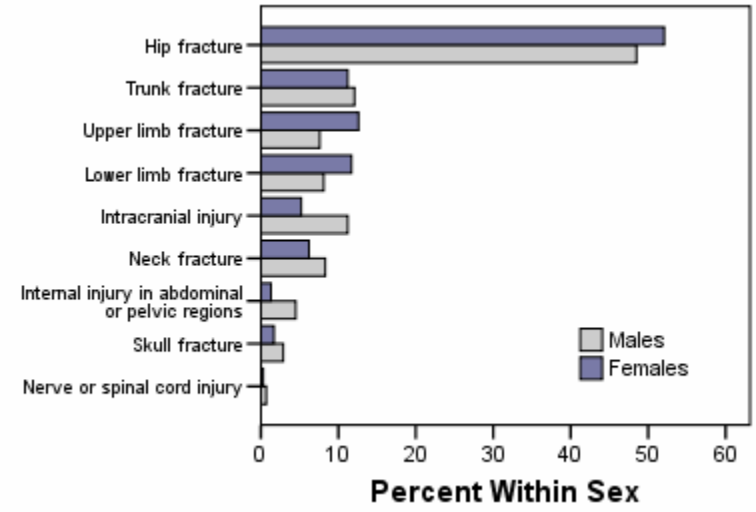
Just over 2,800 seniors were hospitalized for hip fractures due to falls each year.

Figure 17: Average annual frequency of injuries diagnosed among Oregon seniors hospitalized for falls, 2002-2006



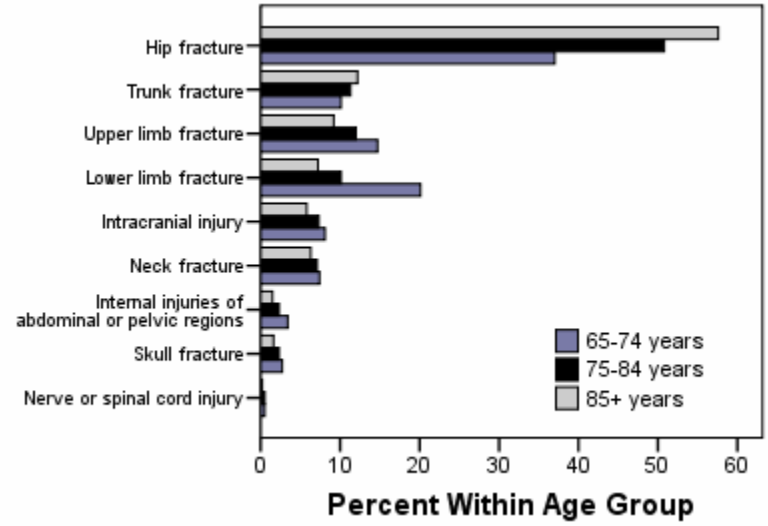
Hip fractures were significantly more common among senior women than senior men hospitalized for falls (Figure 18). Greater proportions of women were also diagnosed with upper and lower limb fractures. Men more frequently experienced intracranial injuries, neck fractures, internal injuries of the abdominal or pelvic regions, skull fractures and spinal cord injuries. Nearly equal proportions of men and women were diagnosed with trunk fractures.

Figure 18: Frequency of injury diagnosed among Oregon seniors hospitalized for falls by sex, 2002-2006



The frequency of injuries sustained by seniors hospitalized for falls differed significantly by age group as well (Figure 19). The number of Oregon seniors diagnosed with hip and trunk fractures increased with age. On the other hand, more Oregon seniors ages 65 to 74 years sustained upper and lower limb fractures, intracranial injuries, internal injuries of the abdominal or pelvic regions, and skull fractures. Most of the spinal cord injuries were sustained by seniors ages 75 to 84 years; neck fractures were experienced equally by all age groups.

Figure 19: Frequency of injuries diagnosed among Oregon seniors hospitalized for falls by age group, 2002-2006



Hip fractures were the most common injury due to all fall types except falls from ladders (see bolded percentages in Table 9). Trunk fractures were the most common injury resulting from falls from ladders.

Table 9: Proportion of fall types resulting in selected injuries among Oregon seniors, 2002-2006*

Injury	***Cause and Type of Fall***							
	From stairs and steps	From ladder	From chair	From wheelchair	From bed	Other 2-level	Same level, tripping/ stumbling	Unspecified
Skull fracture	5.7%	6.0%	1.2%	2.1%	0.8%	3.8%	1.6%	1.9%
Neck fracture	9.3%	18.1%	9.1%	8.0%	5.4%	10.0%	5.2%	7.3%
Trunk fracture	12.1%	**28.1%**	10.1%	8.0%	9.1%	19.4%	10.6%	11.2%
Upper limb fracture	16.2%	17.7%	6.5%	8.0%	8.0%	14.1%	12.0%	10.0%
Lower limb fracture	17.3%	20.5%	9.1%	14.7%	8.5%	16.7%	11.7%	8.0%
Hip fracture	**33.8%**	20.5%	**56.2%**	**51.2%**	**55.5%**	**34.4%**	**55.2%**	**50.8%**
Dislocation	1.9%	3.2%	1.2%	0.0%	0.6%	2.2%	0.7%	0.6%
Intracranial injury	12.3%	12.0%	4.3%	8.5%	6.0%	10.0%	4.6%	8.5%
Sprain or strain	6.3%	5.1%	3.6%	0.8%	2.7%	6.2%	3.0%	3.6%
Internal injury of abdominal or pelvic region	3.2%	11.7%	2.6%	2.1%	1.3%	6.7%	1.3%	2.2%
Open wound	10.0%	11.0%	3.9%	8.3%	3.9%	10.3%	5.1%	5.0%
Contusion w/ intact skin	13.5%	13.3%	7.9%	12.4%	10.1%	13.2%	8.7%	9.8%
Spinal Cord Injury	0.9%	1.2%	0.6%	0.3%	0.6%	0.5%	0.3%	0.3%

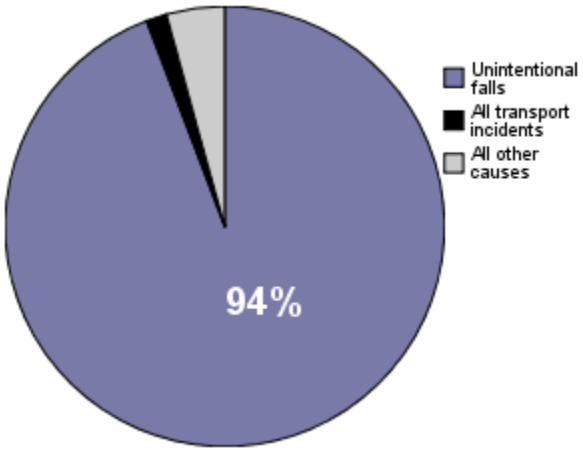
*Column percentages do not add up to 100 due to patients with multiple injuries

Hip Fractures and Traumatic Brain Injuries:

Just over 50% of the seniors hospitalized for fall-related injuries between 2002 and 2006 were diagnosed with a hip fracture. Unintentional falls were responsible for 94.3% of all hip fractures diagnosed among Oregon seniors hospitalized for injuries between 2002 and 2006 (Figure 20).

Over 50% of the seniors hospitalized for fall-related injuries were diagnosed with a hip fracture.

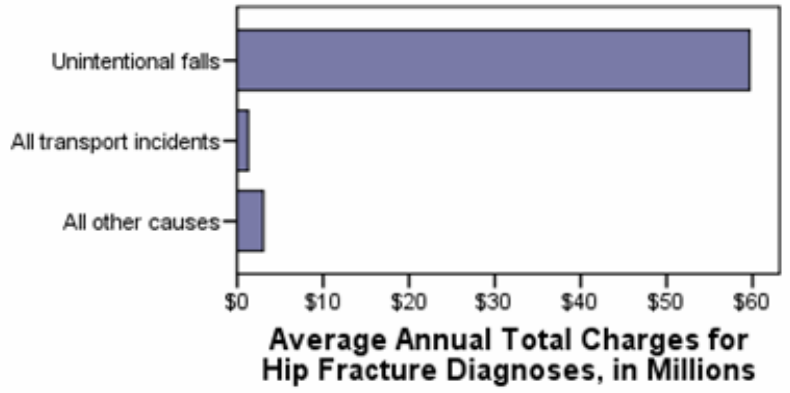
Figure 20: Causes of hip fractures among Oregon seniors, 2002-2006



Hip fractures were the leading primary diagnosis for fall hospitalization. Falls caused more than 2,800 hip fractures among Oregon seniors each year. Falls result in hip fractures four times more

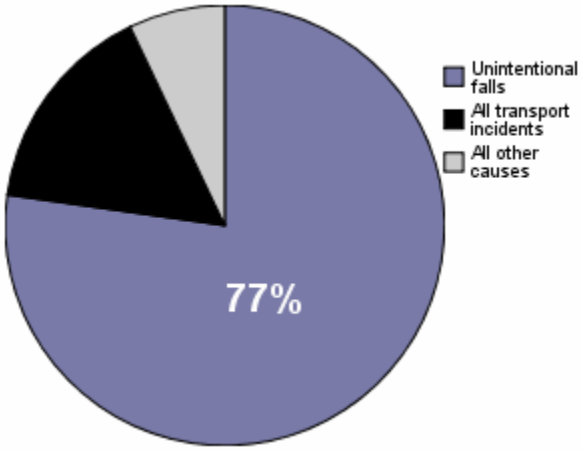
often than any other injury. Further, the costs of fall-related hip fractures are high, nearly $60 million dollars each year (Figure 21).

Figure 21: Average annual hospitalization charges for hip fractures among Oregon seniors by cause of injury, 2002-2006



Unintentional falls are associated with TBI more than any other cause of injury hospitalization among seniors (Figure 22). Approximately 8% of the seniors hospitalized for falls between 2002 and 2006 were diagnosed with a TBI. Falls are associated with approximately 77.2% of all injury-related TBI hospitalizations, 83.5% of the TBIs among senior women, and 70.8% of those among senior men. The number of TBIs associated with falls increased with age. Falls were associated with 63.3% of the TBI diagnoses among those ages 65 to 74 years, 78.7% among those ages 75 to 84, and 87.2% among those ages 85 and older.

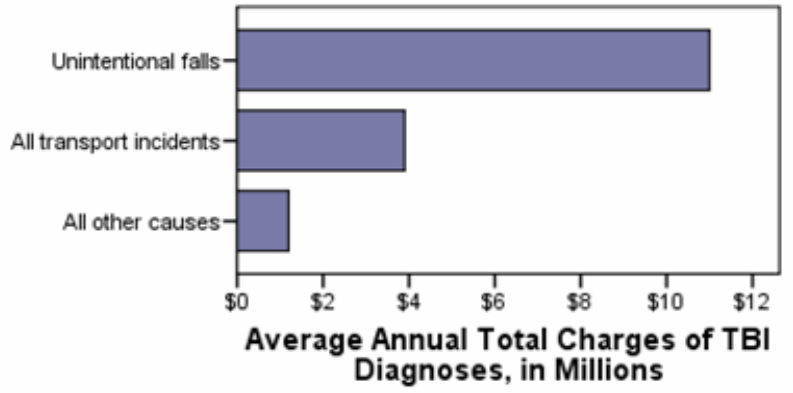
Figure 22: Causes of hospitalization for traumatic brain injuries among Oregon seniors, 2002-2006



TBIs were observed less often among hospitalized seniors than they were among seniors who died from a fall (8% versus 33%). This difference suggests that falls resulting in TBIs had a greater tendency to be fatal than those resulting in other injuries. Men sustained TBIs more often than women, it is expected that their rate of fatal fall injuries was also higher than that of women.

Between 2002 and 2006 hospitals charged approximately $11 million dollars each year to treat fall-related TBIs (Figure 23).

Figure 23: Annual average hospitalization charges for traumatic brain injuries among Oregon seniors by cause of injury, 2002-2006



Details of Fall-related Injury Hospitalizations

Source and Type of Admissions

The majority of seniors, or 84%, were admitted through the emergency department (ED), 12% from a physician referral, 3% were transferred from another hospital, and the other 1% were admitted through other sources. Sixty-three percent of admissions were emergency, 29% were urgent care, 7% elective, and 1% trauma center.

Length of Stay

The median length of stay for fall-related injuries was four days; the range was from 0 to 89 days. The majority of seniors hospitalized for falls (72%) stayed three days to a week (Figure 24). There was no difference in the median length of stay by sex, age group or fall type. However, more younger seniors had lengths of stay of one or two days (Figure 25). The median length of stay for seniors hospitalized for falls was significantly higher than for seniors hospitalized for all causes.

Figure 24: Total length of stay for Oregon seniors hospitalized for fall-related injuries, 2002-2006

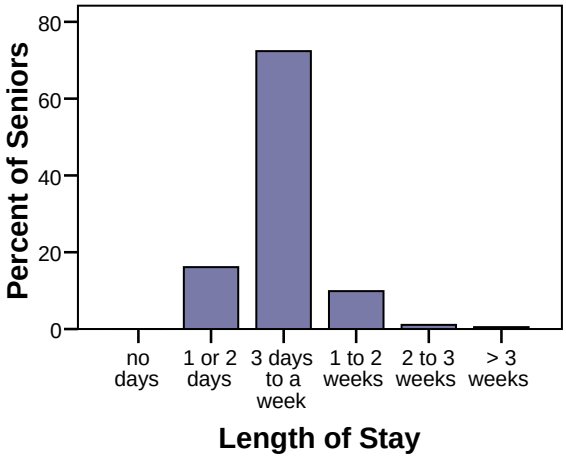
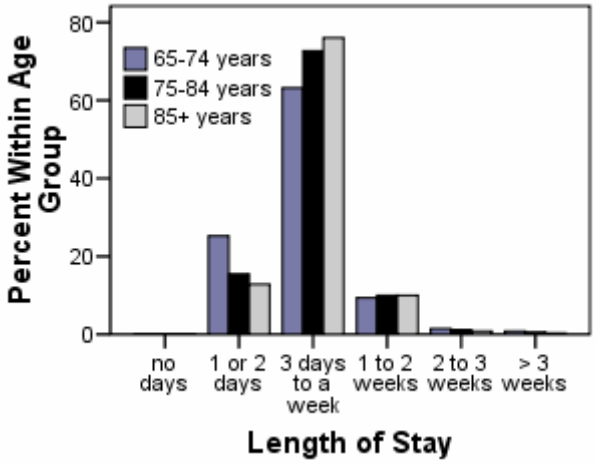


Figure 25: Length of stay for Oregon seniors hospitalized for fall-related injuries by age group, 2002-2006



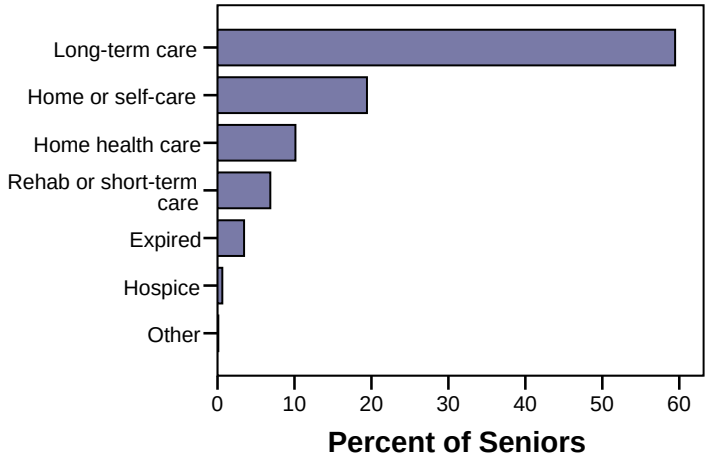
Discharge Status

Nearly 60% of seniors hospitalized for falls were discharged into a long-term care facility

Patients hospitalized for falls were discharged into long-term care more often than seniors hospitalized for all other causes between 2002 and 2006. Nearly 60% of seniors hospitalized for falls were discharged into a long-term care facility, approximately 3,265 seniors each year (Figure 26). Whether these patients originated in long-term care was unknown, but falls in general are a major reason for institutionalization. Another 20% had a routine discharge to their home, 10% were transferred to home health care services, 7% were transferred for short-term care or rehabilitation, 3% died in the hospital, and 1% were discharged into a hospice care setting. Seniors hospitalized due to fall-related injury were 5.9 times more likely to be discharged into long term care than those hospitalized for all reasons [odds ratio=5.9, 95% CI: 5.7, 6.0]. Seniors hospitalized for falls were 2.5 times as likely to have been discharged into long-term care than seniors hospitalized due to all injury [odds ratio=2.5, 95% CI: 2.4, 2.7].

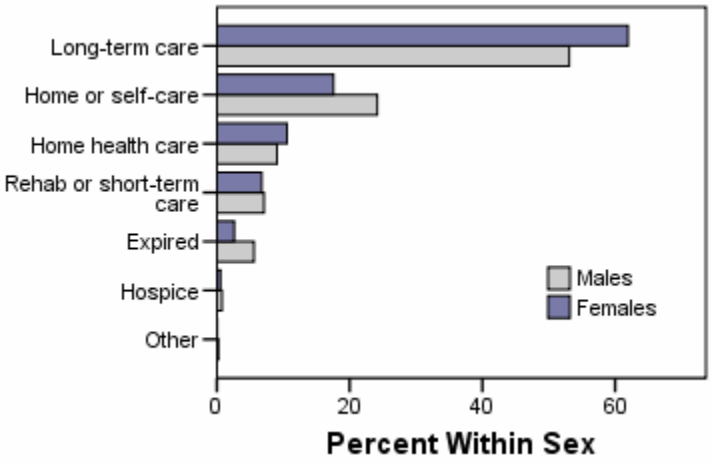
Older adults hospitalized due to injury are 5.9 time more likely to be discharged into long term care than older adults hospitalized for all other reasons.

Figure 26: Discharge status of Oregon seniors hospitalized for fall-related injuries, 2002-2006



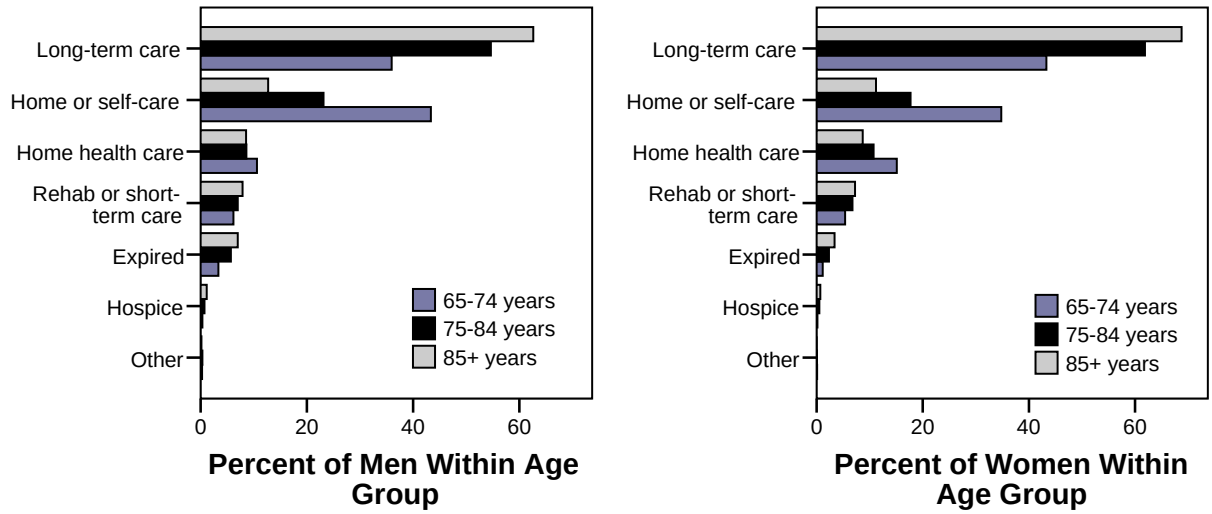
More men died in the hospital, were discharged into hospice care, or were routinely discharged to their homes (Figure 27). More women than men were transferred to long-term or home health care. There was no difference between the number of men and women discharged into rehab or short-term care facilities.

Figure 27: Discharge status of Oregon seniors hospitalized for fall-related injuries by sex, 2002-2006



Seniors aged 65-74 are more likely to be discharged home or to home healthcare regardless of sex (Figure 28).

Figure 28: Discharge status of Oregon seniors hospitalized for falls by sex and age group, 2002-2006



Approximately three-fourths of the patients diagnosed with hip fractures (73%) were discharged into long-term care facilities, more than any other primary diagnosis group (see bolded figures in Table 10). Greater proportions of seniors diagnosed with intracranial injuries or skull fractures died in the hospital; seniors with intracranial injuries were also discharged into hospice more often than patients with other injuries.

Table 10: Discharge status for selected diagnoses among Oregon seniors hospitalized for fall-related injuries, 2002-2006*

Injury	***Discharge Status***						
	Home or self-care	Short-term care	Long-term care	Hospice	Home health care	Expired	Other
Skull fracture	221	38	177	6	61	65	2
	39%	7%	31%	1%	11%	11%	< 1%
Neck fracture	479	144	931	13	226	77	0
	25%	8%	50%	1%	12%	4%	0%
Trunk fracture	626	230	1,799	17	371	100	3
	20%	7%	57%	1%	12%	3%	< 1%
Hip fracture	1,079	981	**10,298**	78	1,149	436	14
	8%	7%	**73%**	1%	8%	3%	< 1%
Intracranial injury	700	137	589	40	181	228	7
	37%	7%	31%	2%	10%	12%	< 1%
Internal injury of abdominal region	245	36	199	1	78	35	1
	41%	6%	33%	< 1%	13%	6%	< 1%

*Some patients may have had more than one of the following injury diagnoses

Cost Analysis of Fall-related Injury Hospitalizations

In 2006, fall hospitalization cost for Oregon seniors was $121.6 million (Table 11). Unintentional falls were the third most costly hospitalized condition after cancer and heart disease. Between 2002 and 2006, the median per patient hospitalization costs for fall-related injury was $16,480. The charges ranged from a minimum of $597 to a maximum of $434,033.

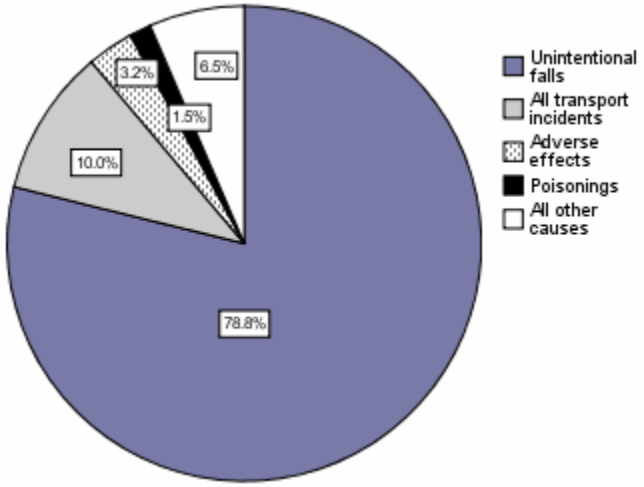
Table 11: Three leading causes of hospitalization among seniors in Oregon in terms of cost, 2002-2006

Diagnosis	***2006 Frequency***	***Total Costs, 2006***	***5-Year Total Costs***	***Median per Patient Costs, 2002-2006***
Heart disease	21,477	$560.9 million	$2.4 billion	$13,293
Cancer	6,285	$178.9 million	$770.0 million	$17,472
Unintentional falls	5,557	$121.6 million	$505.1 million	$16,480

Between 2002 and 2006, the average annual cost for fall injury hospitalization among seniors was $101 million per year. This is equivalent to 79% of the total costs for all injury hospitalizations (Figure 29).

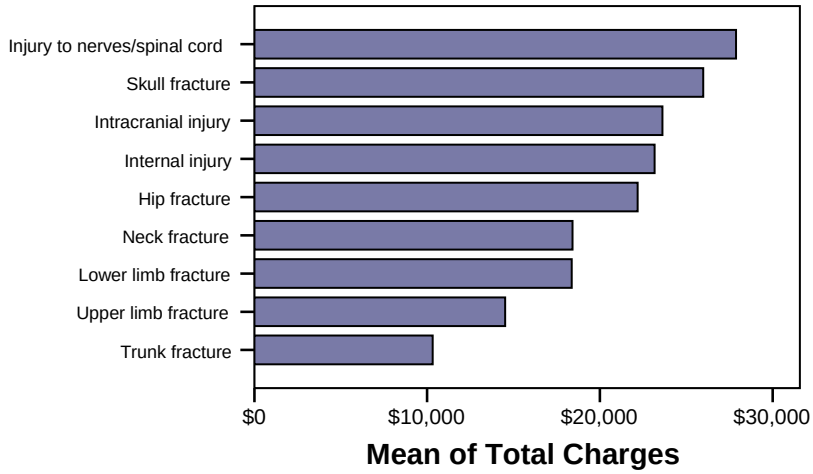
The average annual cost for fall hospitalization was $101 million

Figure 29: Average annual charges for injury hospitalizations among Oregon seniors by cause of injury, 2002-2006



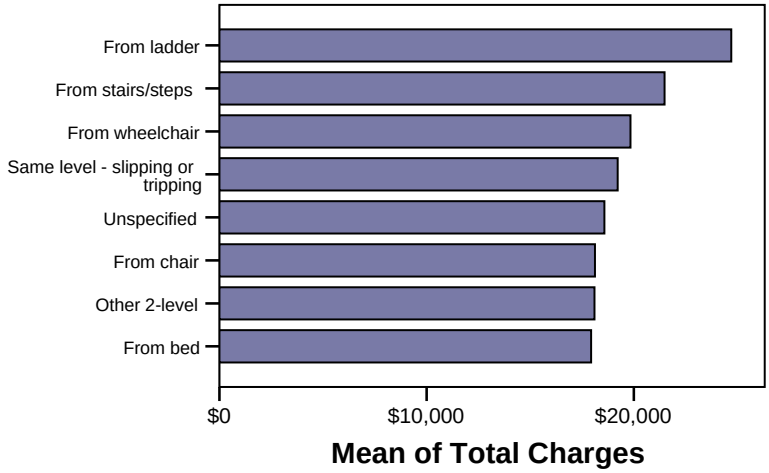
Total fall hospitalization costs varied by injury diagnosis (Figure 30). Those with spinal cord injuries and skull fractures had the highest average total costs, while those with trunk fractures had the lowest.

Figure 30: Average annual charges for fall-related hospitalizations among Oregon seniors by injury diagnoses, 2002-2006



The total costs also differed significantly by type of fall (see Figure 31). Falls from ladders had the highest average total costs and falls from bed the lowest. Falls from ladders and stairs or steps result in skull fractures and spinal cord or intracranial injuries more often than other fall types, which cost more to treat on average.

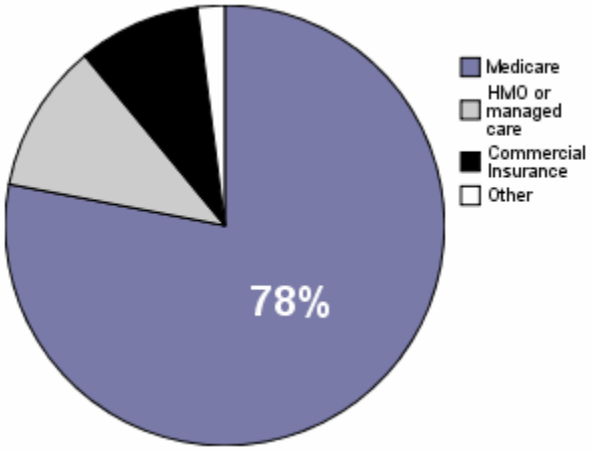
Figure 31: Average annual charges for fall-related hospitalizations among Oregon seniors by fall type, 2002-2006



Medicare was the primary payer listed for 78% of the seniors hospitalized with fall-related injuries. An estimated average of $76.5 million was charged to Medicare for costs incurred by Oregon seniors from fall-related injury hospitalizations each year between 2002 and 2006 (see Figure 32). Another $12.1 million was paid by HMOs or other managed care organizations, and nearly $10.1 million by commercial insurance companies.

78% of fall related hospitalization costs were charged to Medicare ($76.5 million annually).

Figure 32: Hospitalization charges for fall-related admissions among Oregon seniors by primary payer, 2002-2006

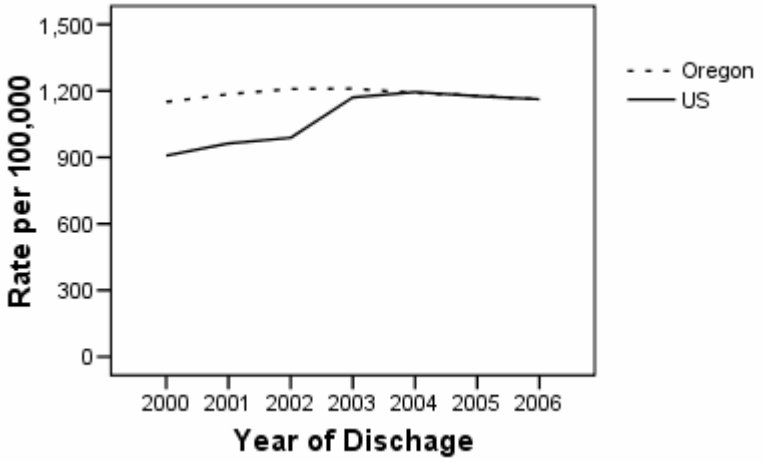


Trends in Fall-related Injury Hospitalizations

In Oregon between 2000 and 2006, the rate of hospitalizations due to fall-related injuries has changed little, while rates rose slightly across the entire U.S (Figure 33). In 2006, the senior age-specific fall injury hospitalization rate in Oregon was the same as the national rate (1,162 per 100,000), The age-adjusted rate in Oregon (using the NCHS year 2000 standard population) was slightly higher than the nation (216 per 100,000 versus 201 falls per 100,000).[12] According to

the Agency for Healthcare Research and Quality's (AHRQ) Healthcare Cost and Utilization Project (H-CUP), Oregon's senior age adjusted fall-related hospitalization rate ranked 22 out of 28 states reporting data.[17]

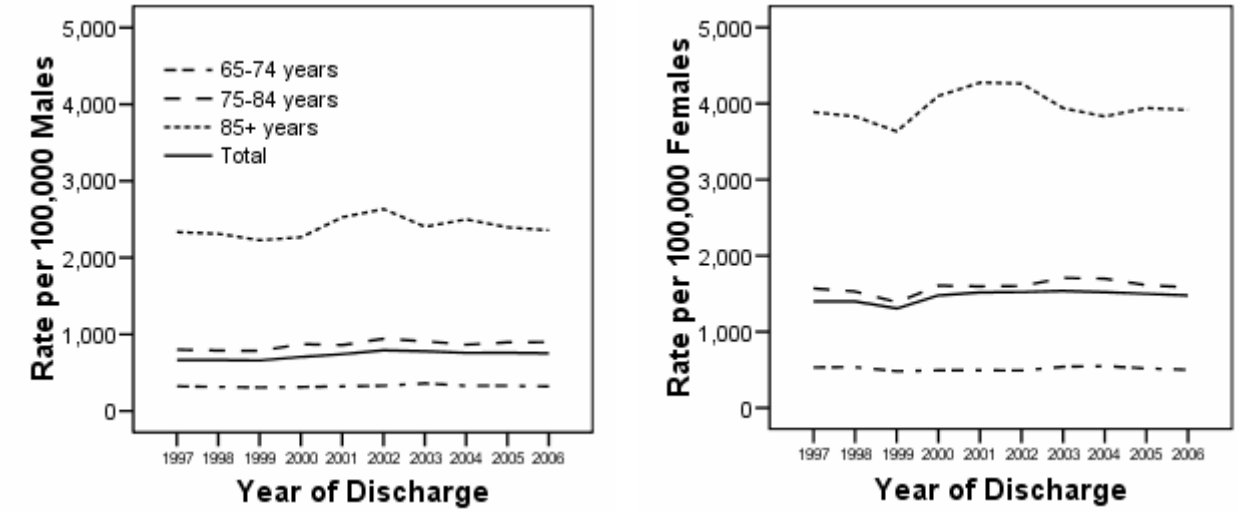
Figure 33: Rate of fall-related hospitalizations among senior residents of the US and Oregon, 2000-2006*



*National rates obtained from the CDC's Web-based Injury Statistics Query and Reporting System

Finally, as observed at the national level, the rates among senior women were higher than those of senior men in Oregon for all age groups (Figure 34).

Figure 34: Trend in the rate of fall-related hospitalizations among Oregon seniors by sex and age group, 1997-2006



Unlike the rate of fatal fall injuries among Oregon seniors, the rates of fall-related injury hospitalizations have changed little since 2001, and are comparable to those found at the national level for both sexes and all age groups. However, due to missing cause of injury coding within Oregon's hospitalization discharge database, the frequencies and rates of fall hospitalizations among seniors reported here are not as reliable as the frequencies and rates of fatal fall injuries within this population.

Fall Incidence – Oregon Behavioral Risk Factor Surveillance System (BRFSS)

Occurrence of Falls

According to the Oregon Behavioral Risk Factor Surveillance System, 15.3% of Oregonians ages 65 and older fell in the three months prior to the survey in 2006, or an estimated 71,255 Oregon seniors (Table 12). The proportion of seniors reporting falls in Oregon's 2006 BRFSS was similar to the number that reported falling on the national level (15.9%).[18] The proportion of senior women ages 65 to 74 was greater than that of senior men. However, the proportion ages 75 years and older was less than that of senior men. Regardless of sex, seniors 85 years of age and older had the highest proportion of falls; however, these proportions were not significantly different from those in the 75 to 84 year age group.

An estimated 20,466 (4.3%) Oregon seniors experienced a fall-related injury in the three months prior to the survey in 2006. Women aged 65-74 and 75-84 had more fall-related injuries than men in these age groups, and men 85 and older had more fall-related injuries than women. Proportions of fall injury increased with age, with the exception of the proportion for women ages 75 to 84 and 85+, which were not statistically different.

Table 12: Estimates of fall and fall injury incidence among Oregon seniors, 2006*†‡

		(N=1,283)		
Has fallen in the past 3 months		Total	Males	Females
Total:	Percent	15.3%	14.6%	15.9%
	Frequency	71,255	29,495	41,760
65-74 years:	Percent	13.0%	11.6%	14.3%
	Frequency	30,464	12,971	17,493
75-84 years:	Percent	17.7%	18.2%	17.3%
	Frequency	32,810	13,844	18,966
85 and over:	Percent	17.8%	18.4%	17.5%
	Frequency	7,981	2,680	5,301
Had a fall in the past 3 months that resulted in an injury or required medical care		Total	Males	Females
Total:	Percent	4.3%	2.0%	6.0%
	Frequency	20,466	4,192	16,274
65-74 years:	Percent	3.6%	1.3%	5.7%
	Frequency	8,716	1,513	7,203
75-84 years:	Percent	4.5%	1.9%	6.2%
	Frequency	8,557	1,489	7,068
85 and over:	Percent	6.8%	7.5%	6.4%
	Frequency	3,193	1,190	2,003

*Source: BRFSS
† Weighted percentages
‡Frequencies were estimated using weighted BRFSS population values

Demographic Characteristics

According to the 2006 BRFSS results, the proportions of women reporting a fall and fall-related injury were significantly higher than those of the men (Table 13 below). While greater proportions of seniors ages 75 to 84 and 85 and older reported falls, only a significantly greater

proportion of those ages 85 and older reported a fall-related injury. The racial distribution did not differ between the groups, with the exception of American Indian/Alaska Natives and those reporting multiple race ethnicities.

Table 13: Fall and fall injury among Oregon seniors by various demographics, 2006*†

Demographic Characteristic	***Total (N=1,283)***	***Reported Fall (N=202)***	***Reported Fall-related Injury (N=66)***
Sex			
Male	43.2%	41.4%	20.5%
Female	56.8%	58.6%	79.5%
Age Group			
Total			
65-74 years	50.3%	42.8%	42.6%
75-84 years	39.9%	46.0%	41.8%
85 and over	9.8%	11.2%	15.6%
Males			
65-74 years	54.9%	44.0%	36.1%
75-84 years	37.7%	46.9%	35.5%
85 and over	7.7%	9.1%	28.4%
Females			
65-74 years	46.8%	41.9%	44.3%
75-84 years	41.7%	45.4%	43.4%
85 and over	11.5%	12.7%	12.3%
Race			
Non-Hispanic White	93.0%	92.8%	88.7%
African American	0.6%	0.0%	0.0%
Hispanic only	0.3%	0.0%	0.0%
Asian American	0.5%	0.0%	0.0%
American Indian/AK Native	0.9%	0.8%	3.0%
Other	0.5%	0.9%	0.0%
Multiple Races	3.1%	4.2%	8.3%
Unknown/Not stated	1.1%	1.3%	0.0%

*Source: BRFSS
†Weighted Data

Characteristics of Health Status

Nearly everyone in the total population surveyed, ages 65 and older, (98.8%) had healthcare coverage at the time of the BRFSS survey (Table 14). Approximately 40% had some sort of physical or mental limitation, and 20% required the use of special equipment for their limitation. The majority, over 93%, reported their health status as good or better, and approximately three-fourths of the population made time for exercise outside of the physical requirements of their jobs in the month prior to questioning. According to their calculated body mass indexes, the majority of seniors were either overweight (41%) or obese (19%). Approximately 11% of the seniors had had a heart attack or heart disease, and another 8% had had a stroke. Seventeen percent had been diagnosed with diabetes, 9% had difficulty concentrating, and 4% had some sort of depressive disorder.

A significantly greater proportion of the seniors that reported falling in the three months prior to questioning had no health care coverage at the time of questioning than in the total population.

There were also significantly greater proportions of seniors that had physical or mental limitations, used special equipment for their limitation, had a poor self-perceived health status, had had a stroke, had difficulty concentrating, or had some sort of depressive disorder in the population that reported a fall.

Table 14: Other characteristics of Oregon seniors reporting falls and fall injuries, 2006*†

Characteristics of Health Status	*Total*	*Reported Fall*	*Reported Fall-related Injury*
No healthcare coverage:	1.2%	3.2%	2.3%
Has physical/mental limitations:	39.9%	54.5%	72.0%
Uses special equipment for limitations:	19.2%	35.0%	47.3%
Excellent self-perceived health status:	44.3%	37.6%	22.4%
Good self-perceived health status:	48.3%	49.4%	59.8%
Poor self-perceived health status:	6.6%	11.3%	17.8%
Has exercised regularly in the past month:	75.6%	71.3%	56.1%
Normal BMI:	35.7%	30.3%	35.3%
Overweight BMI:	41.0%	43.8%	31.2%
Obese BMI:	19.0%	22.4%	28.9%
Diagnosed with a heart attack:	10.6%	13.2%	20.3%
Diagnosed with angina or coronary heart disease:	11.6%	14.4%	18.0%
Diagnosed with a stroke:	7.6%	13.1%	17.3%
Diagnosed with diabetes:	16.9%	21.9%	20.5%
Has had diabetes related sores on feet that took more than 4 weeks to heal:	1.4%	2.6%	5.4%
Has had difficulty concentrating:	8.8%	14.8%	22.0%
Major depressive disorder:	1.2%	2.5%	7.9%
Other depressive disorder:	3.1%	5.8%	11.6%

*Source: BRFSS
†Weighted Data

Nearly 30% of seniors reporting fall injuries were obese.

Nearly three-fourths of those reporting fall injuries had some sort of physical or mental limitation, a proportion significantly greater than both those who had reported a fall and the total population. Conversely, the proportions that used special equipment for their limitation or reported their health status as poor, while greater than the overall population, were not significantly different from those reporting a fall. A little over half of the injured seniors had exercised regularly in the month prior to questioning, a significantly smaller proportion than either of the other groups, possibly due to the fact that their injuries prevented them from exercising. However, nearly 30% of this group was obese; therefore they may have been more inactive than the other groups all along, making them more susceptible to injury. Further, greater proportions of the seniors with fall injuries had been diagnosed with a heart attack, stroke, or had diabetes related sores on their feet than in the total population. This group also had the greatest proportion of seniors that had some form of depressive disorder.

Discussion

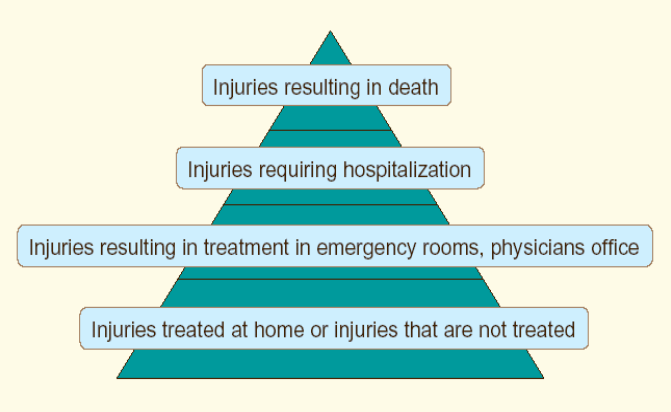
This report provides the state's first detailed epidemiologic analysis of the available data on falls and fall injuries among Oregonians aged 65 and older. Falls are a serious threat to senior health. Fall fatality in Oregon among seniors is 70% higher than the nation and hospitalization costs are 25% higher than the nation. The cost of hospitalization exceeds $100 million each year. This problem will grow as the size of the senior population grows. By 2020 the population of seniors in Oregon is expected to increase 53%.

We know that:

- The population data and trend data indicate that this problem will grow,
- Fall injuries can create the conditions where entry into long term care is necessary, and
- Two-thirds of falls can be prevented.

These facts should create a sense of urgency to do what is necessary to establish a coordinated statewide effort to reduce falls and fall-related injury among Oregon's seniors.

Figure 35: Injury Pyramid



However, this report underestimates the problem in Oregon in three ways. First, these data only represent the top two tiers of the injury pyramid (Figure 35). There is currently no data source to examine the frequency, rate and costs of emergency department care or pre-hospital care.

Second, approximately 17% of the hospitalization records of seniors with injuries did not have coding that identified the cause of the injuries. All of these injury hospitalizations were excluded from this analysis. The actual number of hospitalizations could have been more than 6,500 each year.

Third, the annual number of fall-related deaths may be underestimated because falls are sometimes overlooked as the underlying condition that contributed to a death. Oregon's fall hospitalization and death data provide ample evidence that falls are a serious threat to the health of older adults. However, in a three month period, the number of fall injuries estimated in the BRFSS dataset was approximately three to five times the number captured in hospitalization data. This report clearly illustrates that the magnitude of the problem poses a serious public health threat, and that falls have a great impact on individuals, communities, and institutions.

Health impact

Falls in the senior population can cause deterioration in health status, increase the need for long-term care, and lead to a lower quality of life. Some falls cause severe and incapacitating injuries that result in seniors living out the rest of their lives in nursing facilities. Among the population of hospitalized seniors discharged into long-term care between 2002 and 2006, hip fractures were the most common primary diagnosis. Falls were the leading causes of both hip fractures and

traumatic brain injuries in Oregonians ages 65 and older. Both of these conditions often lead to a decline in mobility and independence. More than 70% of the fall hospitalization patients with hip fractures and more than 30% with TBIs were discharged into long-term care facilities. Further, these conditions were contributing factors in 37% and 33% of all senior fall-related deaths respectively between 2001 and 2005.

Costs

Fall injury hospitalizations cost more than all other injury hospitalizations combined. The hospitalization costs due to unintentional fall injuries among seniors were high, averaging over $101 million each year. Most of the charges were to Medicare. This figure did not include the costs for those who did not seek help at hospitals, those that were not admitted as inpatients, or the costs of rehabilitation or long-term care that was required by more than 60% of the hospitalized seniors. Figures produced here do not include the loss of productive life-years in the senior population, which not only affects the individual, but all of society as a whole. Unintentional falls in the older adult population of Oregon should be a major focus of public health prevention.

Recommendations

Many falls are preventable. Oregon can reduce the burden of falls incurred by individuals and society if nine components of a fall prevention strategy are implemented.

In the Community:

1. **Implement evidence-based group exercise that decreases falls, increases strength, mobility, coordination, balance, and overall physical fitness.**
2. **Educate older adults and their families about falls.**
3. **Conduct environmental assessments to reduce fall hazards and improve safety in the homes of older adults and in institutions.**

Group-based exercise is the most potent single intervention to prevent falls.[19] The CDC's compendium on evidence based fall interventions found that exercise programs that focus on decreasing falls, increasing strength, mobility, coordination, balance, and overall physical fitness, provided a reduction of risk that ranged from approximately 20-60% (see the appendix for a list of evidence based prevention programs). Comprehensive fall prevention programs must be low cost, accessible, and also varied enough to suit a variety of abilities and interests.

Older adult health and fitness programs that teach seniors to cope with and control chronic conditions, improve their diet, physical fitness and mobility can already be found throughout Oregon. However, many of these programs are not evaluated to determine their efficacy in fall reduction.

A new evidence-based fall reduction practice developed in Oregon is "Moving for Better Balance." This eight form tai chi program was developed by Dr. Fuzhong Li at the Oregon Research Institute and funded by the Centers for Disease Control and Prevention. It is currently being implemented in pilot projects throughout the state. Funding from the Administration on Aging enabled the state and local communities to set up classes where 817 people enrolled in

2007 from six Oregon counties, 93% of the participants were over 60 years of age. These courses offered two 1-hour classes each week for 12 week intervals at senior centers in the Mid-Columbia and Rogue Valley regions, and have been shown in a randomized control trial to reduce the risk of falls among seniors by 55%.[20] While still in its infancy, Oregon's public health division hopes to expand this program across the state in an effort to reduce the burden of fall injuries among seniors.

A little discussed key to prevention of older adult falls is to educate seniors about the simple steps they can take to empower themselves and increase their fitness, well-being, and quality of life. The single most important motivation for seniors to reduce falls is their desire to live independently in their communities. Fall prevention should be encouraged as a way to maintain independence.

The home environment can pose risks to individuals as they age. Seniors and their family members can conduct home safety audits to identify ways to improve safety as these audits can identify hazards, increase awareness of fall risk, and result in safety improvements in the home.

In the Healthcare Sector:

10. **Screen each senior for falls at every primary care visit.**
11. **Promote regular eye exams for seniors.**
12. **Conduct medication review and assess for dangerous interactions in primary care, pharmacies, and other settings.**
13. **Conduct fall assessment in annual primary care visits for those ages 55 and older to enable prevention before a fall occurs.**

Every senior should be screened for falls at every primary care visit. Many falls can be prevented if those who screen positively are then engaged in health, medication, vision, and environmental interventions. In addition, a fall assessment should be built into the annual exam at physician visits for those ages 55 and older, so that preventative measures, created to fit each individual's needs and situation, can begin before a fall occurs.

Healthcare professionals can provide educational materials and refer those at risk to suitable prevention programs, as well as provide home hazards and modifications checklists that target environmental hazards and unsafe behaviors at home (such as the Home Safety Council's "Safe Steps" program).[21] Also, since seniors who have fallen once are two to three times more likely to fall again,[19] intervention referrals should be given to seniors who present with fall-related injuries in emergency departments, physician's offices, and other treatment locations.

Seniors recovering from a fall often experience challenges to their health while in a weakened state. The decline in health status that often occurs after a fall may be followed by acute infections such as influenza and pneumonia, exacerbate chronic conditions such as heart disease, and hasten one's death. After a fall hospitalization guidance to reduce the risk of influenza and pneumonia might well be life saving.

In Public Health:

14. **Institute sentinel fall surveillance in Oregon emergency departments to gather circumstantial information needed to focus and tailor prevention strategies.**
15. **Convene a partnership to obtain the resources necessary to implement community based primary prevention strategies and public health surveillance and research.**

The data used for public health surveillance must be improved. A state-wide emergency department data set does not exist in Oregon and it is a necessary tool, as it could provide the level of data essential to intervene before fall hospitalization occurs. In addition, pre-hospital data are needed to craft interventions that might be coordinated through emergency medical services personnel. External cause of injury coding must be improved as nearly half of all unintentional fall injuries in medical records don't specify the cause or mechanism, and there is little information detailing the precipitating circumstances, with the exception of scarce notes in medical examiner reports after a death from a fall. Each medical record of an individual hospitalized and treated for injury should include an external cause of injury code that specifies the type of fall.

Sentinel surveillance set up at a few representative hospital emergency departments would capture information on falls shortly, if not immediately after occurrence. This information could be used to focus prevention efforts and tailor programs that more effectively meet the needs of Oregon's seniors.

Public health data are needed to assess outcomes and risk factors in the population, and measure the effect of prevention efforts. The impact of interventions must be quantitatively understood to assure that resources are allocated to programs that are effective.

Finally, a coordinated effort to develop resources for fall prevention is needed. Stakeholders in this effort might include hospitals, seniors, and government agencies.

Conclusion

Prevention programs can save healthcare dollars currently expended in hospitalization and long term care. The costs of implementing prevention programs are minimal in comparison. If Oregon is able to reduce the number of unintentional falls that occur in this state, it will save much needed resources and increase the quality of life for thousands of its senior residents.

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Appendix A: List of CDC approved evidence-based fall interventions[19]

Exercise-based Interventions

1. Stay Safe, Stay Active
   - Focuses on improving balance and coordination, muscle strength, reaction time, and aerobic capacity
   - Research performed in Sydney, Australia
   - Contact: Anne Barnett, MPH
     Physiotherapy Department
     Bankstown Hospital, Locked Mailbag 1600
     Bankstown, NSW 2200, Australia
     Tel: +61 (9) 722-7154, Fax: +61 (9) 722-7125
     Email: ann.barnett@swsahs.nsw.gov.au

2. The Otago Exercise Program
   - Focuses on improving strength and balance with a home-based exercise program
   - Research performed in Dunedin, New Zealand
   - Contact: M. Clare Robertson, PhD
     Department of Medical and Surgical Sciences
     University of Otago Medical School
     PO Box 913
     Dunedin 9054, New Zealand
     Tel: +64 (3) 474-7007 x8508, Fax: +64 (3) 474-7641
     Email: clare.robertson@stonebow.otago.ac.nz

3. Tai Chi: Moving for Better Balance
   - Focuses on improving balance and physical performance with Tai Chi classes designed for older adults
   - Research performed in Portland, OR
   - Contact: Fuzhong Li, PhD
     Oregon Research Institute
     1715 Franklin Boulevard
     Eugene, OR 97403
     Tel: 541-484-2123
     Email: fuzhongl@ori.org

4. Australian Group Exercise Program
   - Focuses on increasing participants' strength, coordination, balance, gait and ability to carry out activities of daily living
   - Research performed in Sydney and Wollongong, Australia
   - Contact: Stephen R. Lord, PhD
     Prince of Wales Medical Research Institute
     Barker Street, Randwick
     Sydney NSW 2031, Australia
     Tel: +61 (2) 9399 1061, Fax: +61 (2) 9399 1005
     Email: s.lord@unsw.edu.au

5. Veterans Affairs Group Exercise Program
   - Focuses on increasing strength, endurance, mobility and balance
   - Research performed in Los Angeles, CA
   - Contact: Laurence Z. Rubenstein, MD, MPH
     VA Medical Center, GRECC (11e)
     16111 Plummer St.
     Sepulveda, CA 91343
     Tel: 818-895-9311, Fax: 818-891-8181
     Email: laurence.rubenstein@va.gov

6. Simplified Tai Chi
    - Focuses on improving strength, balance, walking speed, and other functional measures
    - Research performed in Atlanta, GA
    - Contact: Steven L. Wolf, PhD, PT, FAPTA
      Department of Rehabilitation Medicine
      Emory University School of Medicine
      1441 Clifton Road NE
      Atlanta, GA 30322
      Tel: 404-712-4801, Fax: 404-712-5895
      Email: swolf@emory.edu

Home Modification Interventions

1. Home Visits by an Occupational Therapist
    - Focuses on assessing and reducing home hazards
    - Research performed in Sydney, Australia
    - Contact: Robert G. Cumming, PhD
      Centre for Education and Research on Ageing (CERA)
      Concord Hospital C25
      Concord NSW 2139, Australia
      Tel: +61 (2) 9767 6818 or +61 (2) 9767 7212, Fax: +61 (2) 9767 5419
      Email: bobc@health.usyd.edu.au

2. Falls-HIT (Home Intervention Team) Program
    - Focuses on assessing and reducing fall hazards in participants' homes
    - Research performed in Germany
    - Contact: Thorsten Nikolaus, MD
      Department of Geriatric Medicine
      University of Ulm and Bethesda Geriatric Clinic
      Zollernring 26, D-89073 ULM, Germany
      Tel: +49 731 187185, Fax: +49 731 187389
      Email: thorsten.nikolaus@bethesda-ulm.de

Multifaceted Interventions

1. Stepping On
    - Focuses on improving self-efficacy and empowering participants to make better decisions. Emphasizes fall prevention techniques and behavioral changes through balance and strength exercises, education on home and community hazards, safe footwear and clothing, the risk of poor vision, and the benefits of vitamin D, calcium, and hip protectors
    - Research performed in Sydney, Australia
    - Contact: Lindy Clemson, PhD
      School of Occupation and Leisure Sciences
      The University of Sydney
      PO Box 170
      Lidcombe 1825, Australia
      Tel: +61 (2) 9351 9372, Fax: +61 (2) 9351 9166
      Email: L.Clemson@fhs.usyd.edu.au

2. PROFET (Prevention of Falls in the Elderly Trial)
   - Focuses on identifying medical risk factors and home hazards and provides referrals and/or recommendations to reduce fall risk and improve home safety
   - Research performed in London, England
   - Contact: Jacqueline Close, MD
     Prince of Wales Medical Research Institute
     Barker Street, Randwick
     Sydney NSW 2031, Australia
     Tel: +61 (2) 9399 1000, Fax: +61 (2) 9399 1082
     Email: j.close@unsw.edu.au

3. The NoFalls Intervention
   - Focuses on increasing strength and balance, improving poor vision, and reducing home hazards
   - Research performed in City of Whitehorse, Melbourne, Australia
   - Contact: Lesley Day, PhD, MPH
     Accident Research Centre
     Building 70, Monash University
     Wellington Road
     Clayton Victoria 3800, Australia
     Tel: +61 (3) 9905 1811, Fax: +61 (3) 9905 1809
     Email: NoFalls.enquire@general.monash.edu.au

4. The SAFE Health Behavior and Exercise Intervention
   - Focuses on reducing risky behaviors, improving physical fitness through exercise, and reducing home hazards
   - Research performed in Portland, OR and Vancouver, WA
   - Contact: Mark C. Hornbrook, PhD
     Kaiser Permanente Center for Health Research
     3800 N Interstate Ave.
     Portland, OR 97227
     Tel: 503-335-6746
     Email: mark.c.hornbrook@kpchr.org

5. Yale FICSIT (Frailty and Injuries: Cooperative Studies of Intervention Techniques)
   - Individualized home intervention which focuses on identifying and modifying participants' risk factors. Potential components include: medication adjustment, behavioral changes, education and training, physical therapy, and balance and strength building exercises
   - Research performed in Farmington, CT
   - Contact: Mary Tinetti, MD
     Department of Epidemiology and Public Health
     Yale University School of Medicine
     Internal Medicine-Geriatrics
     PO Box 208025
     New Haven, CT 06520-8025
     Tel: 203-688-5238, Fax: 203-688-4209
     Email: Mary.tinetti@yale.edu

6. A Multifactorial Program
    - Focuses on reducing disability and/or falls by: improving physical fitness, modifying excessive alcohol use, improving home safety, reducing psychoactive medication use, and improving hearing and vision
    - Research performed in Seattle, WA
    - Contact: Edward H. Wagner, MD, MPH
      Center for Health Studies
      Group Health Cooperative
      1730 Minor Avenue, Ste. 1290
      Seattle, WA 98101
      Tel: 206-287-2877
      Email: wagner.e@ghc.org

Appendix B: Tables

Table 1: Leading causes of death among senior Oregonians by age group, 2001-2005

Cause of Death	*Rank*	*Average Annual Frequency*	*Average Annual Rate Per 100,000*
Ages 65-74			
Malignant neoplasms	1	1,802	800.8
Heart disease	2	1,006	446.9
Chronic lower respiratory diseases	3	442	196.4
Cerebrovascular disease	4	274	121.7
Diabetes mellitus	5	218	96.8
All Unintentional Injuries	*(6)*	*(98)*	*(43.7)*
Motor vehicle crashes	12	38	16.9
Unintentional falls	16	26	11.5
Chronic liver disease and cirrhosis	6	66	29.1
Alzheimer's disease	7	60	26.7
Influenza and Pneumonia	8	49	21.9
Nephritis, nephrotic syndrome and nephrosis	9	45	20.2
Suicide	10	42	18.6
Ages 75-84			
Malignant neoplasms	1	2,222	1,340.8
Heart disease	2	2,122	1,280.7
Cerebrovascular disease	3	858	517.8
Chronic lower respiratory diseases	4	719	433.9
Alzheimer's disease	5	377	227.4
Diabetes mellitus	6	340	205.1
All Unintentional Injuries	*(7)*	*(193)*	*(116.6)*
Unintentional falls	10	106	64.2
Influenza and Pneumonia	7	159	95.9
Parkinson's disease	8	146	88.3
Hypertension	9	109	66.0
Ages 85 and over			
Heart disease	1	2,760	4,325.2
Malignant neoplasms	2	1,157	1,812.9
Cerebrovascular disease	3	1,120	1,754.6
Alzheimer's disease	4	714	1,118.1
Chronic lower respiratory diseases	5	417	653.1
Influenza and Pneumonia	6	325	509.9
All Unintentional Injuries	*(7)*	*(245)*	*(384.5)*
Unintentional falls	9	165	258.2
Diabetes mellitus	7	239	374.5
Hypertension	8	175	274.5
Parkinson's disease	10	117	183.0

Table 2: Leading causes of injury hospitalizations among senior Oregonians by age group, 2002-2006

Cause of Injury	*Rank*	*Average Annual Frequency*	*Average Annual Rate Per 100,000*
Ages 65-74			
Unintentional falls	1	993	432.7
Occupant in motor vehicle traffic accident	2	106	46.3
Unintentional poisoning	3	73	31.8
Overexertion	4	44	19.0
Other transport injury	5	35	15.3
Adverse effect of drugs	5	35	15.3
Self-inflicted poisoning	7	31	13.5
Unintentionally struck by or against an object	8	19	8.4
Pedestrian injured in motor vehicle traffic accident	9	13	5.8
Pedal cyclist injured in non-traffic accident	9	13	5.8
Ages 75-85			
Unintentional falls	1	2,214	1,330.6
Occupant in motor vehicle traffic accident	2	103	62.2
Unintentional poisoning	3	76	45.6
Adverse effect of drugs	4	61	36.9
Overexertion	5	41	24.9
Unintentionally struck by or against an object	6	23	13.6
Other transport injury	7	19	11.7
Self-inflicted poisoning	8	17	10.1
Injury from natural or environmental causes	9	13	7.7
Pedestrian injured in motor vehicle traffic accident	10	11	6.9
Ages 85 and over			
Unintentional falls	1	2,286	3,463.7
Adverse effect of drugs	2	53	80.9
Occupant in motor vehicle traffic accident	3	46	70.0
Unintentional poisoning	4	35	53.6
Overexertion	5	22	33.0
Unintentionally struck by or against an object	6	19	29.1
Injury from natural or environmental causes	7	12	17.9
Other transport injury	7	12	17.6
Adverse effects of medical care	9	10	14.8
Unintentional suffocation	10	7	10.0

Table 3: Frequency and rate of fatal fall injuries among seniors by year, sex and age group in Oregon versus the United States, 2001-2005

Year	*Annual Frequency of Fatal Fall Injuries in OR*			*Annual Rate of Fatal Fall Injuries in OR*			*Annual Rate of Fatal Fall Injuries in U.S.*		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
2001									
65-74 years	15	8	23	14.7*	6.8*	10.5	13.1	7.4	10.0
75-84 years	56	35	91	82.7	36.6	55.7	45.6	28.5	35.3
85 and over	51	83	134	261.5	204.5	223.0	154.8	107.0	121.1
Total 65+	122	126	248	64.4	49.8	56.0	36.9	30.1	32.9
2002									
65-74 years	21	9	30	20.4	7.7*	13.6	14.5	7.8	10.8
75-84 years	56	59	115	81.2	61.4	69.7	48.0	31.8	38.2
85 and over	48	108	156	238.6	260.6	253.4	161.7	118.9	131.7
Total 65+	125	176	301	65.0	69.0	67.3	39.7	33.5	36.1
2003									
65-74 years	14	11	25	13.4*	9.2*	11.2	14.5	8.4	11.2
75-84 years	54	41	95	77.6	42.6	57.3	51.6	33.5	40.7
85 and over	61	102	163	287.0	239.7	255.5	165.7	122.7	135.8
Total 65+	129	154	283	66.0	59.7	62.4	41.8	35.5	38.1
2004									
65-74 years	10	16	26	9.3*	13.2*	11.4	16.5	8.6	12.2
75-84 years	50	62	112	71.4	64.0	67.1	54.7	36.4	43.8
85 and over	64	121	185	290.9	278.2	282.4	175.4	129.4	143.6
Total 65+	124	199	323	62.3	76.1	70.1	45.4	37.9	41.0
2005									
65-74 years	16	9	25	14.5*	7.3*	10.7	9.2	16.2	12.4
75-84 years	55	64	119	78.0	66.1	71.1	37.4	57.8	45.6
85 and over	77	109	186	333.7	241.8	272.9	175.9	135.6	148.2
Total 65+	148	182	330	72.6	68.6	70.3	47.0	40.1	43.0

*Rates based on 20 or fewer deaths may be unstable

Table 4: Average annual frequencies, 5-year frequencies, and rates of fatal fall injuries among Oregon seniors by county, 2001-2005

	Average Annual Frequency	***5-year Frequency***	***Rate per 100,000***
Oregon	297	1,485	65.5
Baker	3	17	104.1*
Benton	5	24	57.0*
Clackamas	29	143	70.5
Clatsop	4	20	71.4*
Columbia	5	23	88.2*
Coos	6	31	50.6*
Crook	2	9	56.3*
Curry	1	6	20.9*
Deschutes	12	59	69.5*
Douglas	10	50	53.0*
Gilliam	< 1	1	54.5*
Grant	1	5	73.9*
Harney	1	7	117.5*
Hood River	1	4	30.4*
Jackson	21	104	68.7
Jefferson	2	10	77.2*
Josephine	11	54	68.0*
Klamath	5	24	48.8*
Lake	1	3	43.9*
Lane	24	121	54.2
Lincoln	6	28	65.1*
Linn	8	42	54.1*
Malheur	2	8	36.6*
Marion	18	88	49.3*
Morrow	1	4	65.4*
Multnomah	64	318	88.3
Polk	5	24	48.5*
Sherman	< 1	1	57.3*
Tillamook	1	7	29.2*
Umatilla	7	33	75.1*
Union	2	11	60.3*
Wallowa	2	9	126.2*
Wasco	3	15	74.9*
Washington	28	142	67.6
Wheeler	< 1	2	109.0*
Yamhill	8	38	73.1*

*Rates based on fewer than 20 deaths may be unstable

Table 5: Frequency and rate of fall-related injury hospitalizations among seniors in Oregon and the United States by year, sex and age group, 2002-2006

Year	*Annual Frequency of Fall-related Hospitalizations in OR*			*Annual Rate of Fall-related Hospitalizations in OR*			*Annual Rate of Fall-related Hospitalizations in U.S.*		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
2002									
65-74 years	341	578	919	331	491	411	277	411	350
75-84 years	651	1,539	2,190	943	1,602	1,326	809	1,375	1,150
85 and over	530	1,767	2,297	2,635	4,263	3,731	2,479	3,368	3,103
Total 65+	1,522	3,884	5,406	792	1,522	1,208	664	1,217	988
2003									
65-74 years	379	644	1,022	361	541	457	336	527	440
75-84 years	633	1,645	2,278	910	1,708	1,373	910	1,626	1,339
85 and over	511	1,676	2,187	2,404	3,939	3,428	2,692	3,935	3,555
Total 65+	1,522	3,965	5,487	779	1,537	1,210	761	1,463	1,171
2004									
65-74 years	353	665	1,018	330	5,49	446	386	507	452
75-84 years	606	1,644	2,250	866	1,698	1,349	1,054	1,650	1,411
85 and over	550	1,666	2,216	2,500	3,830	3,383	2,627	3,804	3,443
Total 65+	1,509	3,975	5,484	758	1,520	1,191	838	1,449	1,194
2005									
65-74 years	364	640	1,004	330	519	430	351	526	447
75-84 years	632	1,562	2,194	896	1,612	1,311	1,058	1,567	1,362
85 and over	553	1,777	2,330	2,396	3,942	3,419	2,508	3,776	3,378
Total 65+	1,549	3,979	5,528	760	1,500	1,178	816	1,434	1,176
2006									
65-74 years	366	634	1,000	321	500	416	378	470	428
75-84 years	633	1,524	2,157	898	1,585	1,295	951	1,585	1,327
85 and over	574	1,826	2,400	2,358	3,916	3,382	2,513	3,783	3,378
Total 65+	1,573	3,984	5,557	754	1,478	1,162	802	1,423	1,162

Table 6: Average annual frequencies and rates of fall hospitalizations among Oregon seniors by county, 2002-2006

	Average Annual Frequency				*Rate per 100,000*			
	65-74	**75-84**	**85+**	**Total**	**65-74**	**75-84**	**85+**	**Total**
Oregon	993	2,214	2,286	5,492	435.0	1,327.2	3,490.0	1,192.7
Baker	6	11	14	32	360.1*	1,008.0*	2,933.9*	963.1
Benton	12	34	38	85	292.1*	1,105.0	2,968.1	988.5
Clackamas	90	206	215	511	419.7	1,397.2	3,914.7	1,224.8
Clatsop	16	30	31	78	568.0*	1,451.2	3,934.4	1,355.2
Columbia	15	27	22	64	532.4*	1,469.6	3,451.5	1,208.1
Coos	41	64	63	167	641.7	1,450.1	3,671.6	1,338.0
Crook	7	14	13	33	372.2*	1,207.8*	3,307.5*	994.0
Curry	9	16	14	39	323.9*	697.0*	2,000.0*	671.6
Deschutes	37	78	84	199	388.0	1,271.5	4,117.4	1,124.6
Douglas	44	87	78	209	445.4	1,255.8	3,218.9	1,084.5
Gilliam	0	2	2	4	0.0*	1,418.4*	3,555.6*	983.6*
Grant	1	4	3	8	134.0*	904.8*	1,395.3*	564.8*
Harney	3	4	7	14	504.5*	1,030.9*	4,647.9*	1,162.8*
Hood River	6	12	19	37	451.4*	1,292.4*	4,694.4*	1,410.2
Jackson	66	162	167	395	444.6	1,406.5	3,699.6	1,280.5
Jefferson	5	12	12	29	289.7*	1,449.3*	5,210.1*	1,092.7
Josephine	28	73	76	177	353.4	1,208.9	3,590.0	1,103.6
Klamath	31	56	47	134	581.4	1,573.5	4,090.1	1,336.0
Lake	4	6	6	16	510.1*	1,275.7*	3,612.9*	1,125.5*
Lane	103	232	239	574	468.2	1,381.1	3,597.7	1,262.7
Lincoln	15	24	19	58	328.1*	761.4	1,932.3*	668.8
Linn	30	61	65	156	384.6	1,071.0	2,784.2	991.2
Malheur	9	21	21	51	421.3*	1,318.1	3,046.0	1,164.3
Marion	69	171	179	419	400.3	1,295.6	3,321.0	1,168.7
Morrow	2	4	1	7	279.3*	997.5*	1,238.9*	601.6*
Multnomah	187	418	456	1,060	549.5	1,579.5	3,965.2	1,474.0
Polk	14	39	42	95	305.0*	1,052.9	2,094.3	927.0
Sherman	1	2	< 1	3	365.9*	1,176.5*	754.7*	736.5*
Tillamook	8	14	16	39	310.5*	799.1*	2,998.2*	794.1
Umatilla	14	31	28	74	329.8*	957.1	2,361.8	836.5
Union	5	15	23	43	290.3*	1,218.5*	3,911.6	1,179.7
Wallowa	2	3	3	8	267.7*	543.7*	1,684.2*	551.0*
Wasco	7	23	20	51	373.8*	1,536.4	3,617.0	1,270.9
Washington	82	198	201	481	377.0	1,297.1	3,301.5	1,116.6
Wheeler	< 1	1	1	2	99.5*	645.2*	2,162.2*	497.2*
Yamhill	24	59	59	142	467.5	1,500.4	3,668.1	1,336.5

*Rates based on fewer than 20 hospitalizations may be unstable