



Falls in a Working-Age Population: The U.S. Army Experience

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10 Leading Causes of Injury Death by Age Group

Highlighting Unintentional Injury Deaths, United States – 2004

Rank	Age Groups										Total
	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	
1	Unintentional Suffocation 725	Unintentional MV Traffic 520	Unintentional MV Traffic 584	Unintentional MV Traffic 922	Unintentional MV Traffic 10,757	Unintentional MV Traffic 6,834	Unintentional MV Traffic 6,451	Unintentional MV Traffic 6,088	Unintentional MV Traffic 3,936	Unintentional Fall 14,899	Unintentional MV Traffic 43,432
2	Unintentional MV Traffic 139	Unintentional Drowning 430	Unintentional Fire/burn 169	Suicide Suffocation 204	Homicide Firearm 4,127	Unintentional Poisoning 3,641	Unintentional Poisoning 6,444	Unintentional Poisoning 6,033	Suicide Firearm 2,328	Unintentional MV Traffic 7,175	Unintentional Poisoning 20,950
3	Homicide Unspecified 133	Unintentional Fire/burn 228	Unintentional Drowning 131	Homicide Firearm 139	Unintentional Poisoning 2,259	Homicide Firearm 3,503	Suicide Firearm 2,868	Suicide Firearm 3,349	Unintentional Poisoning 1,577	Unintentional Unspecified 4,868	Unintentional Fall 18,807
4	Homicide Other Spec., Classifiable 101	Homicide Unspecified 164	Homicide Firearm 45	Unintentional Drowning 138	Suicide Firearm 2,104	Suicide Firearm 2,283	Homicide Firearm 1,895	Suicide Poisoning 1,737	Unintentional Fall 1,393	Suicide Firearm 3,756	Suicide Firearm 16,750
5	Unintentional Drowning 62	Unintentional Suffocation 125	Unintentional Suffocation 45	Unintentional Fire/burn 87	Suicide Suffocation 1,516	Suicide Suffocation 1,592	Suicide Suffocation 1,667	Suicide Suffocation 1,231	Suicide Poisoning 801	Unintentional Suffocation 3,369	Homicide Firearm 11,624
6	Undetermined Suffocation 56	Unintentional Pedestrian, Other 113	Unintentional Other Land Transport 37	Unintentional Other Land Transport 87	Unintentional Drowning 574	Suicide Poisoning 817	Suicide Poisoning 1,546	Unintentional Fall 1,184	Suicide Suffocation 575	Adverse Effects 1,857	Suicide Suffocation 7,336
7	Homicide Suffocation 42	Homicide Other Spec., Classifiable 69	Unintentional Pedestrian, Other 36	Unintentional Suffocation 68	Homicide Cut/pierce 484	Undetermined Poisoning 602	Undetermined Poisoning 1,116	Homicide Firearm 1,062	Homicide Firearm 468	Unintentional Fire/burn 1,125	Unintentional Unspecified 6,173
8	Unintentional Fire/burn 28	Unintentional Fall 47	Unintentional Struck by or Against 21	Suicide Firearm 59	Suicide Poisoning 363	Homicide Cut/pierce 479	Unintentional Fall 659	Undetermined Poisoning 1,019	Unintentional Suffocation 443	Unintentional Poisoning 901	Unintentional Suffocation 5,891
9	Undetermined Unspecified 24	Unintentional Natural/ Environment 39	Homicide Unspecified 20	Unintentional Poisoning 47	Undetermined Poisoning 329	Unintentional Drowning 385	Homicide Cut/pierce 450	Unintentional Fire/burn 504	Unintentional Fire/burn 427	Suicide Suffocation 544	Suicide Poisoning 5,800
10	Unintentional Fall 23	Homicide Firearm 36	Four* Tied 13	Unintentional Firearm 35	Unintentional Other Land Transport 284	Unintentional Fall 320	Unintentional Drowning 435	Unintentional Suffocation 468	Adverse Effects 403	Suicide Poisoning 521	Undetermined Poisoning 3,455

*Four causes are: Unintentional Firearm, Unintentional Natural/Environmental, Unintentional Other Transport, and Unintentional Unspecified.

Source: National Vital Statistics System, National Center for Health Statistics, CDC.

National Estimates of the 10 Leading Causes of Nonfatal Injuries Treated in Hospital Emergency Departments, United States, 2004

Rank	Age Groups										Total
	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	
1	Unintentional Fall 126,281	Unintentional Fall 888,335	Unintentional Fall 676,704	Unintentional Fall 668,589	Unintentional Struck by/ Against 980,050	Unintentional Fall 762,703	Unintentional Fall 816,521	Unintentional Fall 791,813	Unintentional Fall 607,041	Unintentional Fall 1,850,649	Unintentional Fall 8,058,498
2	Unintentional Struck by/ Against 30,760	Unintentional Struck by/ Against 368,104	Unintentional Struck by/ Against 404,124	Unintentional Struck by/ Against 593,752	Unintentional MV-Occupant 914,024	Unintentional Overexertion 673,076	Unintentional Overexertion 645,508	Unintentional Overexertion 423,692	Unintentional Struck by/ Against 200,708	Unintentional Struck by/ Against 214,235	Unintentional Struck by/ Against 4,430,171
3	Unintentional Other Bite/ Sting 12,753	Unintentional Other Bite/ Sting 145,001	Unintentional Cut/Pierce 115,886	Unintentional Overexertion 272,797	Unintentional Fall 869,363	Unintentional Struck by/ Against 669,346	Unintentional Struck by/ Against 575,089	Unintentional Struck by/ Against 393,861	Unintentional Overexertion 200,451	Unintentional MV-Occupant 185,779	Unintentional Overexertion 3,279,383
4	Unintentional Fire/burn 11,372	Unintentional Foreign Body 113,084	Unintentional Pedal Cyclist 101,891	Unintentional Cut/Pierce 155,040	Unintentional Overexertion 739,741	Unintentional MV-Occupant 612,446	Unintentional MV-Occupant 501,564	Unintentional MV-Occupant 363,728	Unintentional MV-Occupant 197,296	Unintentional Overexertion 167,395	Unintentional MV-Occupant 3,000,866
5	Unintentional Foreign Body 9,767	Unintentional Cut/Pierce 86,787	Unintentional Other Bite/ Sting 93,317	Unintentional Pedal Cyclist 140,063	Unintentional Cut/Pierce 498,856	Unintentional Cut/Pierce 440,900	Unintentional Cut/Pierce 398,151	Unintentional Cut/Pierce 296,883	Unintentional Cut/Pierce 164,110	Unintentional Cut/Pierce 122,162	Unintentional Cut/Pierce 2,285,191
6	Unintentional Other Specified 7,979	Unintentional Overexertion 76,876	Unintentional MV-Occupant 74,399	Other Assault* Struck by/ Against 116,670	Other Assault* Struck by/ Against 466,700	Other Assault* Struck by/ Against 278,693	Other Assault* Struck by/ Against 224,653	Unintentional Other Specified 149,760	Unintentional Other Bite/ Sting 68,461	Unintentional Other Bite/ Sting 74,395	Other Assault* Struck by/ Against 1,314,496
7	Unintentional Inhalation/ Suffocation 7,801	Unintentional Fire/burn 57,728	Unintentional Overexertion 73,980	Unintentional MV-Occupant 99,353	Unintentional Other Bite/ Sting 194,493	Unintentional Other Bite/ Sting 173,843	Unintentional Other Specified 176,427	Other Assault* Struck by/ Against 118,537	Unintentional Other Specified 59,121	Unintentional Poisoning 61,888	Unintentional Other Bite/ Sting 1,103,257
8	Unintentional MV-Occupant 6,992	Unintentional Other Specified 49,446	Unintentional Foreign Body 58,303	Unintentional Unknown/ Unspecified 95,311	Unintentional Other Specified 158,451	Unintentional Other Specified 142,385	Unintentional Other Bite/ Sting 153,531	Unintentional Other Bite/ Sting 117,166	Unintentional Poisoning 39,802	Unintentional Other Transport 47,822	Unintentional Other Specified 820,676
9	Unintentional Cut/Pierce 6,152	Unintentional Poisoning 47,402	Unintentional Dog Bite 52,568	Unintentional Other Transport 70,429	Unintentional Unknown/ Unspecified 142,089	Unintentional Other Transport 102,175	Unintentional Poisoning 118,140	Unintentional Poisoning 92,787	Unintentional Other Transport 33,856	Unintentional Unknown/ Unspecified 40,910	Unintentional Other Transport 623,846
10	Unintentional Poisoning 5,814	Unintentional Unknown/ Unspecified 47,078	Unintentional Other Transport 49,071	Unintentional Other Bite/ Sting 70,286	Unintentional Other Transport 136,800	Unintentional Foreign Body 99,096	Unintentional Foreign Body 86,079	Unintentional Other Transport 67,640	Other Assault* Struck by/ Against 33,257	Unintentional Other Specified 37,148	Unintentional Foreign Body 609,493

* The "Other Assault" category includes all assaults that are not classified as sexual assault. It represents the majority of assaults.

Source: National Electronic Injury Surveillance System—All Injury Program operated by the U. S. Consumer Product Safety Commission.

Produced by: Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC.



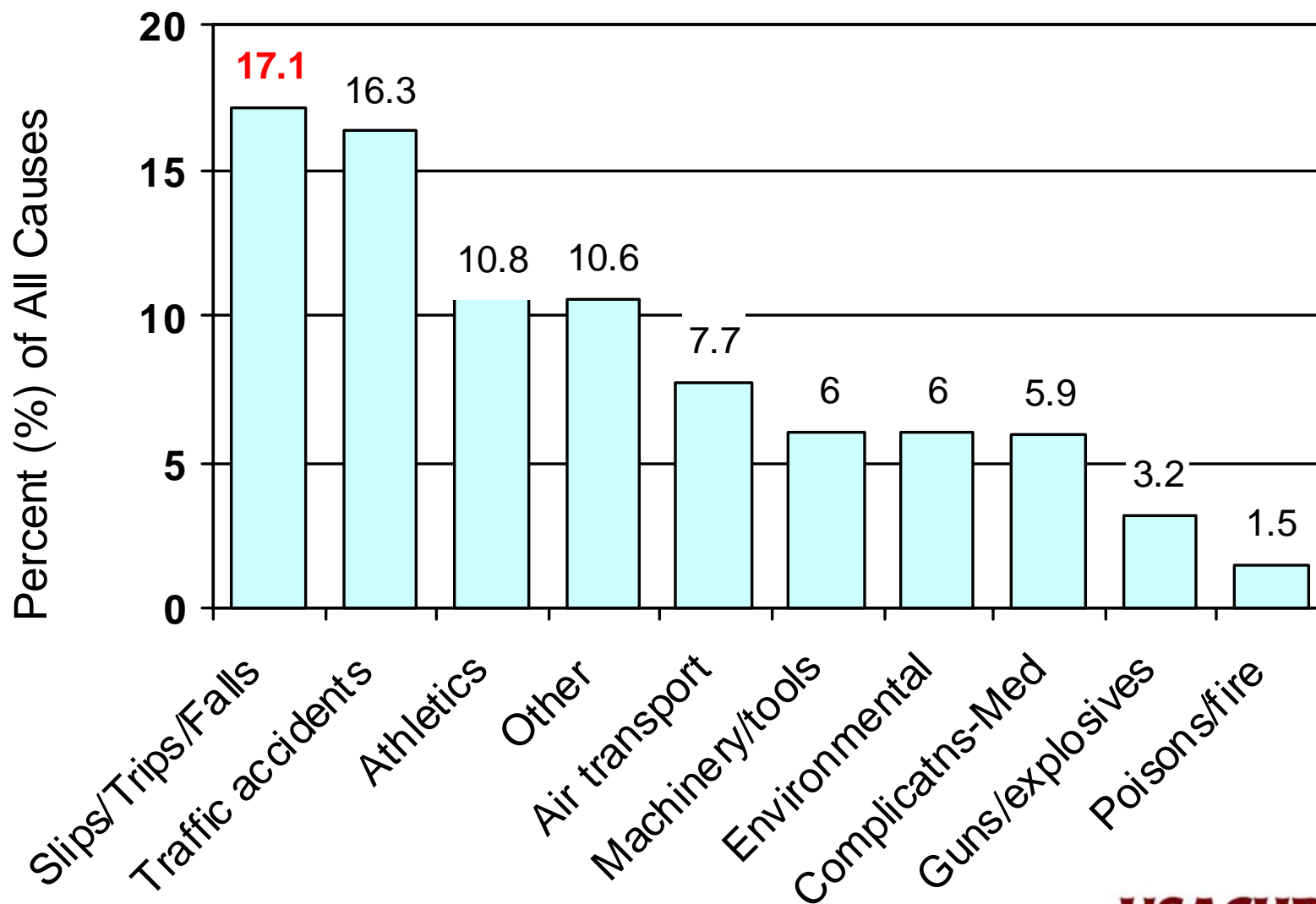
Background

Work-related falls – civilian data

- Fatal injuries
 - 3rd leading event/exposure (BLS, 2004)
 - Increasing in frequency (1992, n=600; 2004, n=822), while other causes decline or remain constant (BLS, 2004)
- Non-fatal injuries
 - 19% of all injuries/illnesses resulting in days away from work (BLS, 2002)
 - Median days away from work
 - Falls on same level – 9 days
 - Falls to a lower level – 14 days (BLS, 2002)
 - Workers' compensation second only to motor vehicles (NSC, 2004)



Causes of Unintentional Injury Hospitalizations – US Army 2005



Source: Defense Medical Surveillance System, 2007

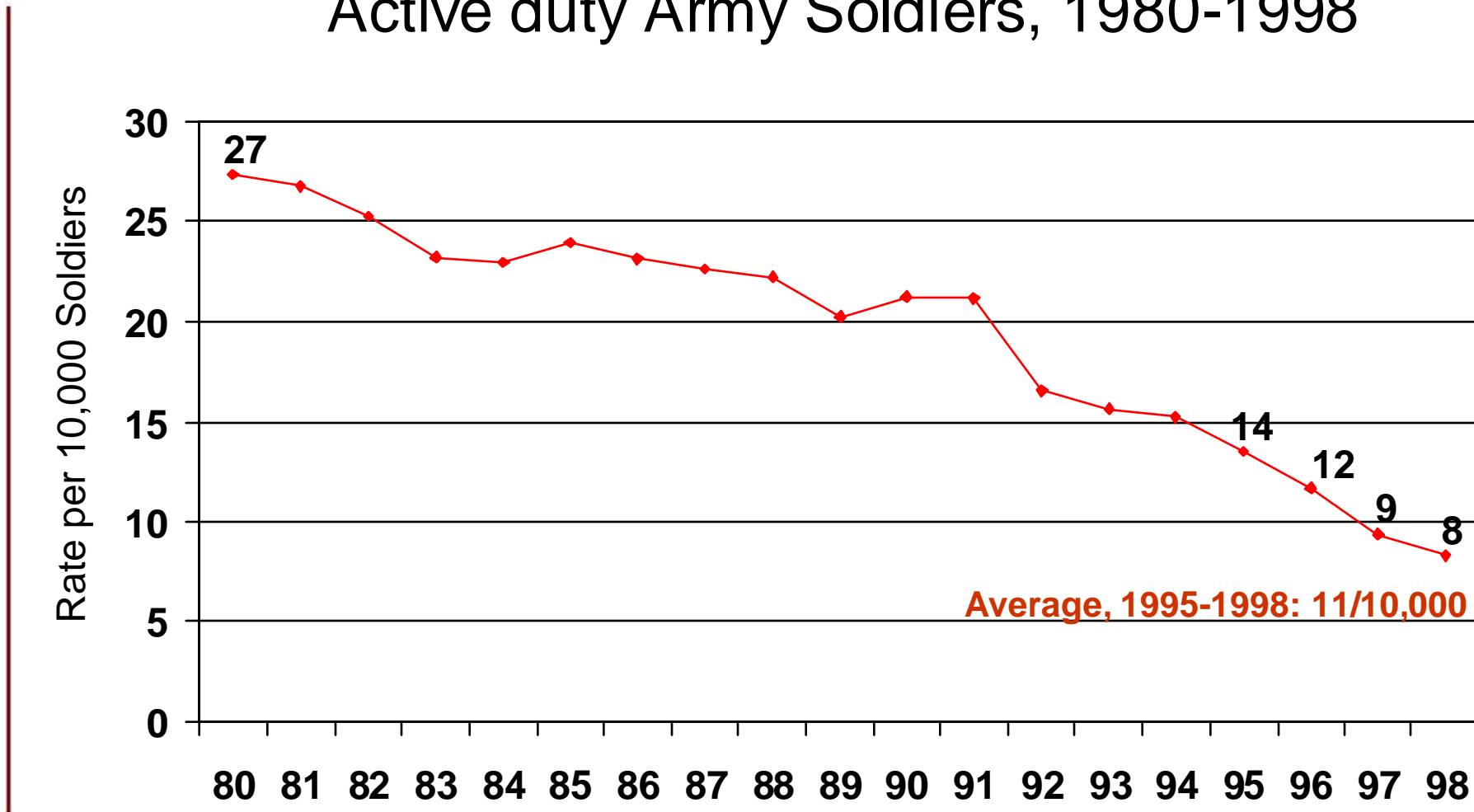
Total # injury hospitalizations, active duty Soldiers=5,195; had cause code=2,679 (52%)

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U.S. Army fall-related hospitalizations*

Active duty Army Soldiers, 1980-1998



*Senier et al., 2002, *Work* 18:161-170.

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Purpose

To identify causes of &
potential modifiable risk factors for falls
using data from U.S. Army safety reports

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Methods

- Data source: Total Army Injury and Health Outcomes Database (TAIHOD)
- Data: U.S. Army Accident Reports
 - Standardized forms
 - Injury to on-duty or off-duty military personnel is reportable
 - Completed at local level
 - Tabulated & maintained centrally
 - Data includes demographic, outcome, cause, contributing factors



Variables Available from U.S. Army Safety Reports

- **Demographics**
 - Age
 - Gender
 - Ethnicity
 - Marital status
 - Rank
 - Occupation
- **Outcome**
 - Days lost duty
 - Days hospitalized
 - Injury severity
- **Injury description**
 - Body part
 - Type of injury
- **Cause/circumstances**
 - Primary cause
 - Activity at time of incident
 - Task at time of incident
 - On/off duty
 - What mistake made*
 - Why mistake made*
- **Contributing Factors**
 - Materiel malfunction*
 - Day or night
 - Environment
 - Location
 - On or off post
 - Alcohol use

*Includes narrative text description

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Methods

Case definition

- Accident report involving active duty Army Soldier
- Cause code of “fall from elevation” or “fall from same level”
- Incident occurred between Fiscal Years 1994-2002 (September 1994 – September 2002)



Results

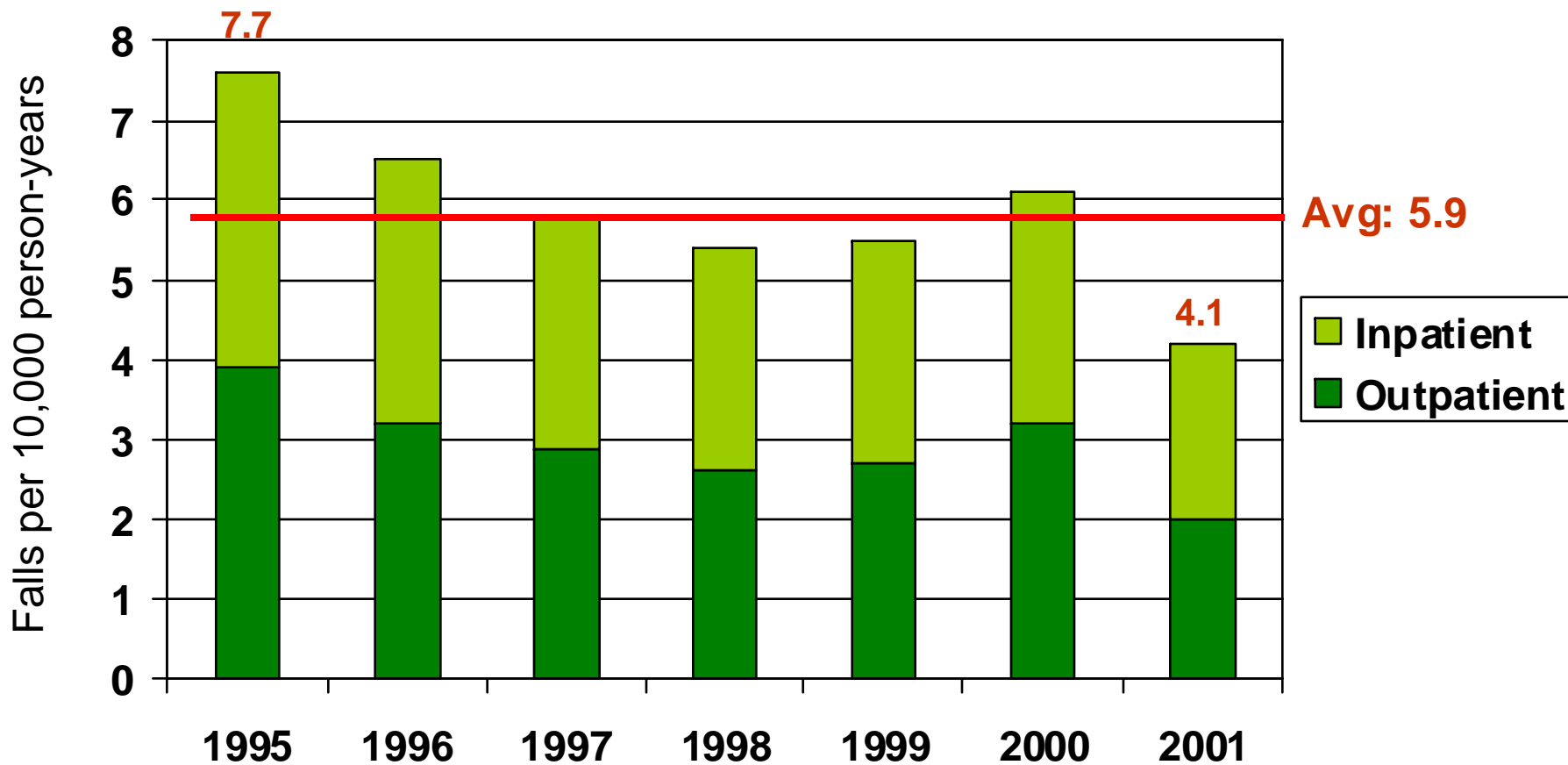
- 2,311 fall-related accident reports, Sep 1994 - Sep 2002
 - Does not include military parachute falls (n=1,288)

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U.S. Army fall-related injury rates, 1995-2001

Falls reported to the US Army Safety Center



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Denominator data source: Defense Medical Surveillance System



Falls by Demographic Characteristic

U.S. Army safety reports, Sep94-Sep02

Characteristic		Freq (%)	Rate* (per 1,000 Soldiers)	Rate ratio (95% confidence interval)
Gender	Female	322 (14)	4.6	ref
	Male	1,988 (86)	4.9	1.1 (1.0-1.2)
Race	Black	442 (19)	3.5	ref
	White	1,610 (70)	6.0	1.6 (1.4-1.8)
	Other	204 (9)	4.5	1.3 (1.1-1.5)
Marital status	Married	1,144 (50)	4.3	ref
	Single	1,065 (46)	5.8	1.4 (1.3-1.5)
	Other	97 (4)	4.5	1.1 (0.9-1.3)

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*Rates calculated using 1998 mid-year average Army population from the Defense Medical Surveillance System



Falls by Demographic Characteristic

U.S. Army safety reports, Sep94-Sep02

Characteristic		Freq (%)	Rate* (per 1,000 Soldiers)	Rate ratio (95% confidence interval)
Age	>=40	98 (4)	2.3	ref
	35-39	251 (11)	4.2	1.8 (1.4-2.2)
	30-34	363 (16)	4.5	1.9 (1.5-2.4)
	25-29	563 (24)	5.1	2.2 (1.8-2.7)
	20-24	912 (39)	6.3	2.7 (2.2-3.3)
	<20	124 (5)	3.1	1.4 (1.0-1.8)
Rank	Officer	218 (9)	2.8	ref
	E5-E9	743 (32)	4.1	1.5 (1.3-1.7)
	<=E4	1,350 (58)	6.3	2.2 (1.9-2.6)

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*Rates calculated using 1998 mid-year average Army population from the Defense Medical Surveillance System



Fall Outcomes

Falls from elevation vs. falls from same level

Injury Outcome	Falls from Elevation Frequency (%)	Falls from Same Level Frequency (%)	p-value [†]
Death	33 (3)	0 (0)	<0.001
Permanent Disability	25 (2)	6 (<1)	0.001
Hospitalized	621 (53)	529 (47)	0.003
Lost work time only	492 (42)	596 (52)	<0.001
Returned to work	5 (<1)	4 (<1)	1.0
Total	1,176 (100)	1,135 (100)	

† p-value from Chi-square test, falls from elevation vs. falls from same level

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Falls from Elevation

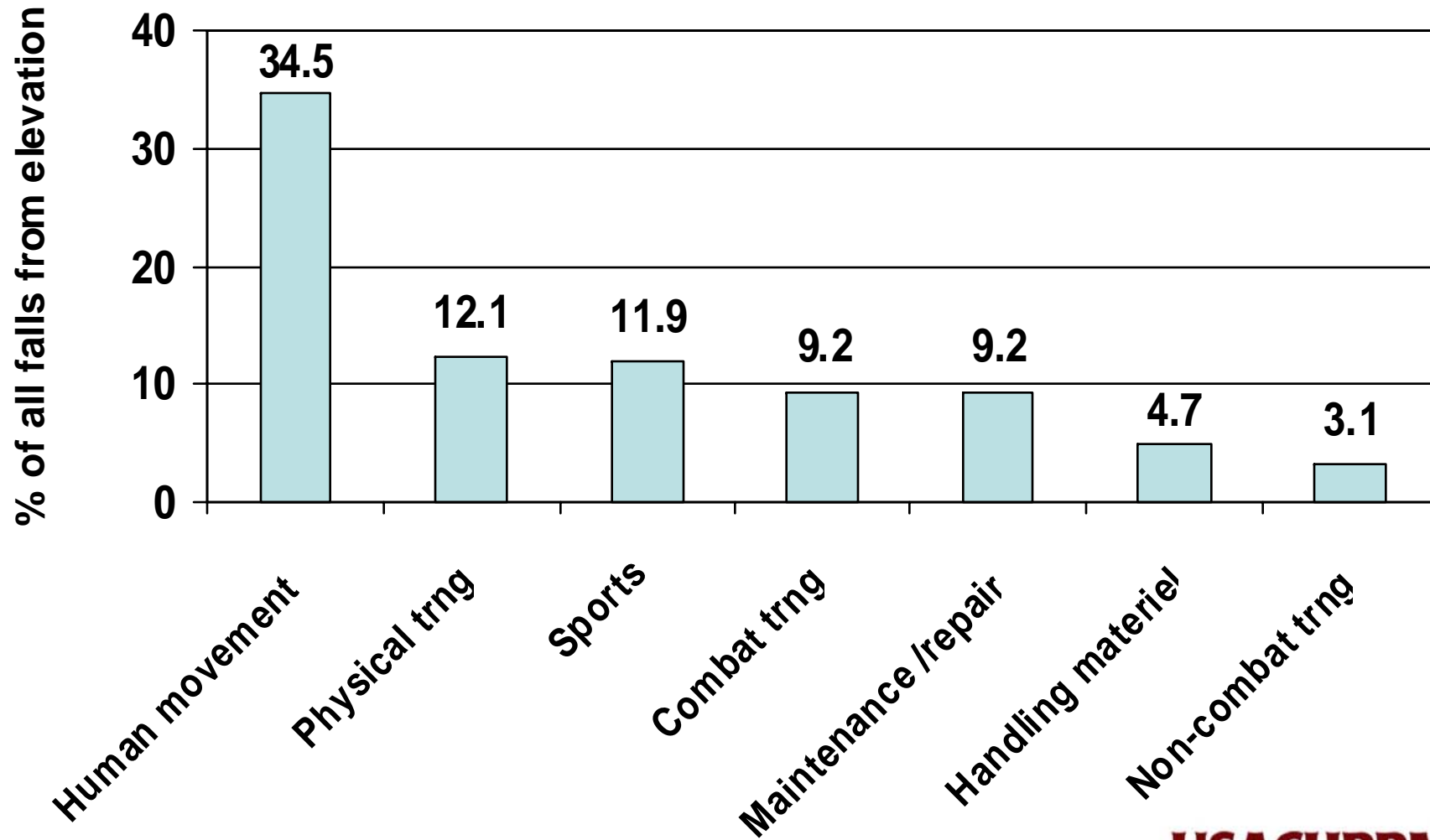
Top 3 Injury Types

1. Fractures – **53%**
 - Lower extremity – 23%
 - Upper extremity – 14%
 - Spine/back – 7%
 - Head/neck – 6%
2. Sprains/strains – **21%**
 - Lower extremity – 11%
 - Spine/back – 8%
3. Concussions – **6%**

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Falls from Elevation Leading Primary Activities

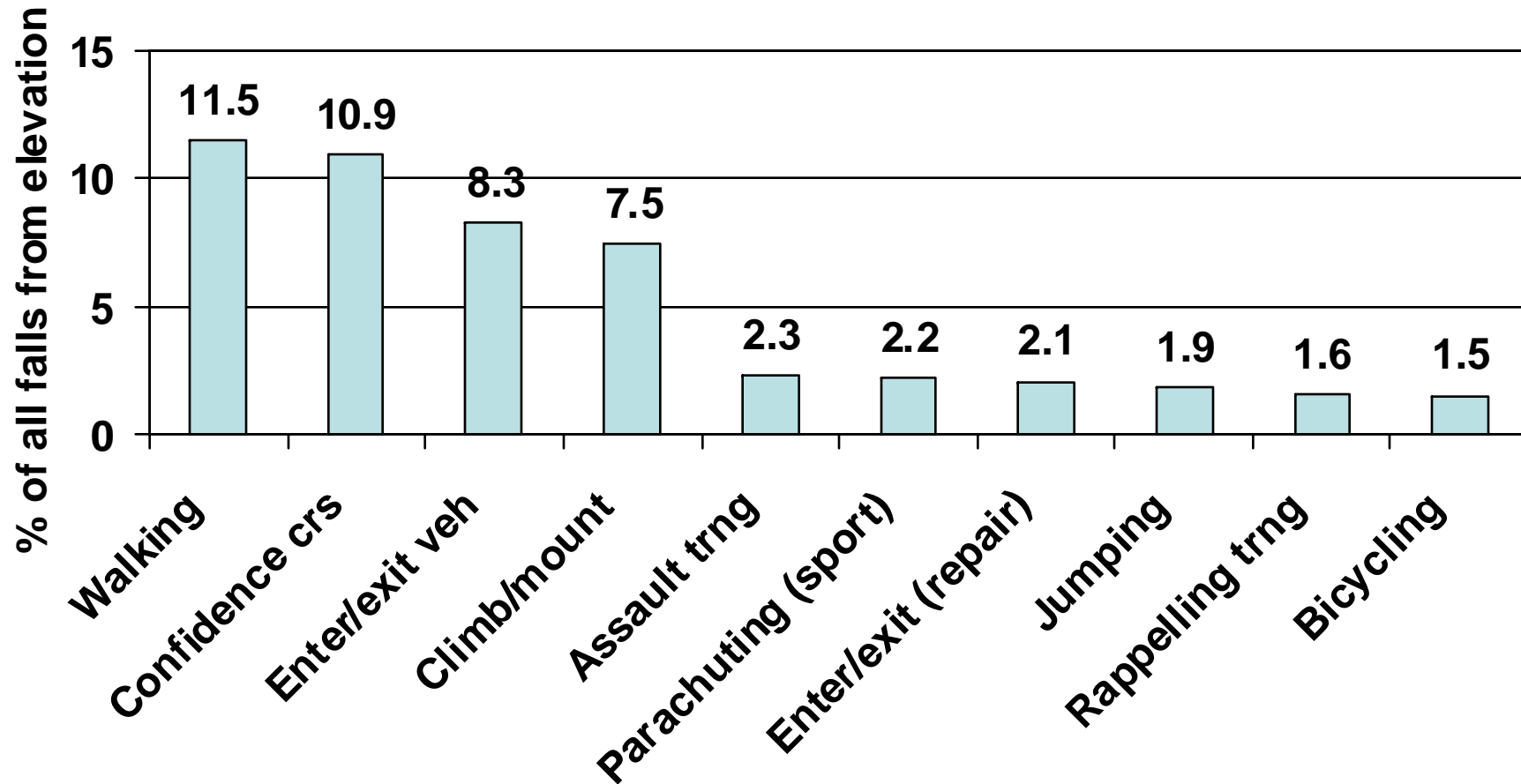


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Human movement includes walking, running, jumping, bending/leaning, climbing



Falls from Elevation Leading Secondary Activities*

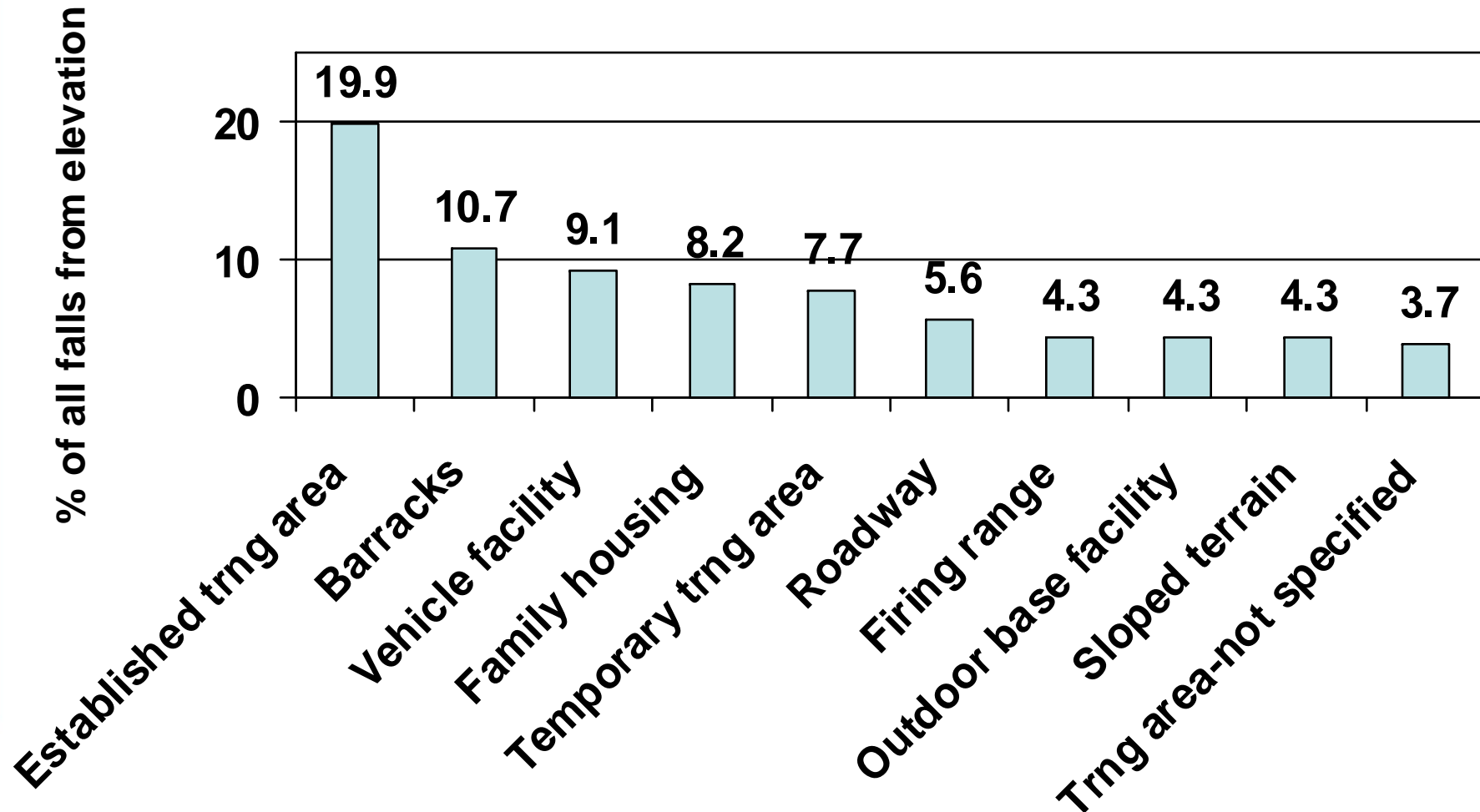


*coded from text field

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Falls from Elevation Location of Incident



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Falls from elevation Circumstances

- Work status
 - On duty – 65%
- Environmental Conditions
 - Good visibility – 47%
 - Dark or dim lighting – 14%
 - Mist, rain, sleet, or hail – 5%
- Why Mistake Made
 - Overconfident – 21%
 - In a hurry – 15%
 - Fear or excitement – 6%
 - Alcohol or drugs – 6%

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Strengths & Limitations

- Strengths
 - Large occupational cohort
 - Multiple years
 - Detailed information on causes of falls, including narrative text
- Limitations
 - Partial data capture
 - Only capturing more serious injuries
 - Enforcement of reporting dependent on leadership
 - Outcome data not collected by & may not be verified by medical personnel



Summary of Results from Previous Studies

- Gender
 - Multiple studies have reported greater proportion of males vs. females
 - When rates presented, male rates were not higher than female
- Age
 - Articles reporting fall fatalities show greatest risk among persons 65 years & older
 - When data presented by age group (incl. prior Army study), see greater proportion among younger vs. 40 years & older
- Injury type
 - 20-78% of fall injuries are fractures
 - 11-43% of fall injuries are sprains/strains
 - Concussions account for 2% or less in civilian data

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Conclusions

- First study of falls among Army personnel using safety report data
- Findings:
 - Greatest proportion of falls reported to safety were among white, single, 20-24 years old, lower rank
 - Severe injuries were due to falls from elevation
 - Specific activities associated with falls from elevation: Walking, confidence courses, entering/exiting vehicle
 - Locations associated with falls from elevation: Training areas, barracks, vehicle facilities, family housing

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Implications

- Identified potential areas to target fall prevention efforts
 - confidence courses
 - entering/exiting vehicles
- Data suggest that Army supervisors/commanders have potential to influence rates of leading causes of falls
 - 65% on-duty
 - Leading locations are Army facilities
- Demonstrated the utility of administrative safety data for obtaining more specific cause of injury information

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Readiness thru Health