

Gender Differences in Occupational & Non-Occupational Injuries in the U.S. Army & The Effects of Re-injury on Military Discharge from the US Army

Hope M. Tiesman, PhD, MSPH

Centers for Disease Control & Prevention
NIOSH
Division of Safety Research



The findings and conclusions in this presentation have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination of policy



Acknowledgments

- Corrie Peek-Asa, MSPH, PhD
 - Craig Zwerling, PhD, MD
 - Ginger Yang, MSPH, PhD
 - Paul Amoroso, MPH, MD
 - Paul Whitten, MA
 - Nancy Sprince, MPH, MD
- **The University of Iowa**
 - Heartland Center for Occupational Health & Safety
 - Occupational Injury Prevention Research Program
 - Dept's of Epidemiology & Occupational & Environmental Health (COPH)
 - **US Army Research Institute of Environmental Medicine**



Overview

- **Military Injury Research**
- **Total Army Injury & Health Outcomes Database (TAIHOD)**
- **Gender Differences in Occupational & Non-Occupational Injuries in the US Army**
- **The Effects of Re-injury on Military Discharge from the US Army**



*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

**In war, there are no unwounded
soldiers**

Jose Norasky

***APHA 135th Annual Meeting & Expo
November 3-7, 2007***

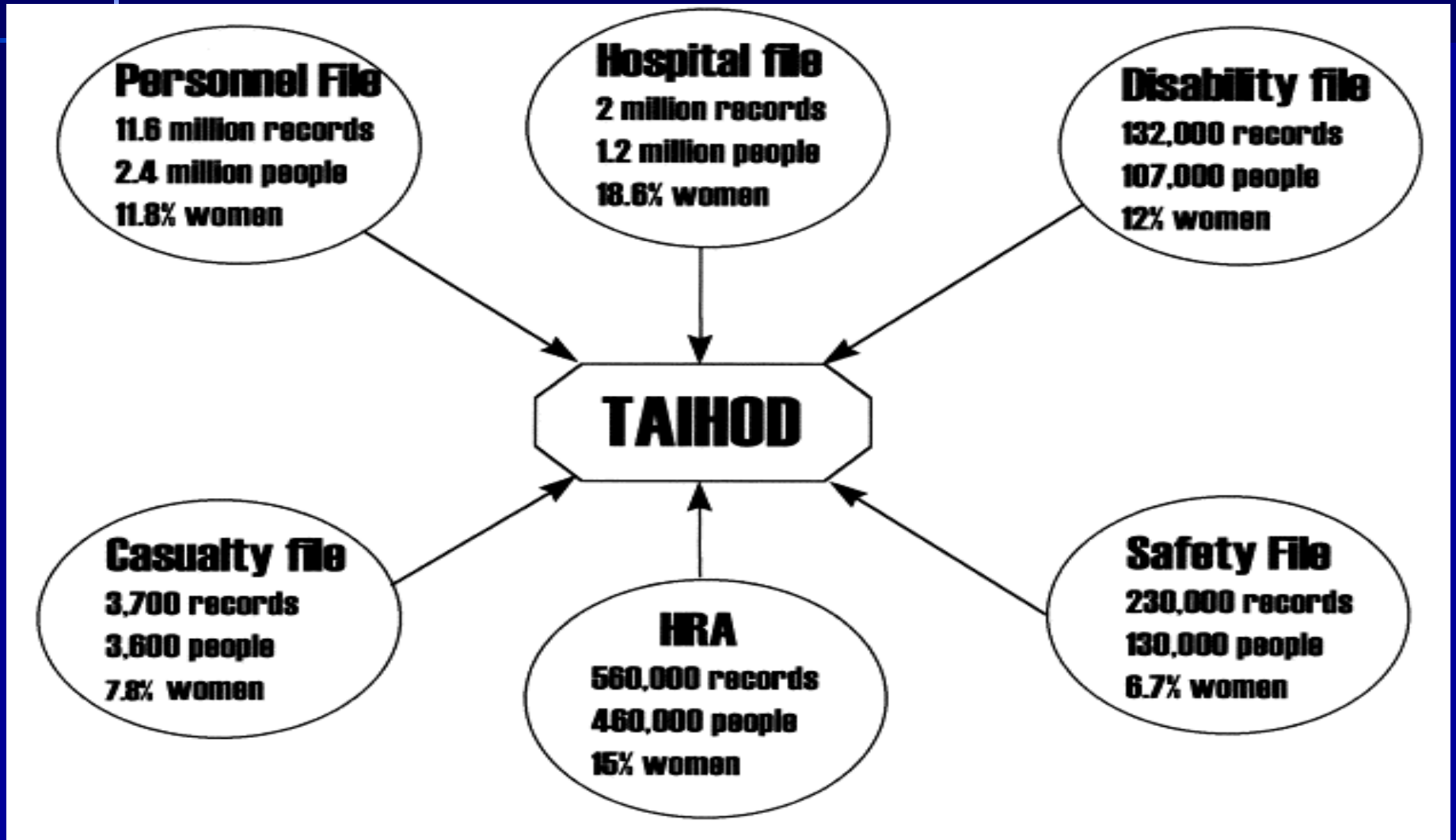
Military Injuries

- 'Biggest health threat confronting the US Armed Forces' – General Peake (2000)
- Leading cause of morbidity, mortality, disability, & manpower loss
- Leading causes of injury: MVC, falls, & sports/athletics
- 39% of hospitalizations in 1st GW were non-battle injuries; only 5% were battle-related



*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

Total Army Injury & Health Outcomes Database (TAIHOD)



Advantages of TAHIOD

- ICD-9 Code – (800-999)
- STANAG injury coding system
 - Trauma code (intent & duty-status)
 - battle related, intentional inflicted non-battle, off-duty, schemes & exercises, scheduled training, on-duty, unknown
 - Injury Code (activity or cause)

*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

Duty - Status



- **Battle Wound/Injury**
 - Direct result of action
 - Other battle casualties

- **Intentionally Inflicted Non-battle Injuries**
 - Assault
 - Intentionally self-inflicted

- **Accidental Injury**
 - Off-duty
 - Schemes & exercises
 - Other scheduled training
 - On-duty
 - Unknown

*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

Example

- ICD-9CM code
 - 800-804 (Fracture of Skull)
 - 800.1 Closed with cerebral laceration and contusion

- Trauma Code
 - 5 = 'off-duty'

- Injury Code
 - 100 = Non-mil: Injury is to driver of motor vehicle
 - 101 = Non-mil: Injury is to passenger of motor vehicle
 - 102 = Non-mil: Injury is to unspecified occupant of mv
 - 103 = Non-mil: Boarding/alighting from vehicle
 - 104 = Non-mil: Injury is to pedestrian
 - 105 = Non-mil: Injury is to pedal cyclist
 - 106 = Non-mil: Injury is to motorcyclist
 - 107 = Non-mil: Driver/rider on tracked/semi tracked veh
 - 109 = Non-mil: Injury is to other or unspecified person

*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

Gender Differences in Occupational & Non-Occupational Injuries*



- Significant correlations between recreational injuries & having a work-place injury
- Trends not well described with respect to gender or occupation
- Majority of military injury research focuses on initial entry training

* *Tiesman HM, Peek-Asa C, Zwerling C, Sprince NL, Amoroso PJ. Occupational & Non-Occupational Injuries in the US Army: Focus on Gender. AJPM 2007; 33(6).*

Retrospective Cohort

Inclusion Criteria:

- AD between 1/1992 – 12/2002
- hospitalized injury via primary diagnosis (ICD-9CM 800-959.8)
- injury occurred in first 11 months of service
- Off-duty, schemes & exercises, scheduled training, on-duty, & unknown

Followed till
12/31/2002

Outcomes:

1. Injuries
2. Re-injuries
3. Disability discharges

APHA 135th Annual Meeting & Expo
November 3-7, 2007

Retrospective Cohort

5,678 soldiers

**4,879 men (86%)
792 women (14%)**

**4,051 Caucasian (71%)
1,627 Non-Caucasian (29%)**

**5,441 Enlisted (96%)
237 Officers (4%)**

Average age 21.4 (sd=3.2)

**Average follow-up
2.7 yrs
(sd=2.5 yrs)**

5,661 followed:

337 soldiers injured

**329 soldiers re-
injured**

**977 with disability-
related
discharges**

**APHA 135th Annual Meeting & Expo
November 3-7, 2007**

Methods

- **Injury Variables**
 - External cause of injury
 - ISS (calculated with ICD-MAP)
 - # days in hospital
- **Demographics**
 - Gender, age, education
 - Pay grade (Enlisted & Officers/Warrant Officers)
- **Occupation (12 DoD Career Management Fields)**
 - infantry, electrical equipment repair, communications & intelligence, health care, technical & allied specialties, support & administration, electronic & mechanical equipment repair, craft workers, service & supply, non-occupational enlisted, unknown, officer

*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

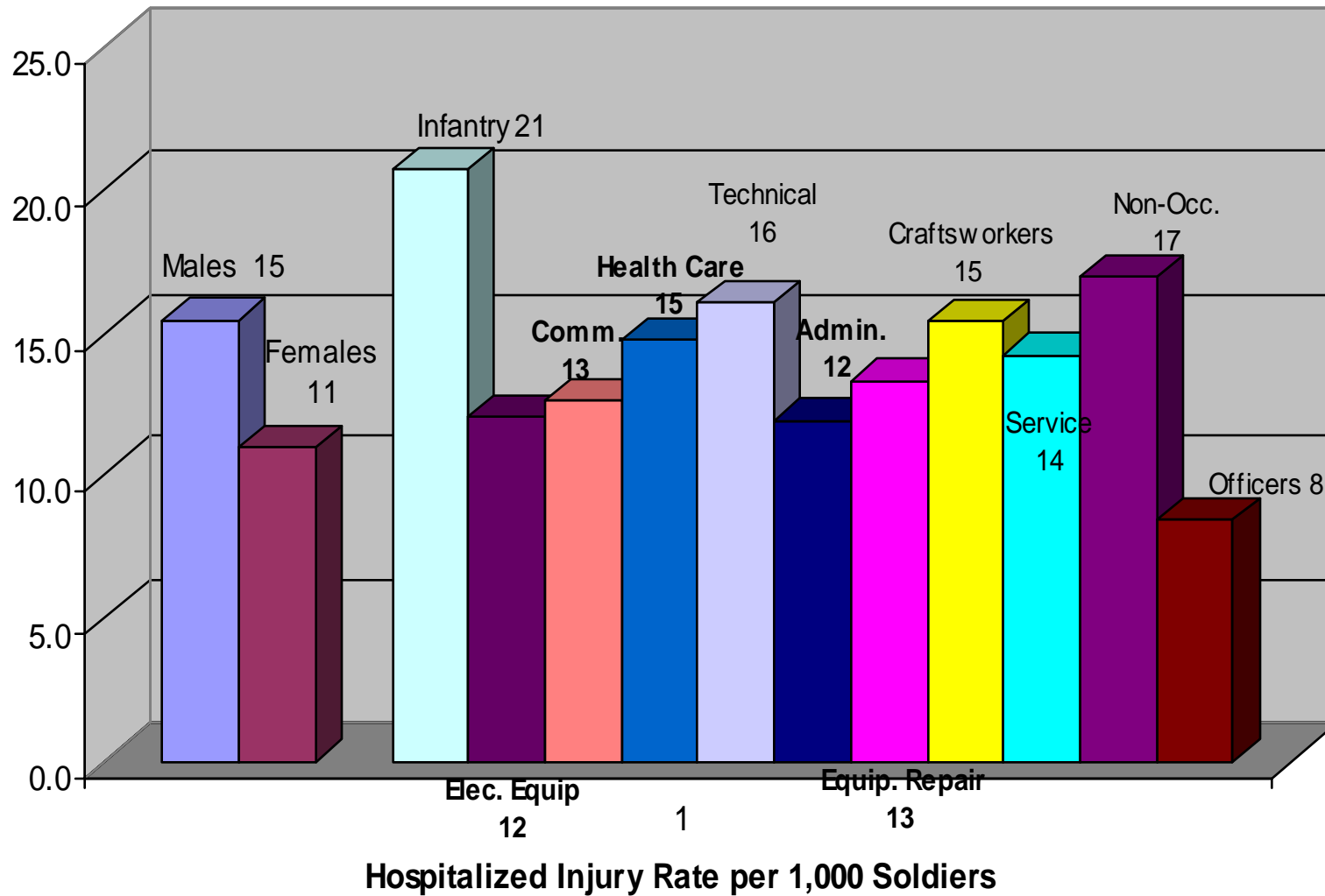
Analysis



- Cross-sectional analysis
- Injury Rates
 - Denominator data via DMDC (mid-yr estimates)
 - Compared with Rate Ratios (RR's) & 95% CI's
- Injuries compared via Pearson chi-square's, Fisher's exact, & t-tests
 - Stratified by gender
 - P-values adjusted using the Bonferroni correction

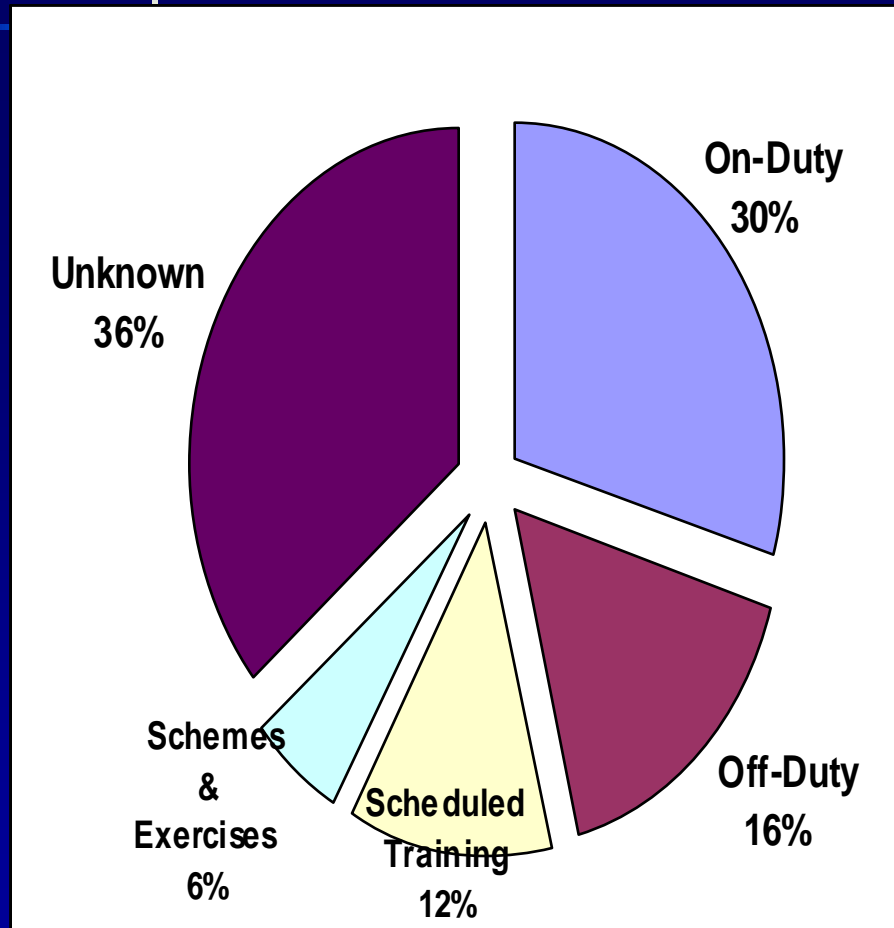
***APHA 135th Annual Meeting & Expo
November 3-7, 2007***

Results – Crude Injury Rates

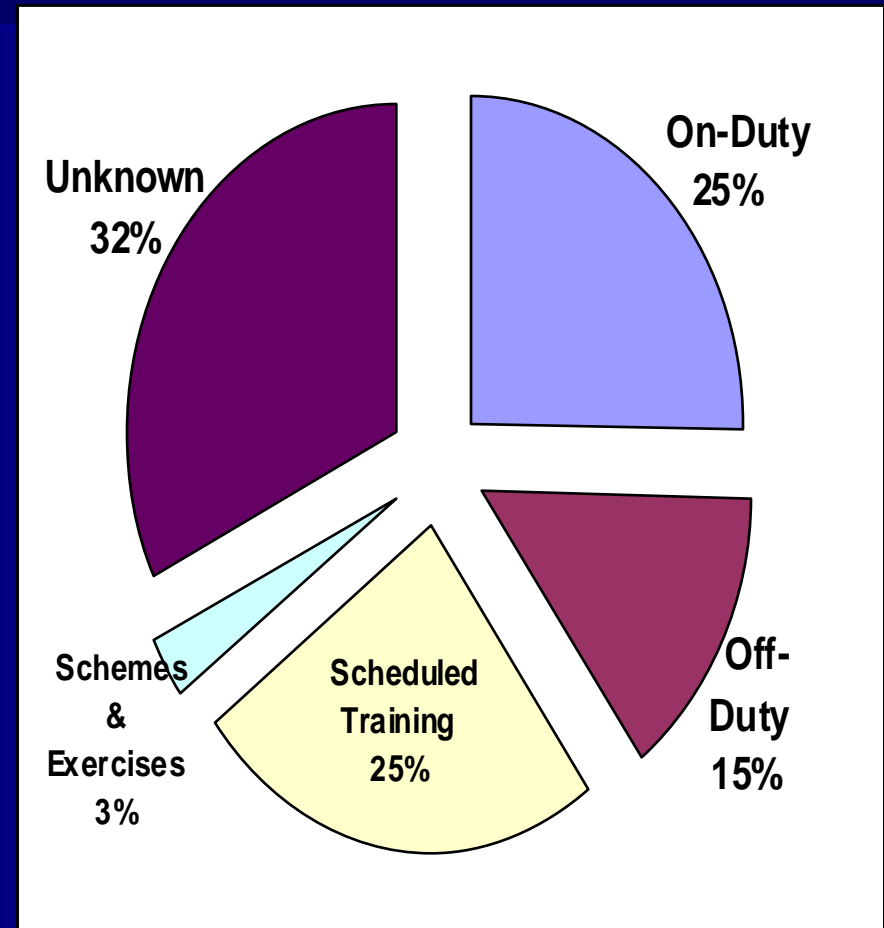


Duty-Status by Gender

Male

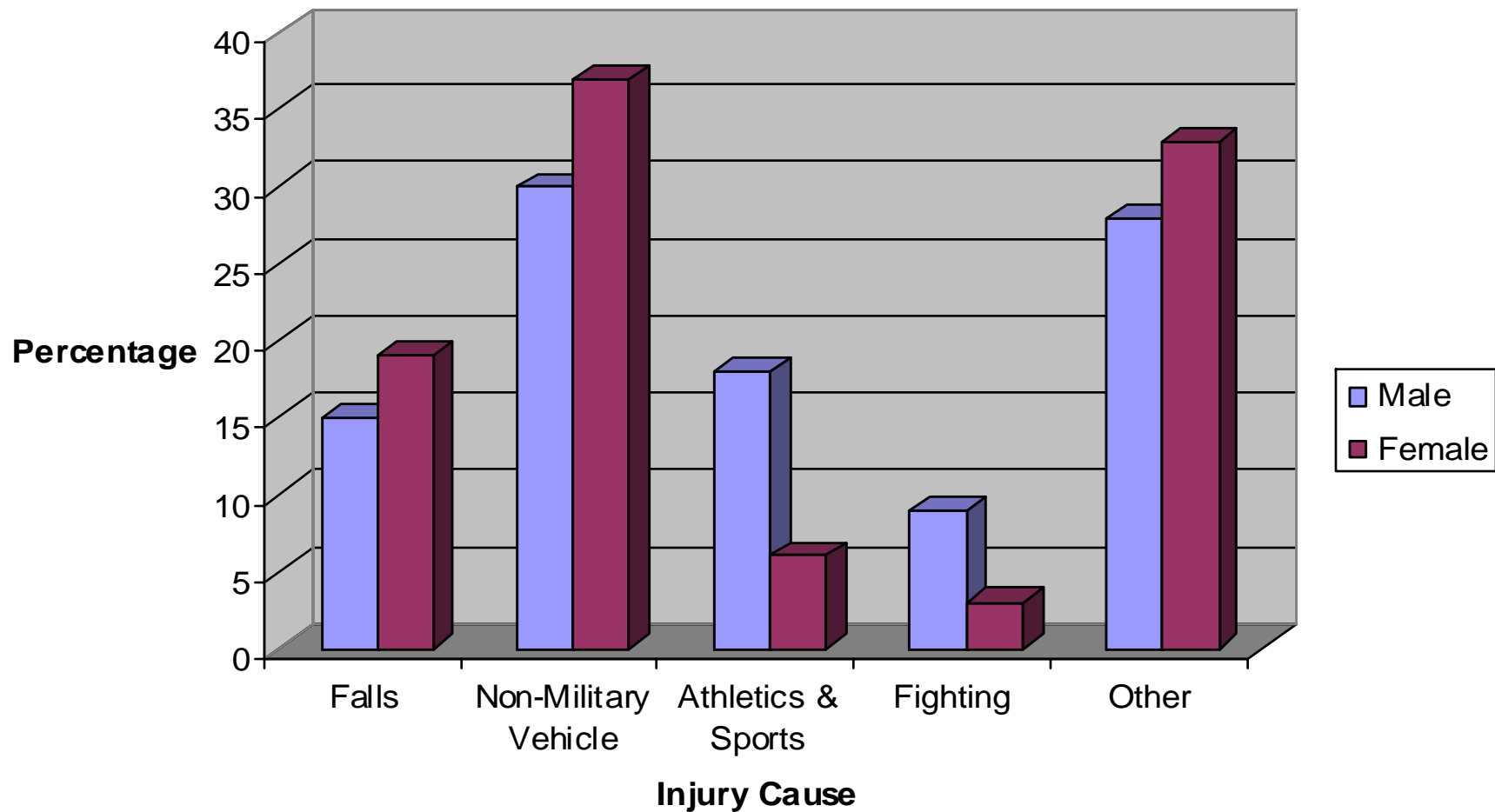


Female



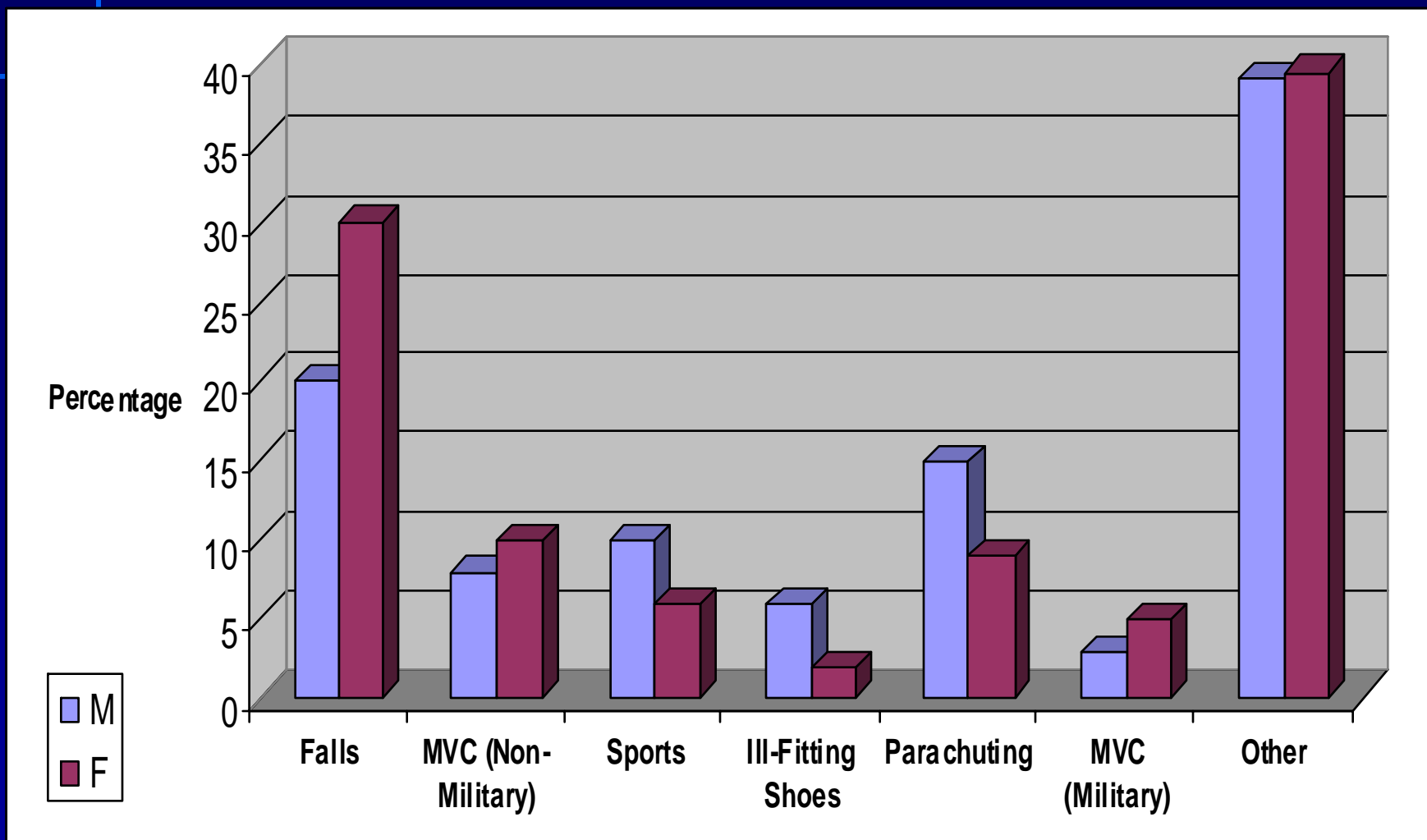
* Training $p < 0.0001$, On-duty $p = 0.01$, Schemes $p = 0.006$, Off-duty $p = 0.23$

Selected Causes of Off-Duty Injuries by Gender



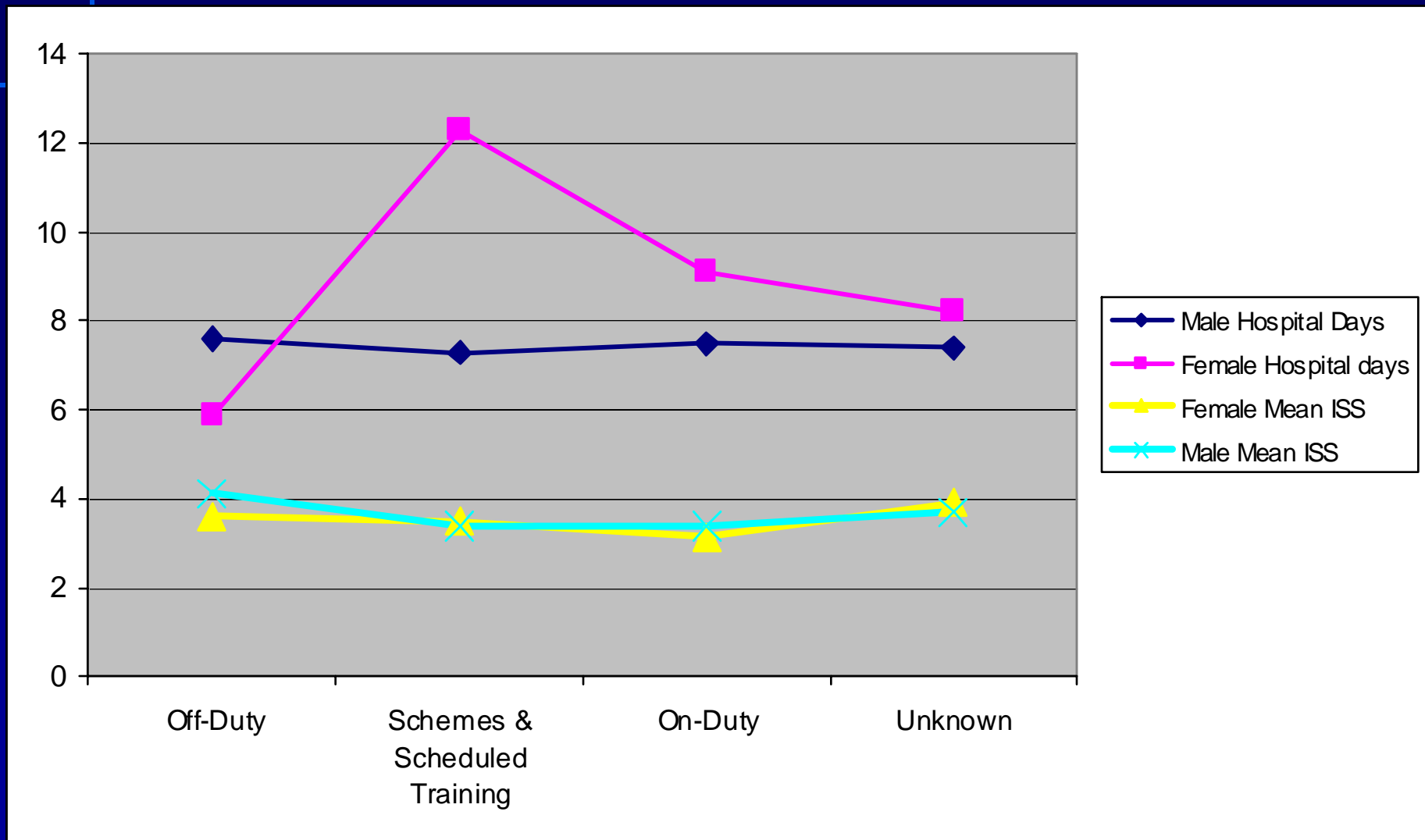
p=0.001 – athletics and sports, p=0.017 - fighting

Selected Causes of On-Duty Injuries by Gender



$p=0.0016$ – Falls

ISS & Hospital Days by Gender



Strengths & Limitations

■ Strengths

- TAIHOD database
- Large cohort of mixed occupations

■ Limitations

- Confounding
- Out-patient injuries
- 'Unknown' trauma code



*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

Conclusions

- Findings consistent with current research
 - Scheduled training most dangerous injury risk period for women
- Off-duty: No differences in frequency, sig. differences in injury causes
- On-duty: job tasks within job categories appear to be gender specific
- Women longer hospital stays, though injuries not more severe
- Special attention paid to men's off-duty injuries

*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

Questions?

*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

The Effects of Re-injury on Military Discharge from the US Army

- Military disability rates rising:
 - 1/5 partly disabled due to service in Iraq/Afghanistan
- Approximately 50% of permanent disability cases caused by traumatic injury
- Role of re-injury unknown
- Investigate role of re-injury on physical disability discharge
 - nature of re-injury



APHA 135th Annual Meeting & Expo
November 3-7, 2007

5,661 soldiers with an early-career hospitalized injury

**337 (6%)
Soldiers with an injury hospitalization, not defined as a re-injury**

**329 (6%)
Soldiers with at least one re-injury hospitalization**

**5,012 (88%)
Soldiers with no injury-related hospitalization during follow-up**

**110 (33%)
Soldiers with an injury hospitalization**

**219 (67%)
Soldiers with a musculoskeletal hospitalization**

***APHA 135th Annual Meeting & Expo
November 3-7, 2007***

Methods

- **Retrospective cohort design – described previously**
- **Primary Risk Factor**
 - Re-injury hospitalization after discharge for 1st event (n=329)
- **Definition of Re-injury**
 - 1 day between discharge for 1st injury & admission for re-injury
 - Visits for aftercare management (V-codes) removed

*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

Methods – Re-injury



- ICD-9 code for re-injury same as code for 1st event (n=74)
- ICD-9 code for re-injury associated with 1st event (n=36)
 - (844):Sprains & Strains of Knee and Leg &
 - (836):Dislocation of Knee
- Musculoskeletal conditions associated with 1st event (n=219)
 - (717):Internal Derangement of Knee

***APHA 135th Annual Meeting & Expo
November 3-7, 2007***

Methods - Outcome

- Discharge from the Army, due to physical disabilities
 - Physical disability, entitled to severance pay, no retirement
 - Mandatory retirement required by law due to temporary disability
 - Mandatory retirement, permanent physical disability
 - Involuntary discharge, physical disability not otherwise covered
 - Involuntary discharge, physical disability, resulted from intentional misconduct, no severance pay
 - Previously retired, entitled to recomputation of retirement pay, aggravate physical disability

*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

Methods



- **Possible Confounders**
 - demographics
 - DoD occupation code
 - body region
 - type of initial injury
 - work-relatedness
 - nature of re-injury

- **Survival Analysis**
 - Cox Proportional Hazards Regression
 - Kaplan-Meier estimates of survival
 - Log-rank tests for equality

*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

Results

- 977 (17%) physical disability discharge
- 3,336 (59%) discharged for other reason
- Females, those not married, & enlisted soldiers significantly more likely to be discharged ($p < 0.0001$)
- Soldiers in health care occupations had highest proportion receiving a disability discharge (49%) ($p < 0.0001$)

*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

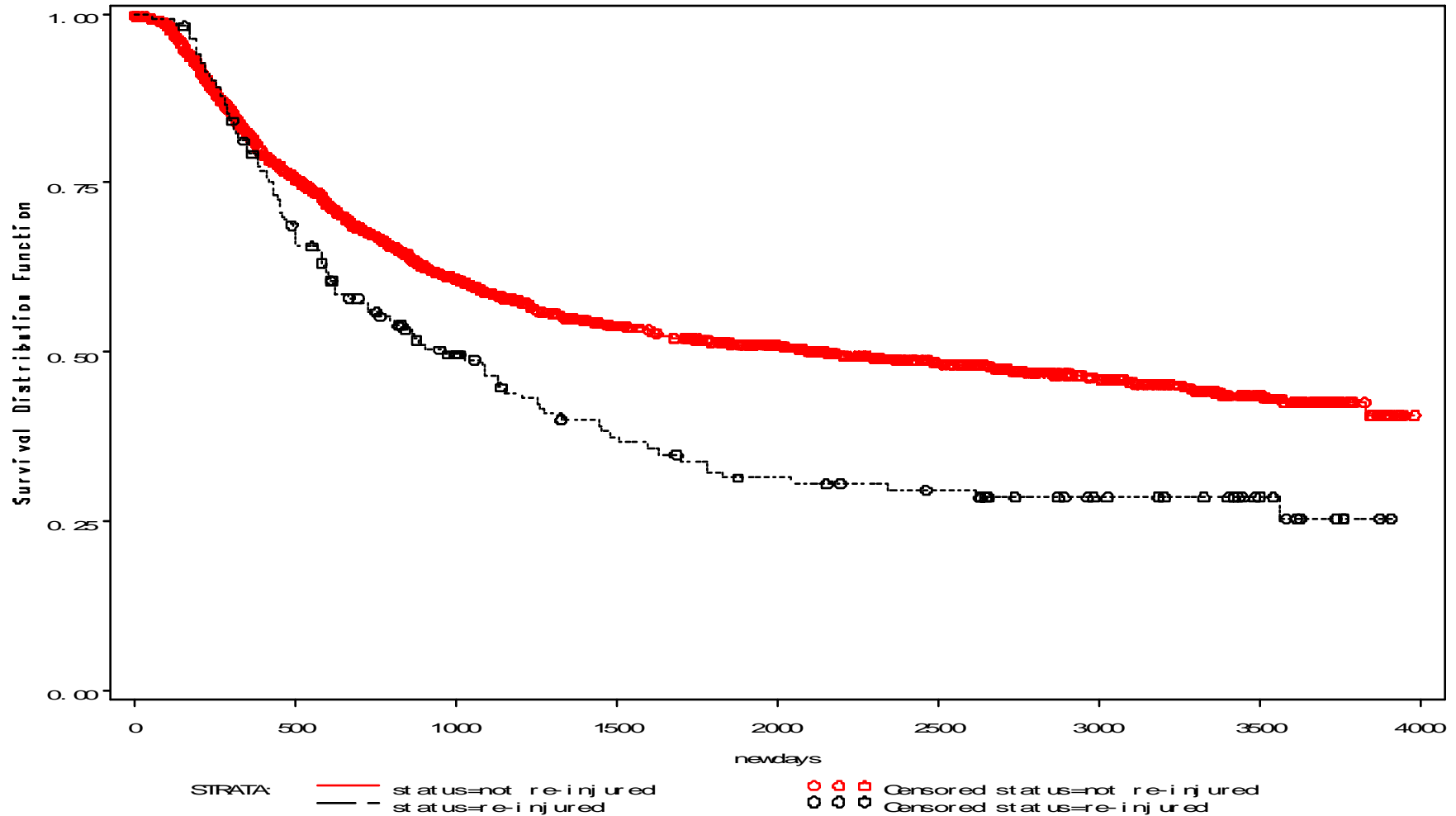
Results



- Those with sprains and strains most likely to be discharged ($p < 0.001$)
- Those with knee injuries most likely to be discharged ($p < 0.001$)
- On-duty injuries slightly more likely to result in discharge ($p = 0.07$)
- Nature of re-injury not associated with discharge ($p = 0.33$)

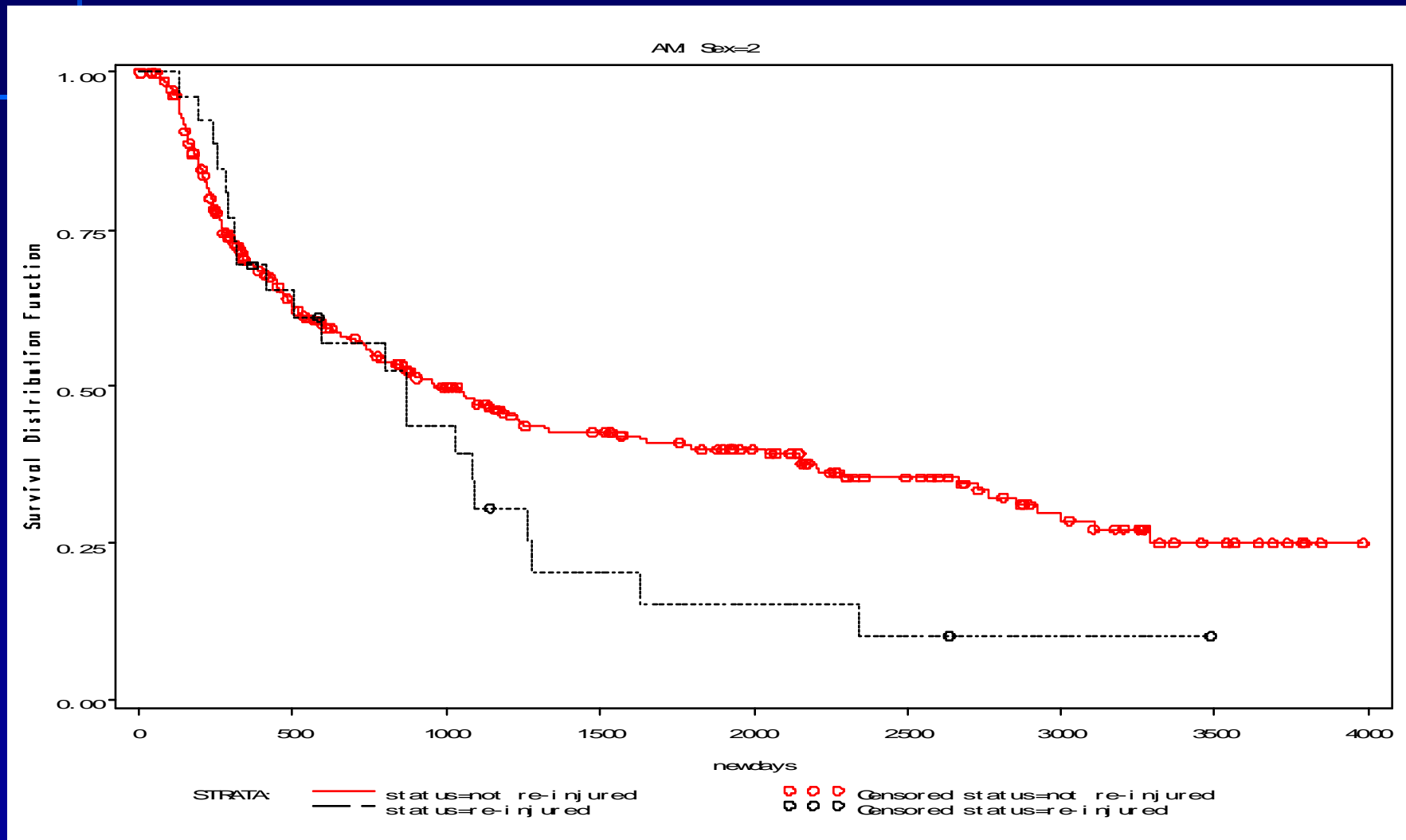
*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

Survival curves for disability discharge, by re-injury status



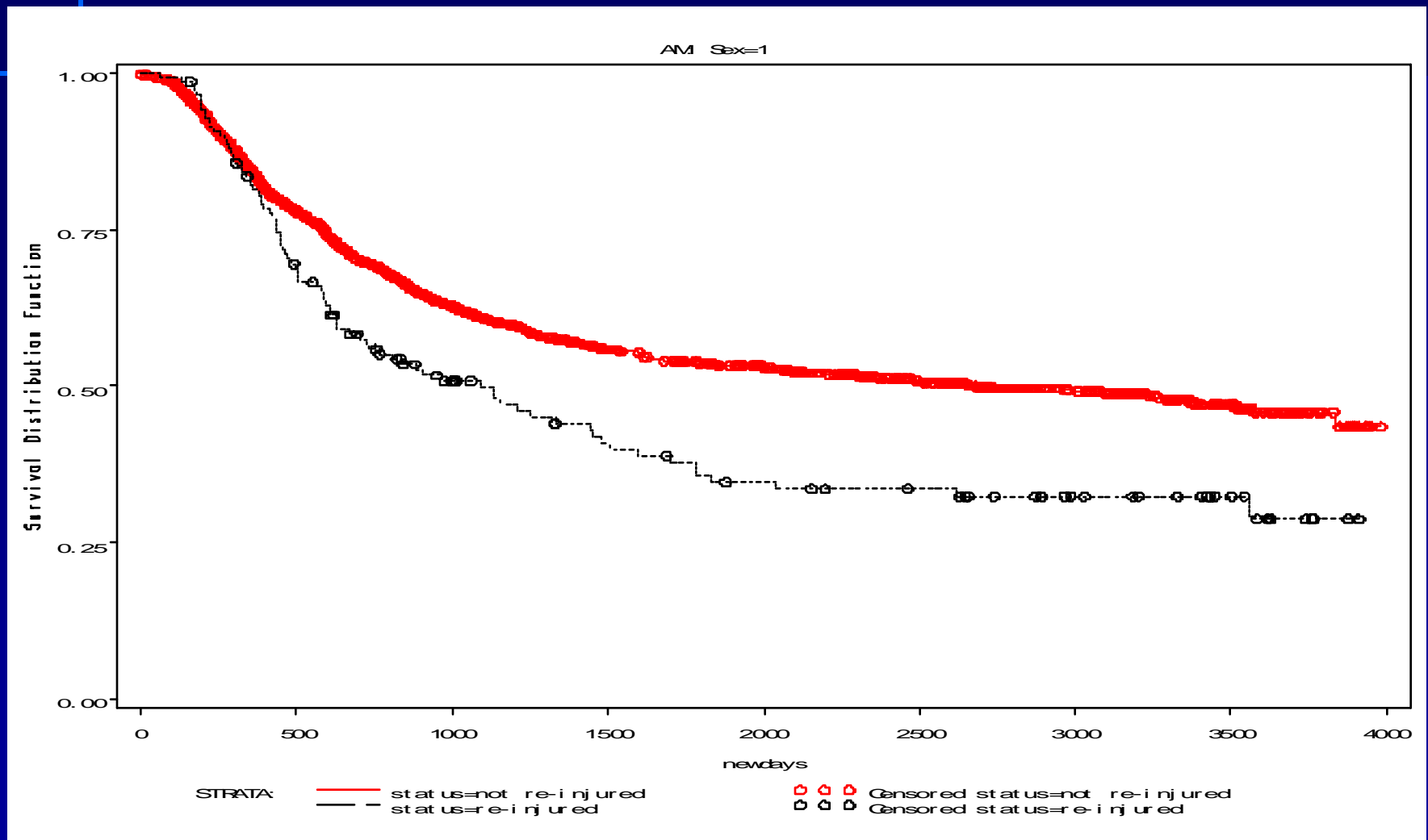
**log-rank test, $p < 0.0001$*

Survival curves for disability discharge, by re-injury status - Females



* Log rank test $p=0.14$

Survival curves for disability discharge, by re-injury status - Males



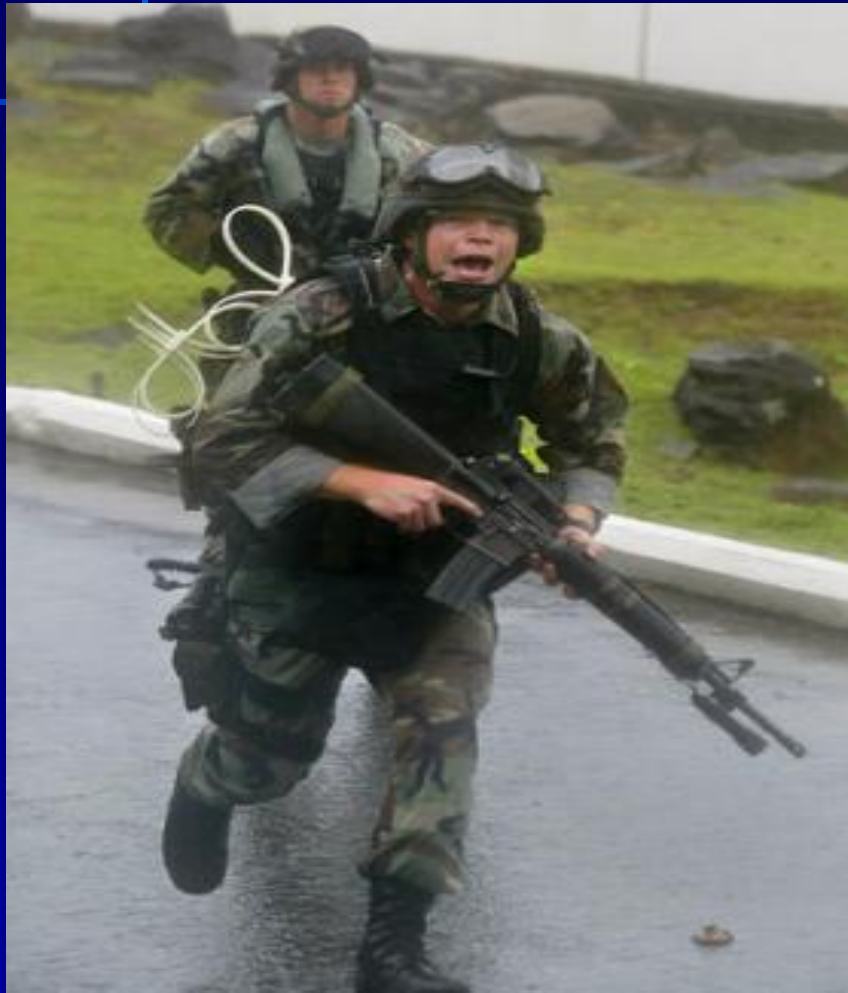
* Log rank test, $p=0.0003$

Multivariate analysis for disability discharge, stratified by gender

	Both Genders	Males	Females
Risk Factor	RR (95% CI)	RR (95% CI)	RR (95% CI)
Re-injury	1.34 (1.04, 1.72)	1.36 (1.03, 1.79)	1.20 (0.67, 2.16)
HS education or more vs. less than HS	1.12 (0.74, 1.69)	1.19 (0.71, 2.00)	1.19 (0.60, 2.35)
Not Married	2.66 (2.22, 3.19)	2.85 (2.32, 3.51)	2.07 (1.40, 3.05)
On-duty Injury	1.28 (1.05, 1.56)	1.15 (0.93, 1.42)	2.21 (1.26, 3.89)
Enlisted Status	3.02 (1.63, 5.59)	2.88 (1.38, 6.00)	2.25 (0.68, 7.41)

APHA 135th Annual Meeting & Expo
November 3-7, 2007

Strengths & Limitations



- **Limitations**
 - Temporality
 - relationship between disability discharge & injury
 - inclusion of musculoskeletal events
 - analysis of re-injury not feasible

- **Strengths**
 - large & diverse cohort over long period
 - control for known confounders

*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

Conclusions

- Re-injury, regardless of nature, sig. risk factor for pre-mature military discharge
- Soldiers with a re-injury 34% more likely to be discharged from the Army, after controlling for confounders (Men - 36%, Women – 20%)
- On-duty injuries associated with military discharge (HR=1.28, 1.05-1.56)
- Nature of re-injury not associated with discharge
- Prospective cohort could fully examine relationships between injury, re-injury and disability

*APHA 135th Annual Meeting & Expo
November 3-7, 2007*

Questions?



www.militaryphotos.net