TIP NO. 12-110-0520

ANNUAL INJURY SURVEILLANCE REPORT 2016 SUMMARY

INTRODUCTION

This document provides a summary of injury medical encounter surveillance data for Active Duty Soldiers from Calendar Year (CY) 2016, analyzed and presented by the U.S. Army Public Health Center (APHC) Injury Prevention Program (Injury Prevention) with assistance from the Defense Health Agency (DHA) Armed Forces Health Surveillance Branch (AFHSB)—Army Satellite.

According to the Centers for Disease Control and Prevention (CDC) (www.cdc.gov), monitoring of public health outcomes is one of the ten essential public health services. Routine monitoring and surveillance of Army injuries provides a foundation to recognize trends, define the magnitude and distribution of injuries, identify emerging issues, and guide injury prevention priorities.

Injuries summarized in this report are based on medical encounters diagnosed using codes from the International Classification of Diseases, Clinical Modification, 10th Revision (ICD-10 CM). Diagnosis codes for injuries were identified as those describing any damage or interruption of body tissue function caused by an energy transfer that exceeds tissue tolerance suddenly (acute trauma) or gradually (cumulative micro-trauma). Energy transfers resulting in injuries are categorized as mechanical, environmental, electrical, non-environment, or other. The definition of injury used in this report has been described in APHC's Taxonomy of Injuries for Public Health Monitoring & Reporting (see bibliography).

The surveillance data presented in this document, along with past Army injury surveillance summaries, are also available in a slide-set format on the APHC Periodic Publications page: https://phc.amedd.army.mil/news/Pages/PublicationDetails.aspx?type=Active%20Duty%20Army%20Injury%20Surveillance%20Summary.

Similar population-level data are presented for injuries, other health outcomes, and key health indicators in the annual U.S. Army Health of the Force Report. Current and past reports can be accessed at: https://phc.amedd.army.mil/topics/campaigns/hof/Pages/default.aspx
Health of the Force data are also presented in a dashboard format at: https://carepoint.health.mil/sites/HOF.

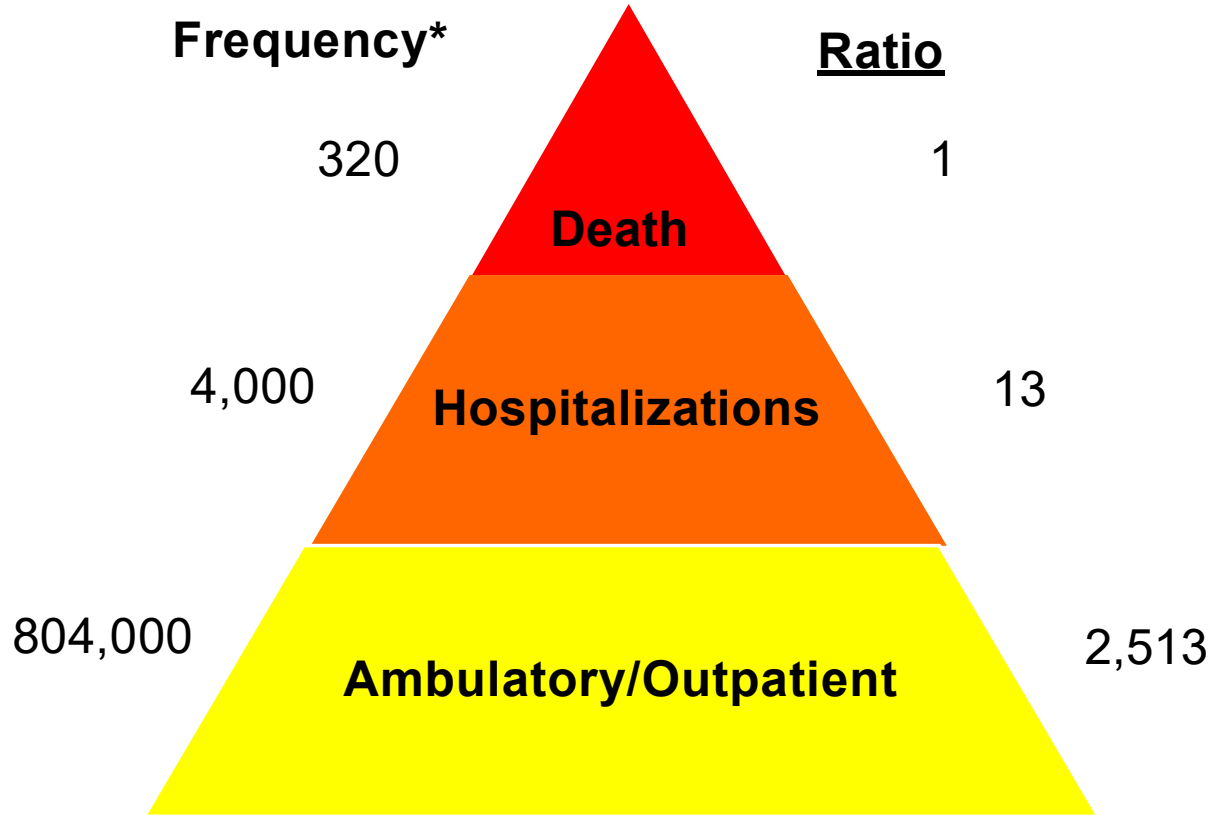
The APHC Injury Prevention also provides installation-level injury summaries for both Active Duty and Civilian populations, upon request, for those interested in detailed installation-specific data. Installation injury rates, one element of these summaries, can be accessed at: https://www.sms.army.mil/ and navigating the menus to Dashboards (from the top left drop-down) > Army Enterprise (from the left menu pane) > OTSG/MEDCOM > OTSG/MEDCOM HQ > DCS, Public Health > Epidemiology and Disease Surveillance Portfolio > Active Duty Injuries by Installation, MEDCOM Region, and MACOM (Quarterly).

Furthermore, injury data specific to basic trainee populations is available upon request, and at: https://carepoint.health.mil/sites/APH/PHPMO/Pages/AD-Training-Related-Injuries.aspx.

For additional information, please visit the Injury Prevention Program Website: https://phc.amedd.army.mil/topics/discond/ptsaip/Pages/default.aspx and contact us by email at usarmy.apg.medcom-aphc.mbx.injuryprevention@mail.mil.

DISTRIBUTION OF INJURIES

The injury pyramid depicts injuries by level of severity, from deaths to injuries treated in an outpatient setting. In 2016, for every one injury-related death, there were over 2,500 outpatient encounters. Injuries treated on an outpatient basis represent a significant obstacle to Soldier medical readiness.

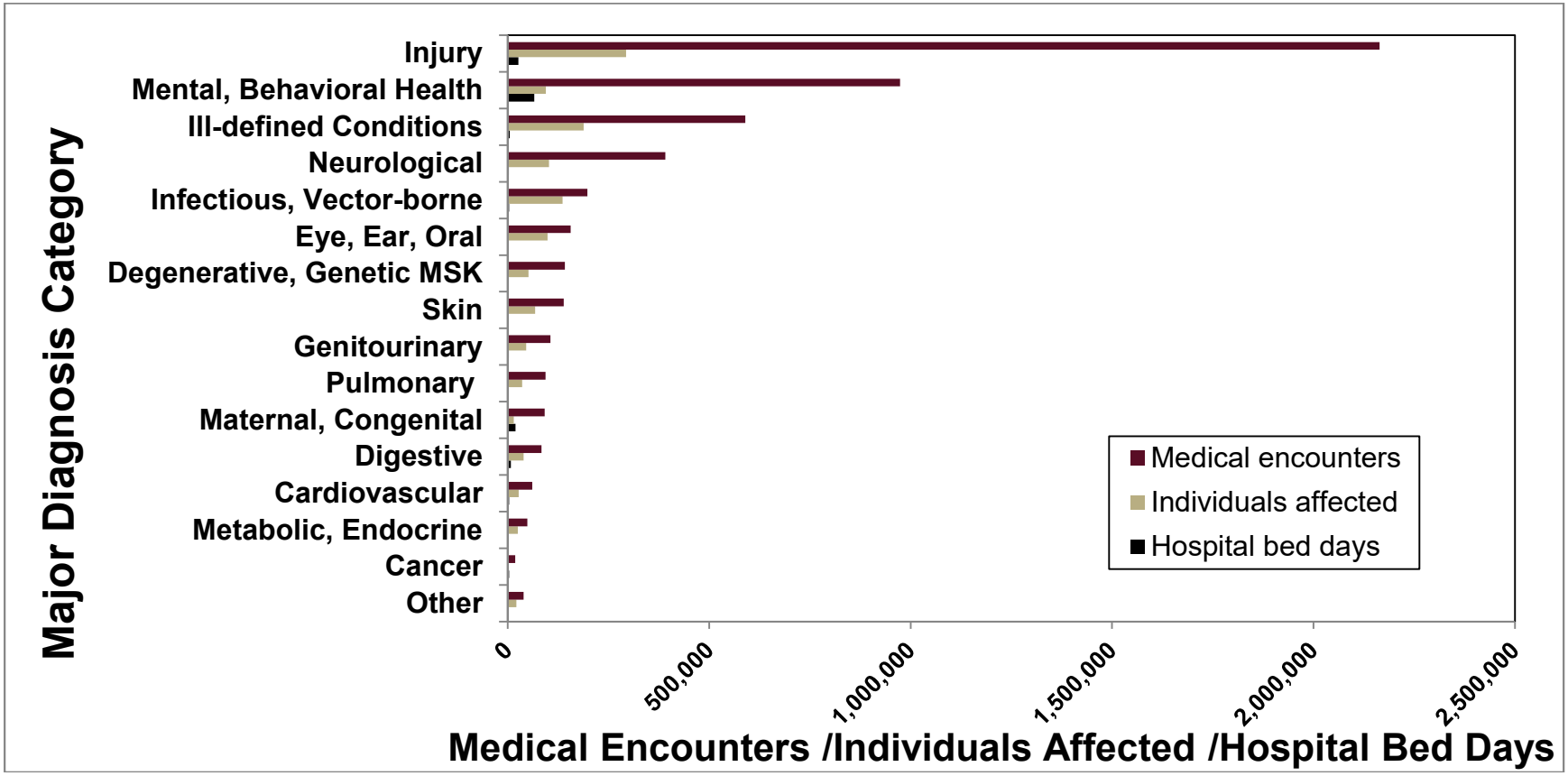


Injury Pyramid, U.S. Army Active Duty, 2016

Notes:
*Frequencies are rounded
Data sources: Defense Medical Surveillance System (DMSS) and Armed Forces Medical Examiner System (AFMES); injuries defined using the APHC Taxonomy of Injuries
Prepared by DHA Army Satellite; APHC Injury Prevention

MAGNITUDE OF THE PROBLEM

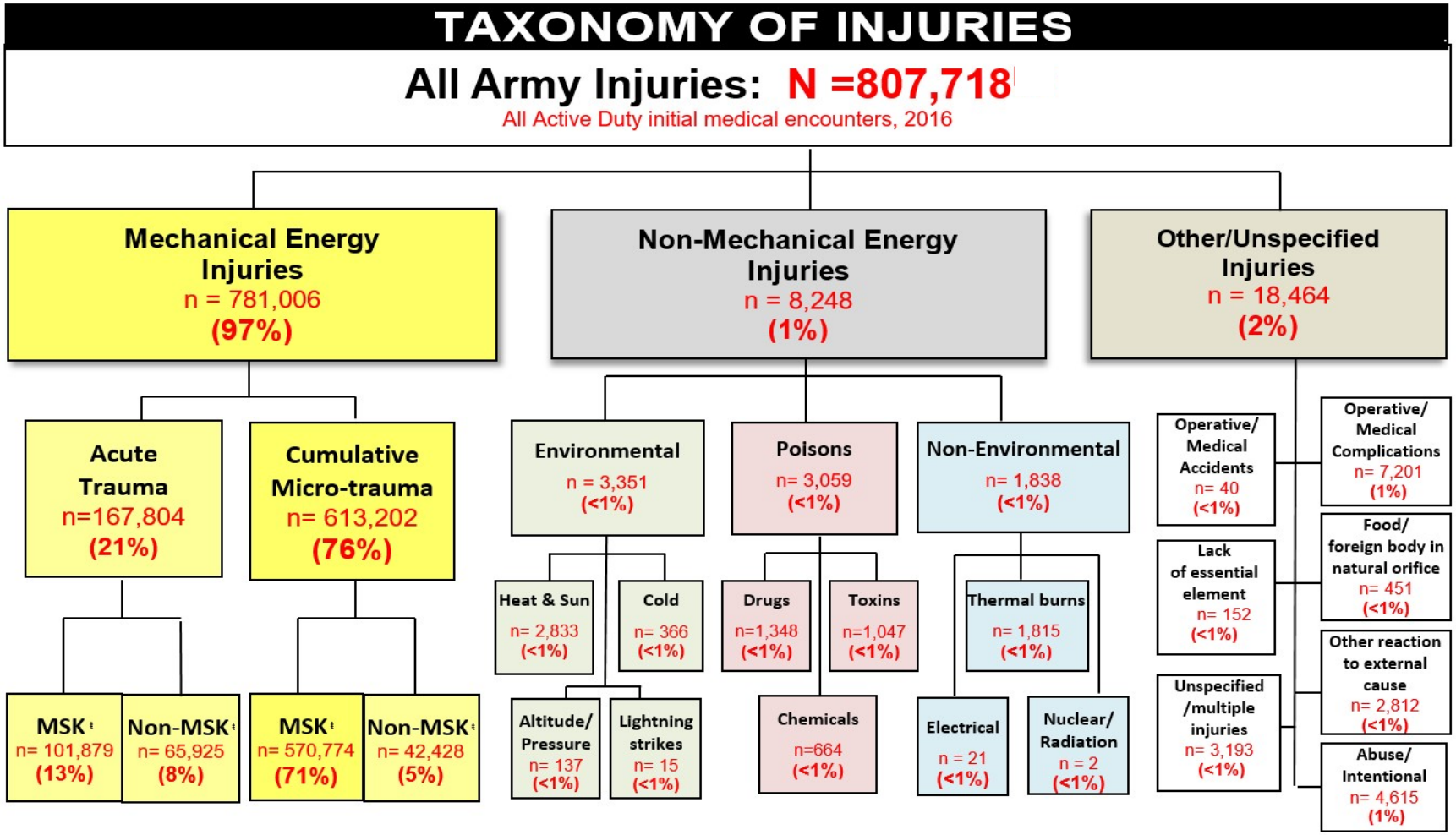
During 2016, injuries accounted for over 2 million medical encounters (41% of all encounters) among Active Duty Army Soldiers, about 2.2 times as many encounters as the second leading cause, mental disorders (18%). Injuries also affected the greatest number of Soldiers, nearly 300,000, compared to all other medical conditions.



Relative Burden of Injuries and Diseases, U.S. Army Active Duty, 2016

Notes:
Diagnosis group "Other" includes adverse effects of drugs, blood disorders, and other neoplasms (not cancer)
Data source: DMSS; injuries defined using the APHC Taxonomy of Injuries.
Prepared by DHA Army Satellite; APHC Injury Prevention

The vast majority (97%) of new (incident) injury diagnoses were attributable to mechanical energy sources, and 71% to cumulative micro-traumatic musculoskeletal (MSK) “overuse” injuries.

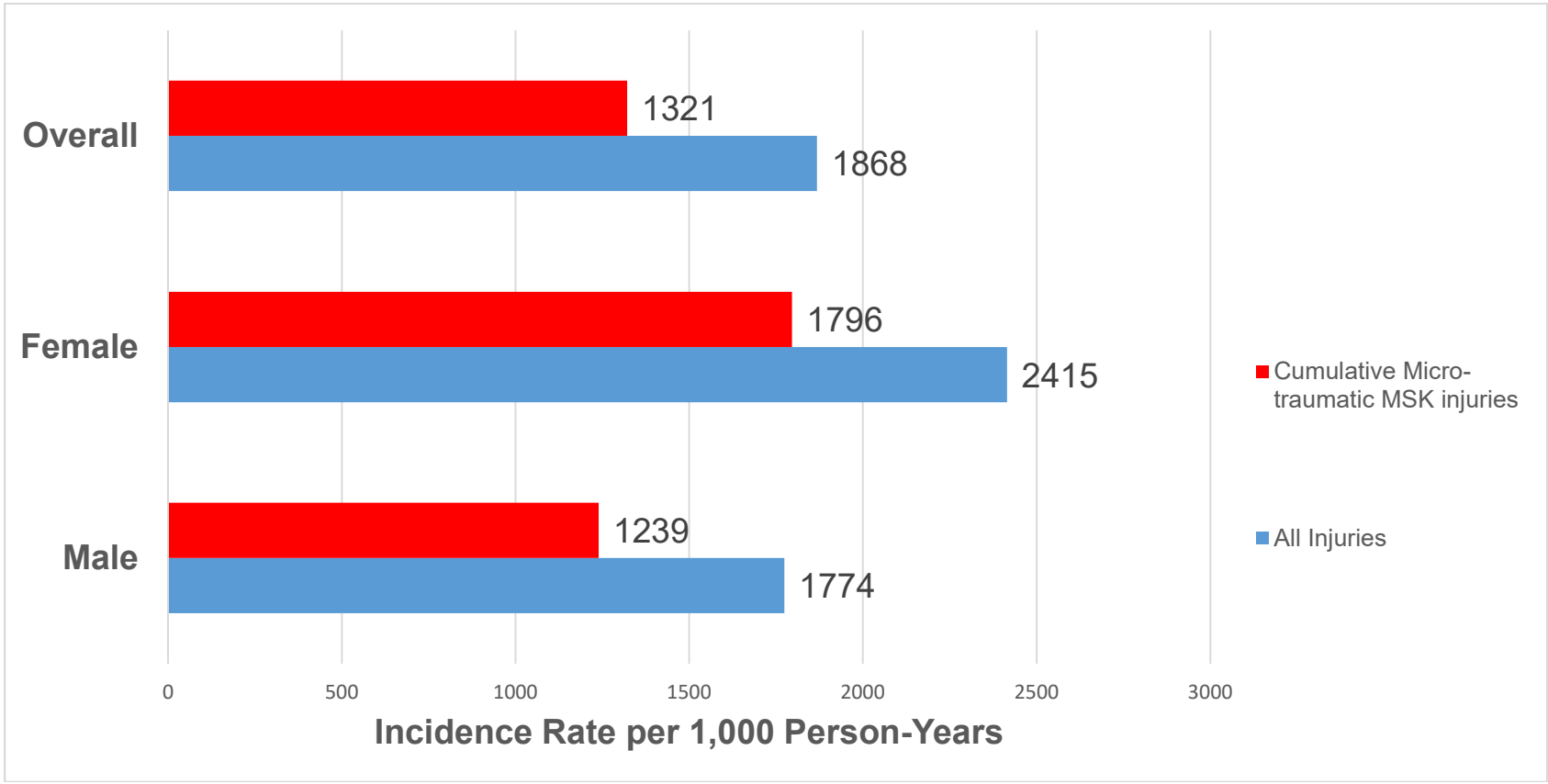


Taxonomy of Injuries

Notes:
Data source: DMSS; injuries defined using the APHC Taxonomy of Injuries
Prepared by DHA Army Satellite; APHC Injury Prevention

INJURY RATES

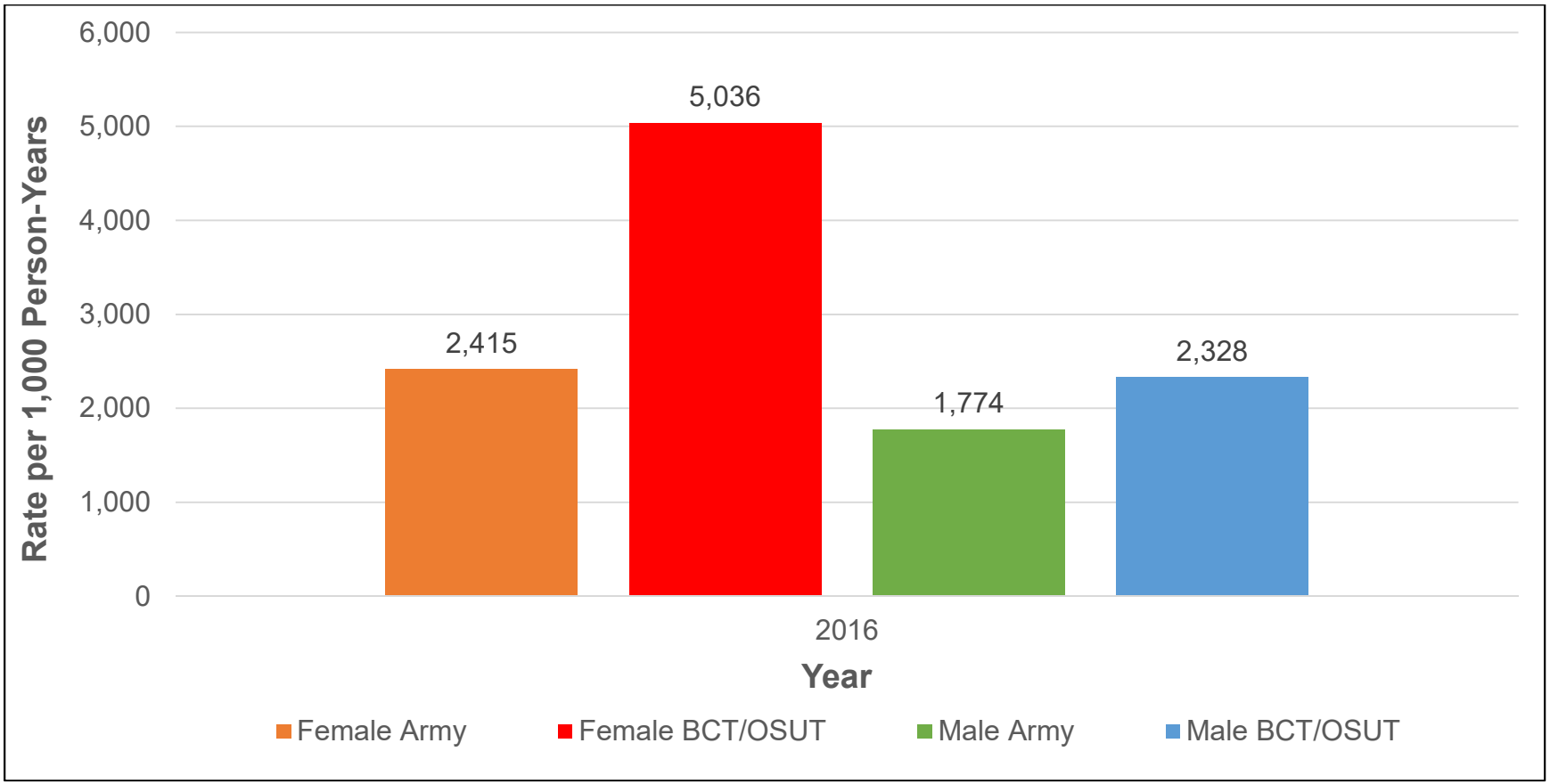
The rate of incident injuries among Army Soldiers during 2016 was 1,868 injuries per 1,000 Soldier-years. Rates for all injuries and cumulative micro-traumatic MSK injuries were both higher among women. Across groups, 71% of all injuries were cumulative micro-traumatic MSK injuries.



All Injury and Cumulative Micro-traumatic Musculoskeletal (MSK) Incident Injury Visit Rates by Sex, U.S. Army Active Duty, 2016

Notes:
Data source: DMSS; injuries defined using the APHC Taxonomy of Injuries
Prepared by DHA Army Satellite; APHC Injury Prevention

Incident injury rates among trainees in Basic Combat Training (BCT) and One Station Unit Training (OSUT) were higher than overall Active Duty Army injury rates. For all Soldiers and trainees, injury rates for females were higher than those for males.



Overall Incident Injury Visit Rates, U.S. Army Active Duty vs. Trainee, 2016

Notes:
Active Duty injury adjusted to remove deployed injury and deployed person-time
Data source: DMSS; injuries defined using the APHC Taxonomy of Injuries
Prepared by DHA Army Satellite; APHC Injury Prevention

INJURY DISTRIBUTION

As noted above, mechanical energy injuries account for 97% of all Army injuries. Mechanical energy injuries are categorized as those occurring from sudden tissue damage (acute traumatic) or those occurring gradually over time (cumulative micro-traumatic, or "overuse"). Over three-quarters (78%) of incident mechanical energy injury encounters among Active Duty Soldiers were due to cumulative micro-trauma. With regard to body region, most injuries were to the lower extremities (46%), followed by the spine and back (24%) and upper extremities (22%).

Body Region	Acute Traumatic (Trauma)	Cumulative Micro-traumatic (Overuse)	All
Lower Extremity	69,740 (41.6%)	288,891 (47.4%)	361,273 (46.3%)
Spine & Back	9,068 (5.4%)	176,350 (28.9%)	185,418 (23.7%)
Upper Extremity	53,830 (32.1%)	115,201 (18.9%)	169,724 (21.7%)
Head, Face & Neck	25,367 (15.1%)	16,324 (2.7%)	41,691 (5.3%)
Torso	9,298 (5.5%)	823 (0.1%)	10,121 (1.3%)
Other	501 (0.3%)	12,244 (2.0%)	12,779 (1.6%)
Total	**167,804 (100%)**	**609,833 (100%)**	**781,006 (100%)**

Incident Mechanical Injuries by Body Region and Acute/Overuse, U.S. Army Active Duty, 2016

Notes:
Data source: DMSS; injuries defined using the APHC Taxonomy of Injuries.
Prepared by DHA Army Satellite; APHC Injury Prevention

Musculoskeletal tissue damage like joint pain, tendinitis, and bursitis accounted for nearly three-quarters (73%) of all incident mechanical injury encounters during 2016.

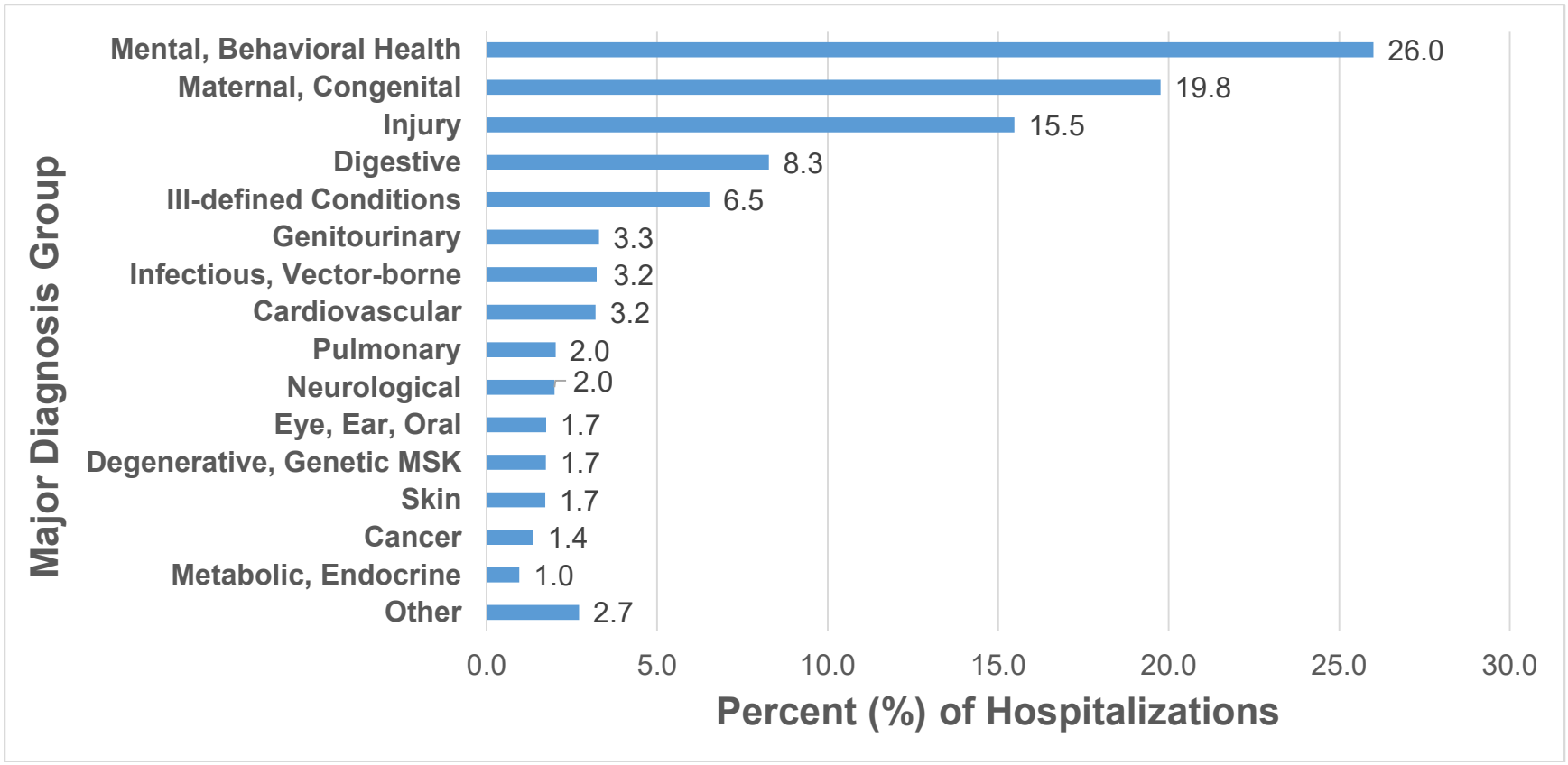
Diagnosis	Head, Face & Neck		Spine & Back		Torso		Upper Extremity		Lower Extremity		Other		Total n (%)
	Acute Trauma (ACT)	Cumulative Micro-Traumatic (CMT)	ACT	CMT	ACT	CMT	ACT	CMT	ACT	CMT	ACT	CMT	
MSK Tissue Damage	36	0	55	159,080	52	3	3,736	106,303	5,580	282,817	165	12,138	**569,965 (73.0)**
Sprain/Joint Damage	8	0	2,775	0	911	0	8,384	693	29,235	2,642	53	34	**44,735 (5.7)**
Tissue Damage, Other	6,350	16,274	1,619	0	1,627	0	4,006	0	3157	0	230	3	**33,266 (4.3)**
Strain/Tear	2,619	0	3,477	0	2,125	0	6,285	4,348	11,916	13	53	7	**30,843 (3.9)**
Nerve	32	0	26	17,253	4	447	3,989	4,407	1,111	1,078	0	0	**28,347 (3.6)**
Contusion/Superficial	5,823	50	0	0	2,553	21	6,453	123	7,371	2,772	0	0	**25,166 (3.2)**
Fracture	1,023	0	969	17	830	352	9,421	20	7,630	2,211	0	96	**22,569 (2.9)**
Open Wound	4,348	0	0	0	426	0	8,060	0	2,654	0	0	0	**15,488 (2.0)**
Internal Organ & Blood Vessel	5,109	0	107	0	709	0	120	0	20	0	0	0	**6,065 (0.8)**
Dislocation	5	0	40	0	45	0	2,661	0	827	0	0	0	**3,578 (0.5)**
Crush	8	0	0	0	14	0	524	0	204	0	0	0	**750 (0.1)**
Amputation	6	0	0	0	2	0	191	0	35	0	0	0	**234 (<0.01)**
Total	**25,367**	**16,324**	**9,068**	**176,350**	**9,298**	**823**	**53,830**	**115,894**	**69,740**	**291,533**	**501**	**12,278**	**781,006**
% Total	**3.2%**	**2.1%**	**1.2%**	**22.6%**	**1.2%**	**0.1%**	**6.9%**	**14.8%**	**8.9%**	**37.3%**	**0.1%**	**1.6%**	

Incident Mechanical Injury Diagnoses by Body Region, U.S. Army Active Duty, 2016

Notes:
Data source: DMSS; injuries defined using the APHC Taxonomy of Injuries
Prepared by Defense Health Agency Army Satellite; APHC Injury Prevention

HOSPITALIZATIONS

Injuries were the third leading cause of hospitalizations during 2016, accounting for 16% of all hospitalizations among Active Duty Army Soldiers. See Appendix A for data on causes of injury hospitalizations.

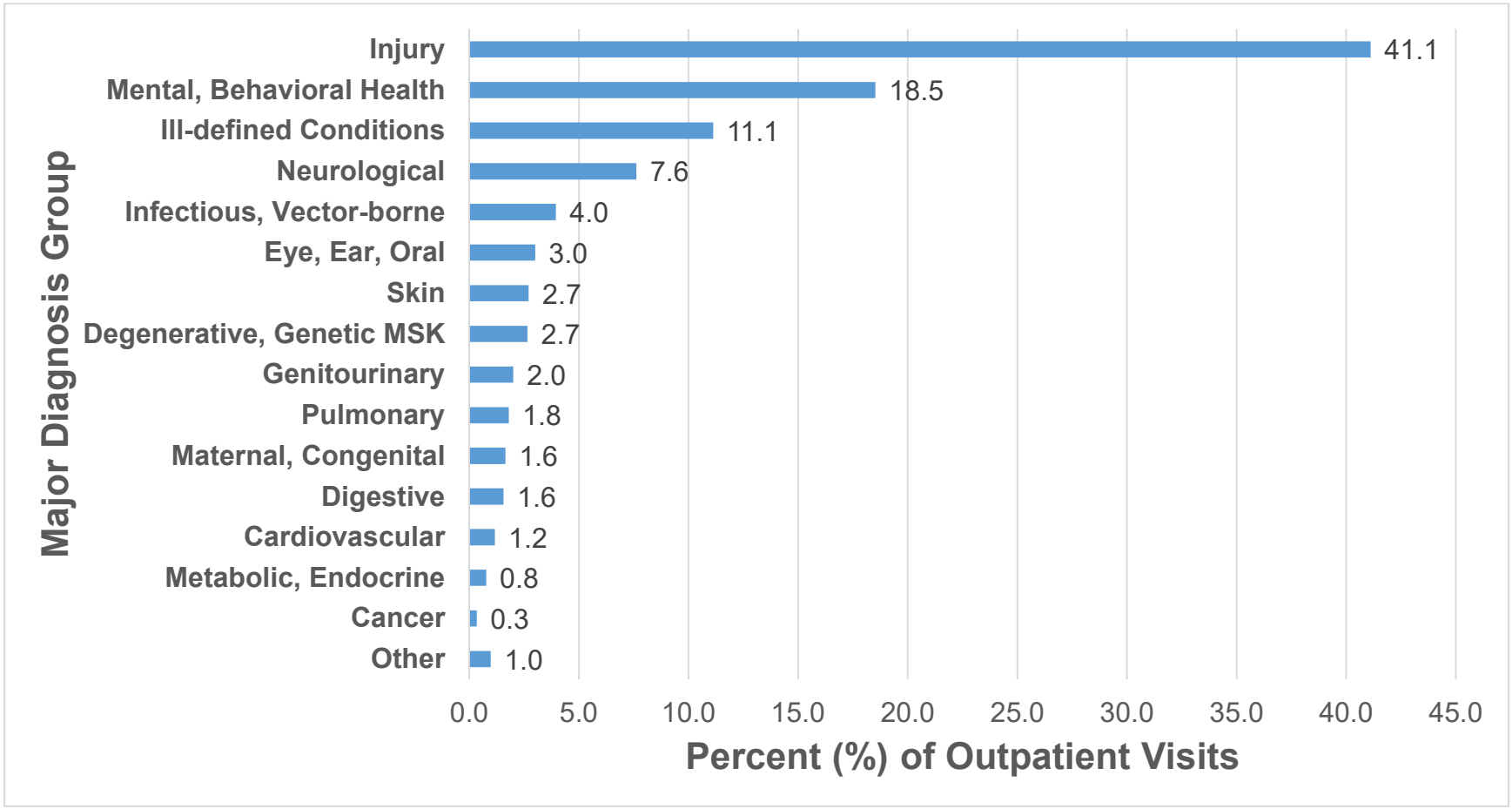


Major Diagnosis Groups Resulting in Hospitalizations, U.S. Army Active Duty, 2016

Notes:
Total number of hospitalizations = 29,561
Diagnosis group “Other” includes adverse effects of drugs, blood disorders, and other neoplasms (not cancer)
Data source: DMSS; injuries defined using the APHC Taxonomy of Injuries. Prepared by DHA Army Satellite; APHC Injury Prevention

OUTPATIENT ENCOUNTERS

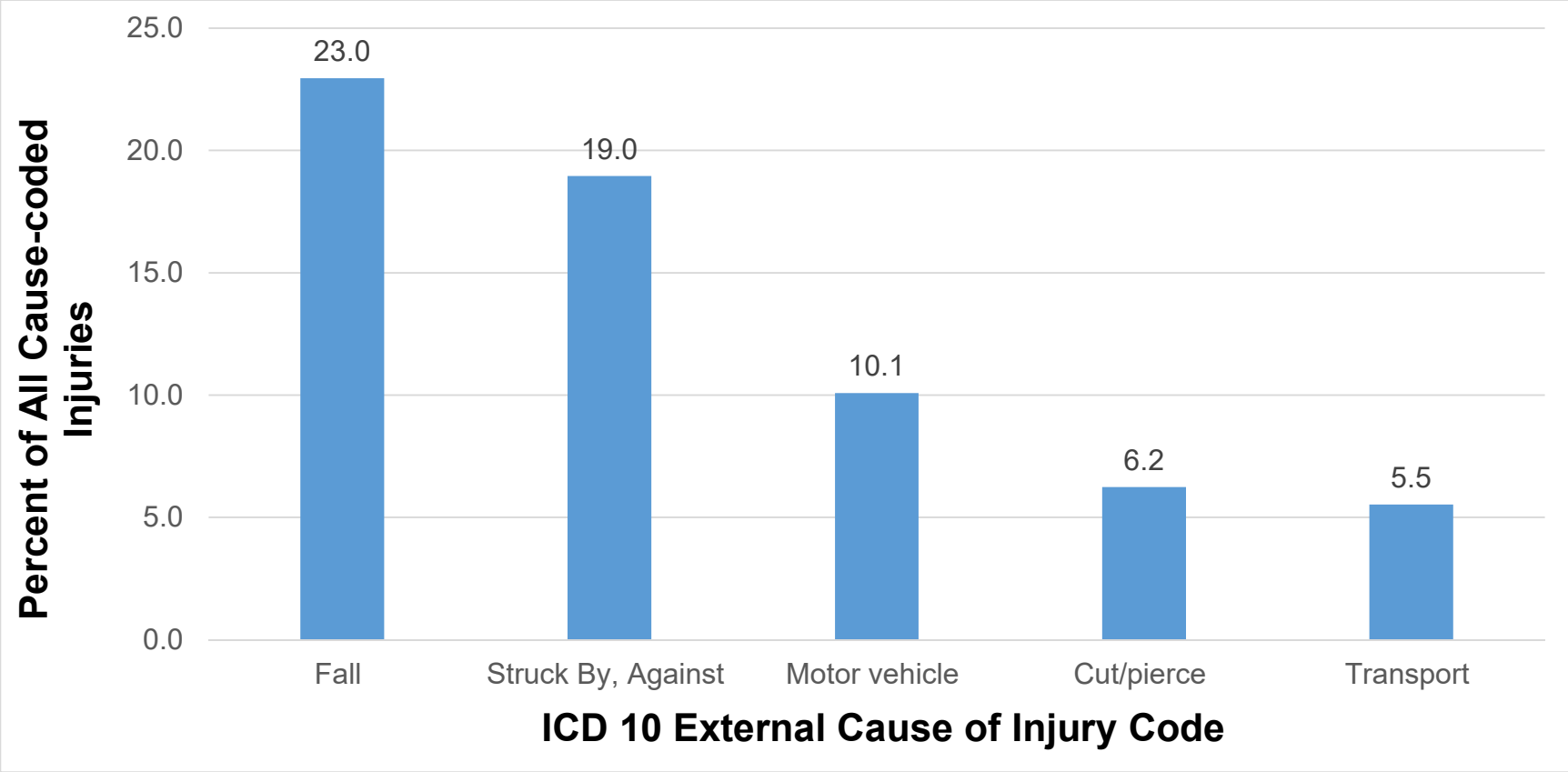
Injuries were the leading cause of outpatient encounters during 2016, accounting for 41% of all outpatient visits among Active Duty Army Soldiers.



Major Diagnosis Groups Resulting in Outpatient Visits, U.S. Army Active Duty, 2016

Notes:
Total number of outpatient visits = 5,631,500
Diagnosis group “Other” includes adverse effects of drugs, blood disorders, and other neoplasms (not cancer)
Data source: DMSS; injuries defined using the APHC Taxonomy of Injuries. Prepared by DHA Army Satellite; APHC Injury Prevention

Among those outpatient injury encounters with a cause code in 2016, leading causes were falls and struck by, against. (Note: the ICD-10-CM cause code for Overexertion was not available for the majority of this surveillance period.)



Leading External Causes of Unintentional Injury, Outpatient Visits, U.S. Army Active Duty, 2016

Notes:
Total number of cause-coded unintentional outpatient visits = 56,385 (7% of incident injury encounters); may not be representative of the distribution of causes for all injuries
Data source: DMSS; injuries defined using the APHC Taxonomy of Injuries
Prepared by DHA Army Satellite; APHC Injury Prevention

FINDINGS

- Medical encounter data provide evidence of the magnitude and distribution of health conditions for which Active Duty Soldiers seek medical care. These conditions represent barriers to medical readiness.

- Injuries are the biggest health problem for U.S. Army Active Duty Soldiers, compared to any other category of medical conditions.

- Rates are higher among women compared to men, and higher among trainees compared to all Active Duty.

- Cumulative micro-traumatic MSK (overuse) injuries account for 71% of all Active Duty Army injuries.

- The most common injury types are musculoskeletal tissue damage such as joint pain, tendinitis, and bursitis (73%). The most frequently injured body regions are the lower extremities (46%), spine and back (24%), and upper extremities (22%).

- Leading causes of outpatient injuries are falls and being struck by or against (an object or surface). Greater detail on causes of injury, information necessary for prevention planning, can be gained from surveys and electronic medical profile data.

BIBLIOGRAPHY OF KEY MILITARY INJURY SURVEILLANCE REFERENCES

Military Injury Surveillance Background

Medical Surveillance of Injuries in the U.S. Military: Descriptive Epidemiology and Recommendations for Improvement. Am J Prev Med 38(S1):S42-S60. Jones BH, Canham-Chervak M, Canada S, Mitchener TA, Moore S (2010). https://phc.amedd.army.mil/PHC%20Resource%20Library/Medical%20Surveillance%20of%20Injuries%20in%20the%20U.S.%20Military%20Descriptive%20Epidemiology%20and%20Recommendations%20for%20Improvement.pdf

Musculoskeletal Injuries: Description of an Under-Recognized Injury Problem Among Military Personnel. Am J Prev Med 38(S1):S61-S70. Hauret KG, Jones BH, Bullock SH, et al. (2010). https://phc.amedd.army.mil/PHC%20Resource%20Library/Musculoskeletal%20Injuries%20Description%20of%20an%20Under-Recognized%20Injury%20Problem%20among%20Military%20Personnel.pdf

Importance of External Cause Coding for Military Injury Surveillance: Lessons from Assessment of Overexertion Injuries Among US Army Soldiers in 2014. MSMR 23(11):10-15. Canham-Chervak M, Steelman RA, Schuh A, Jones BH (2016). https://europepmc.org/abstract/med/27880039

Statistical process control charts for monitoring military injuries. Inj Prev 23(6):416:422. Schuh A, Canham-Chervak M, Jones BH (2017). https://injuryprevention.bmj.com/content/23/6/416

Injury Epidemiology Report 2008. USAPHC (Provisional) Report No. 12-HF-0APLA-09 (2009). https://apps.dtic.mil/docs/citations/ADA523368

Atlas of Injuries in the U.S. Armed Forces: Conclusions and Recommendations of the DoD Injury Surveillance and Prevention Work Group. Mil Med, 164(S8):548-573. Jones BH, Amoroso PJ, Canham ML, Schmitt JB, Weyandt B (1999). https://academic.oup.com/milmed/article/164/suppl_8/548/4832959?searchresult=1

Military Injury Definition

A Taxonomy of Injuries for Public Health Monitoring & Reporting. APHC Public Health Information Paper No. 12-01-0717 (2017). https://apps.dtic.mil/docs/citations/ADA1039481

Using Causal Energy Categories to Report the Distribution of Injuries in an Active Population: An Approach Used by the US Army. J Sci Med Sport 22(9):997-1003. Hauschild VD, Schuh-Renner A, Lee T, Richardson MD, Hauret K, Jones BH (2019). http://jsams.org/retrieve/pii/S1440244019300994

Expanding the Injury Definition: Evidence for the Need to Include Musculoskeletal Conditions. Public Health 169:69-75. Schuh-Renner A, Canham-Chervak M, Grier TL, Hauschild VD, Jones BH (2019). https://www.sciencedirect.com/science/article/abs/pii/S0033350619300022?via%3Dihub

Military Injury Prevention Overview

Musculoskeletal Training Injury Prevention in the U.S. Army: Evolution of the Science and the Public Health Approach. J Sci Med Sport 21(11):1139-1146. Jones BH, Hauschild VD, Canham-Chervak M (2018). https://www.sciencedirect.com/science/article/pii/S144024401830063X

Musculoskeletal Injuries and United States Army Readiness Part I: Overview of Injuries and their Strategic Impact. Mil Med, ePub ahead of print. Molloy JM, Pendergrass TL, Lee IE, Chervak MC, Hauret KG, Rhon DI (2020). https://academic.oup.com/milmed/advance-article/doi/10.1093/milmed/usaa027/5805225

Musculoskeletal Injuries and United States Army Readiness. Part II: Management Challenges and Risk Mitigation Initiatives. Mil Med, ePub ahead of print. Molloy JM, Pendergrass TL, Lee IE, Hauret KG, Chervak MC, Rhon DI (2020). https://academic.oup.com/milmed/advance-article/doi/10.1093/milmed/usaa028/5762817

Physical Training, Fitness, and Injuries: Lessons Learned From Military Studies. J Strength Cond 29(S1):S57-S64. Jones BH, Hauschild VD (2015). https://journals.lww.com/nsca-jscr/Abstract/2015/11001/Physical_Training,_Fitness,_and_Injuries__Lessons.10.aspx

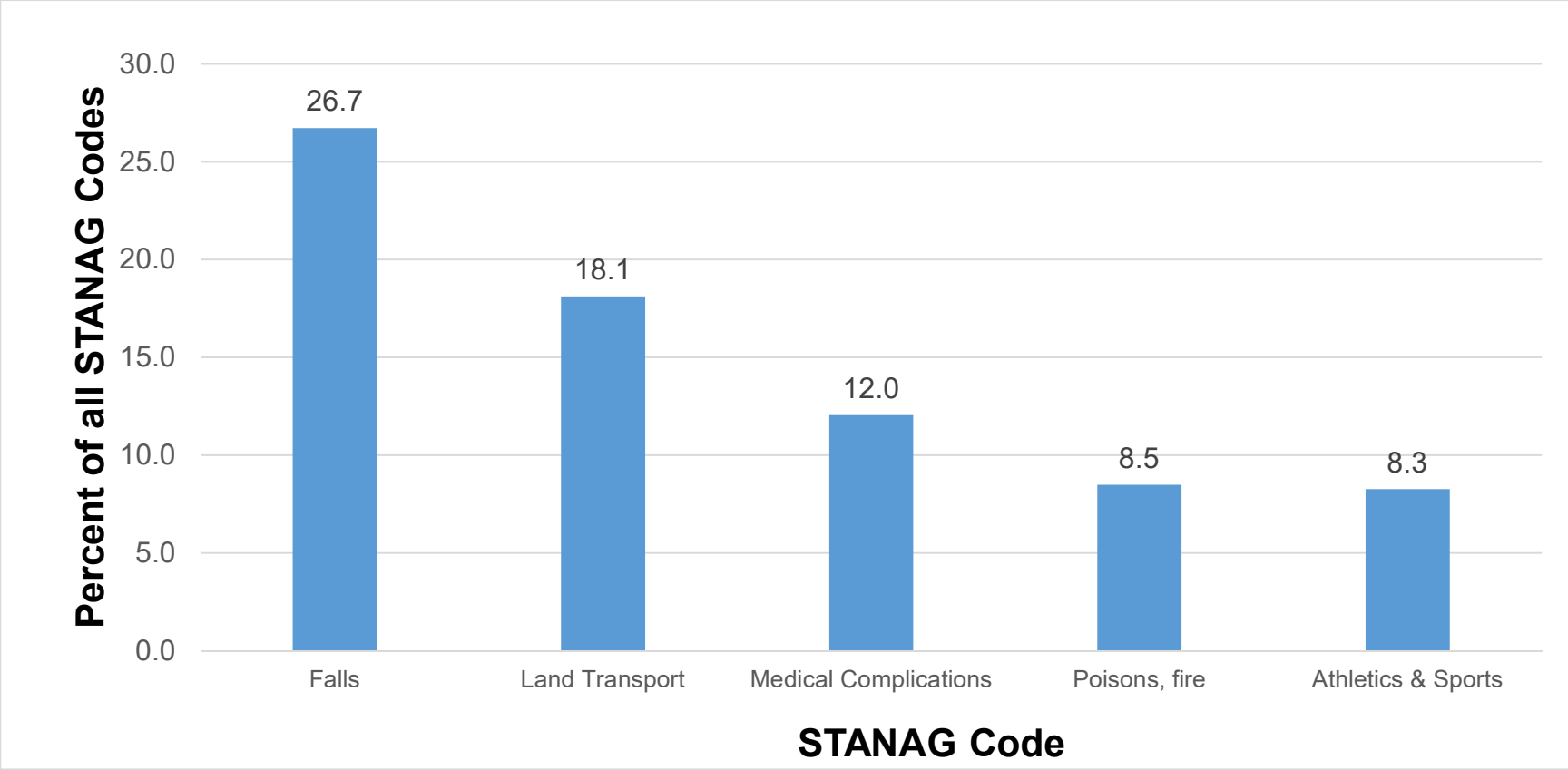
Burden of Musculoskeletal Diseases in the US: Military Injuries. Marshall SW, Canham-Chervak M, Dada EO, Jones BH (2014). https://www.boneandjointburden.org/2013-report/military-injuries/vi5

A Systematic Process to Prioritize Prevention Activities: Sustaining Progress toward the Reduction of Military Injuries. Am J Prev Med 38(1S):S11-S18. Canham-Chervak M, Hooper TI, Brennan FH, Craig SC, Girasek DC, Schaefer RA, Barbour G, Yew KS, Jones BH (2010). https://phc.amedd.army.mil/PHC%20Resource%20Library/Systematic%20Process%20to%20Prioritize%20Prevention%20Activities%20Sustaining%20Progress%20toward%20the%20Reduction%20of%20Military%20Injuries.pdf

Prepared by: Injury Prevention Program, usarmy.apg.medcom-aphc.mbx.injuryprevention@mail.mil, 410-417-2886, DSN 583-2886
Dated: May 2020

APPENDIX A
CAUSES OF INJURY HOSPITALIZATIONS

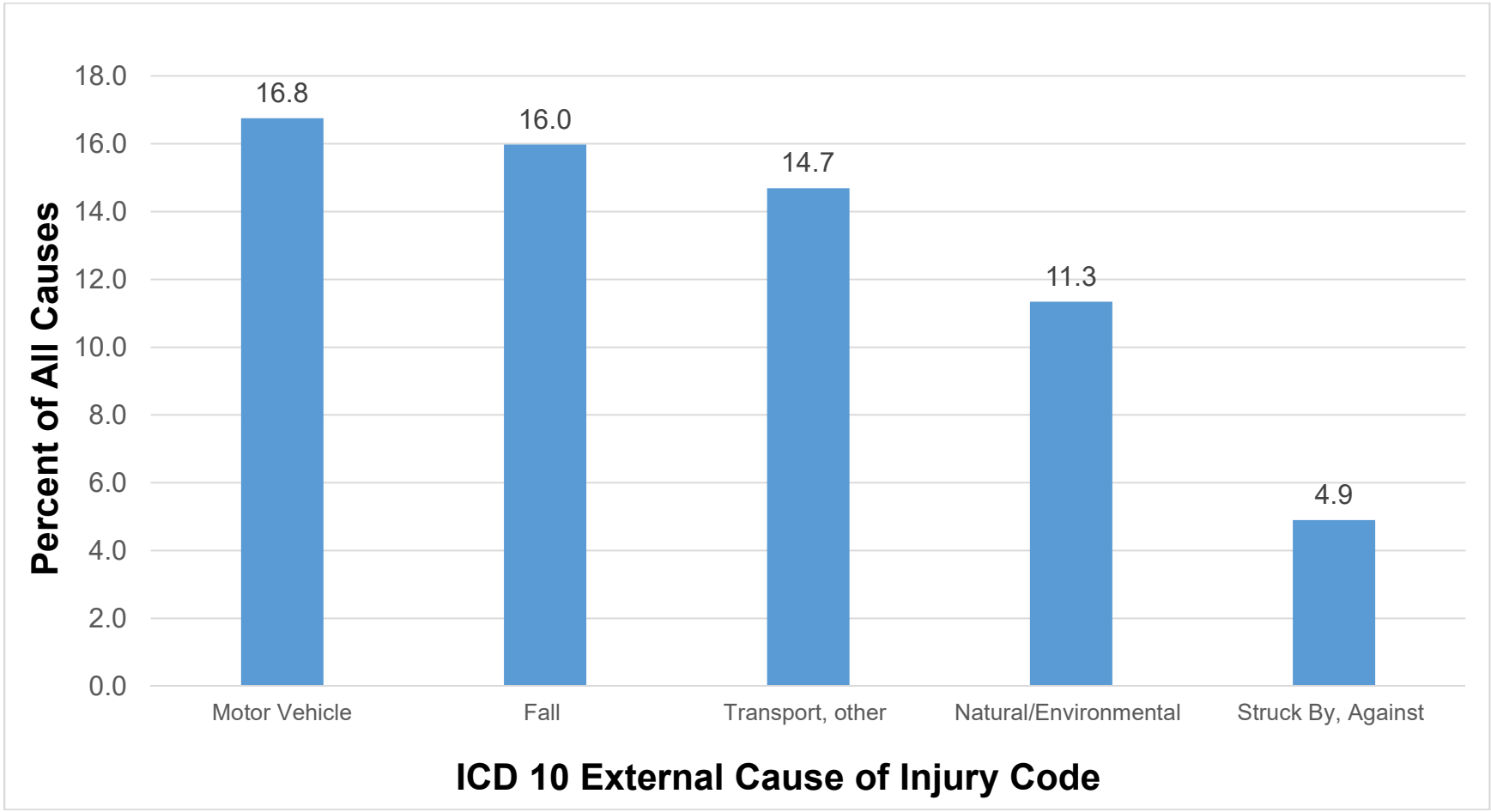
Among those injury hospitalizations that were given a cause code from the Standardized Agreement Codes (STANAG) in 2016 (15%), leading causes were falls and land transport (motor vehicles).



Leading STANAG Cause Codes for Injury Hospitalizations, U.S. Army Active Duty, 2017

Notes:
Total number of STANAG-coded injury hospitalizations = 681; may not be representative of the distribution of causes for all injuries
Data source: DMSS; injuries defined using the APHC Taxonomy of Injuries
Prepared by DHA Army Satellite; APHC Injury Prevention

Among those injury hospitalizations that were given an ICD-10-CM medical diagnosis cause code in 2016 (8%), leading causes were motor vehicle accidents, falls, and transport.



Leading External Causes of Unintentional Hospitalizations, U.S. Army Active Duty, 2017

Notes:
Total number of cause-coded unintentional injury hospitalizations = 357; may not be representative of the distribution of causes for all injuries
Data source: DMSS; injuries defined using the APHC Taxonomy of Injuries
Prepared by DHA Army Satellite; APHC Injury Prevention