

TIP No. 12-114-0121

ANNUAL INJURY SURVEILLANCE REPORT 2019 SUMMARY

INTRODUCTION

This document provides a summary of injury medical encounter surveillance data for Active Duty Soldiers from Calendar Year (CY) 2019, analyzed and presented by the U.S. Army Public Health Center (APHC) Injury Prevention Program (IPP).

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 and 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>

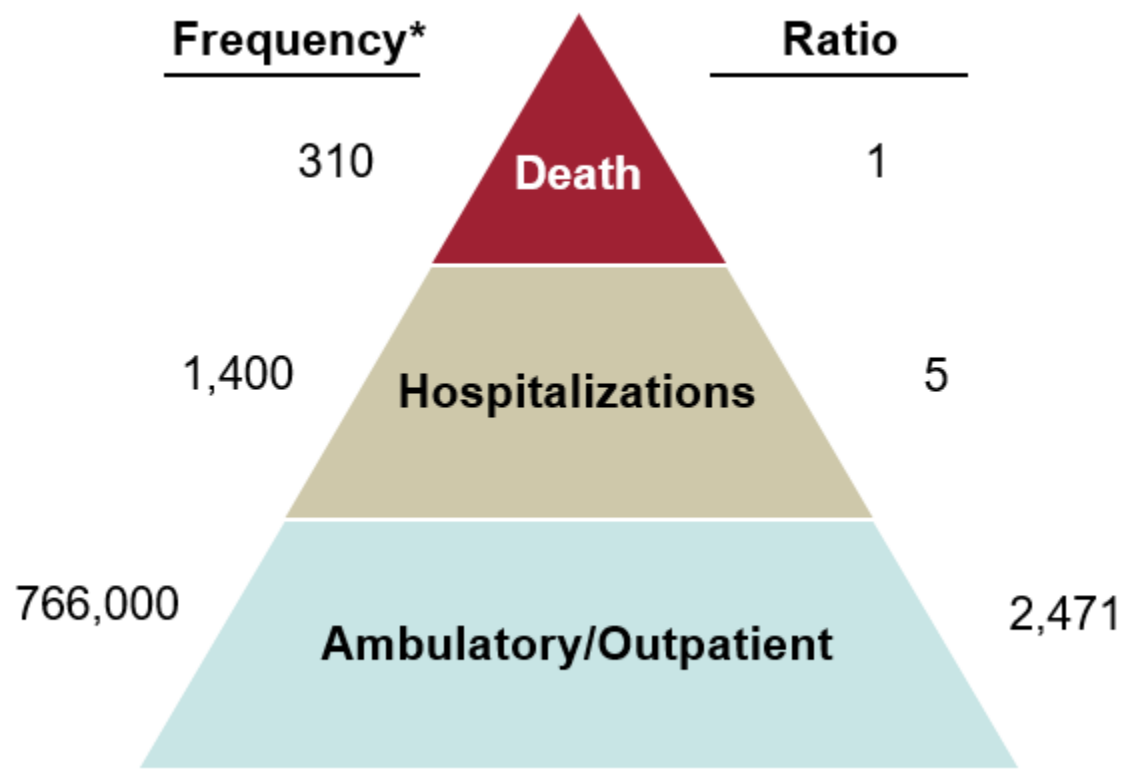
The APHC IPP also provides installation-level injury summaries for both Active Duty and Civilian populations, upon request, for those interested in detailed installation-specific data. Installation injury rates, one element of these summaries, can be accessed at: <https://www.sms.army.mil/>, and navigating 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 at: <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 2019, for every one injury-related death, there were over 2,000 outpatient encounters. Injuries treated on an outpatient basis represent a significant obstacle to Soldier medical readiness.



Injury Pyramid, U.S. Army Active Duty, 2019

Notes:

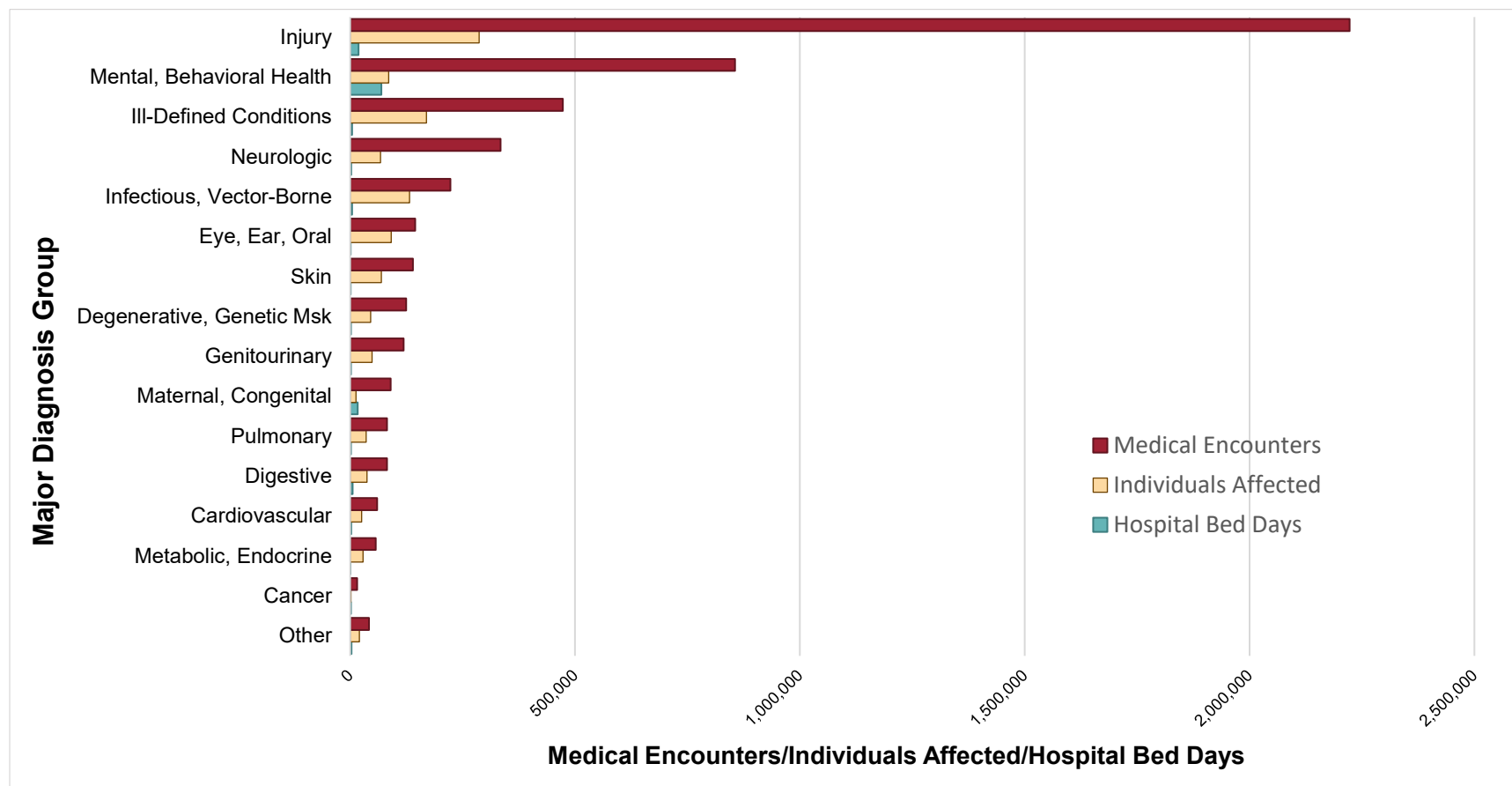
*Frequencies are rounded and represent incident injury visits

Data source: Military Health System Data Repository (MDR) and Armed Forces Medical Examiner System (AFMES); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries

Prepared by APHC Injury Prevention Program

MAGNITUDE OF THE PROBLEM

During 2019, injuries accounted for over 2 million medical encounters (49% of all encounters) among Active Duty Army Soldiers, about 2.6 times as many encounters as the second leading cause, mental disorders (17%). 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, 2019

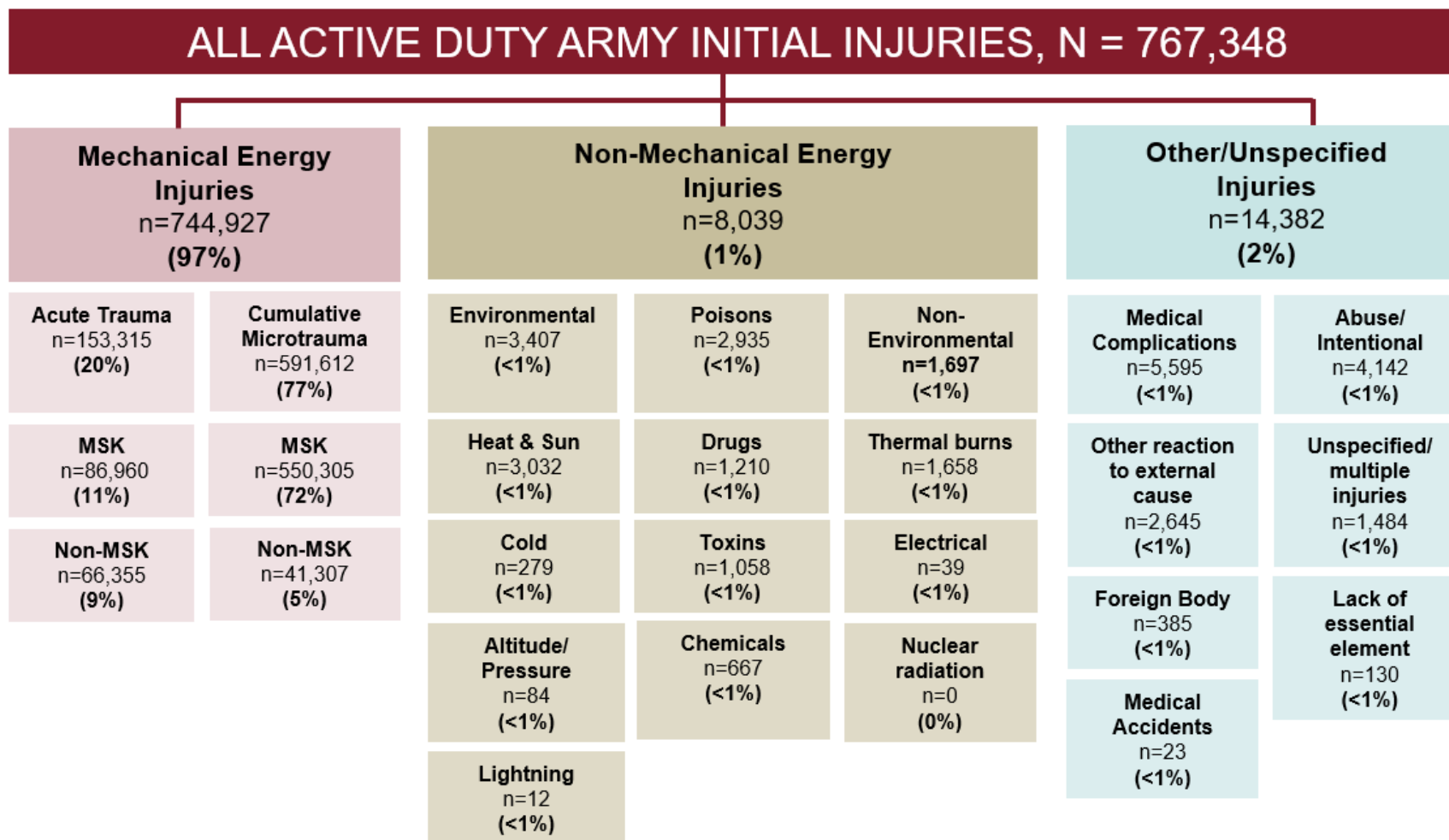
Notes:

Diagnosis group “Other” includes adverse effects of drugs, blood disorders, and other neoplasms (not cancer)

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries

Prepared by APHC Injury Prevention Program

The vast majority (97%) of new (incident) injury diagnoses were attributable to mechanical energy sources and 77% to cumulative micro-traumatic musculoskeletal (MSK), “overuse” injuries.



Taxonomy Distribution of Injuries, U.S. Army Active Duty, 2019

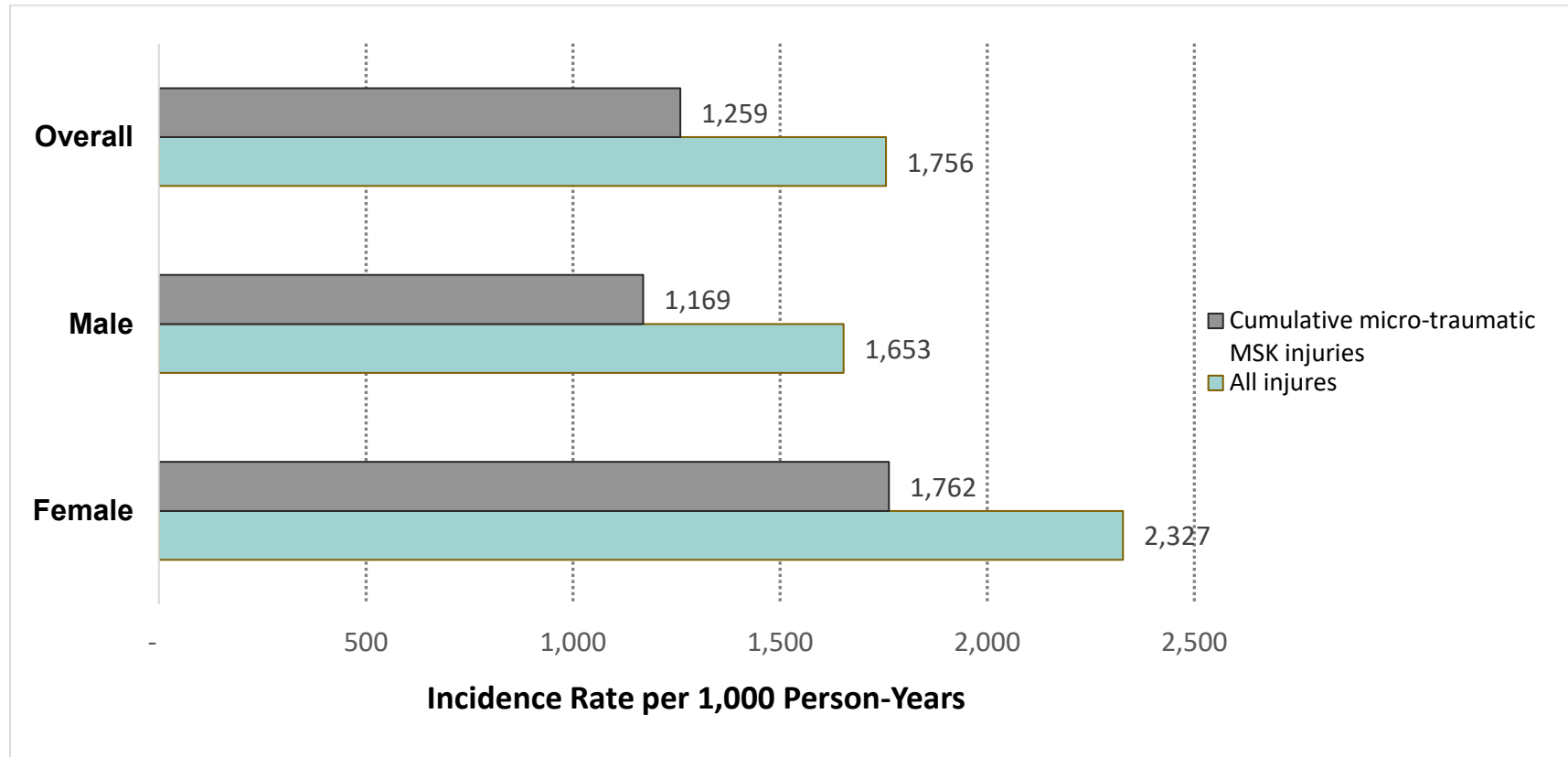
Notes:

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries

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INJURY RATES

The rate of incident injuries among Army Soldiers during 2019 was 1,756 injuries per 1,000 person-years. Rates for all injuries and cumulative micro-traumatic MSK injuries were both significantly higher among women ($p<0.001$). Across groups, 72% of all injuries were cumulative micro-traumatic MSK injuries.



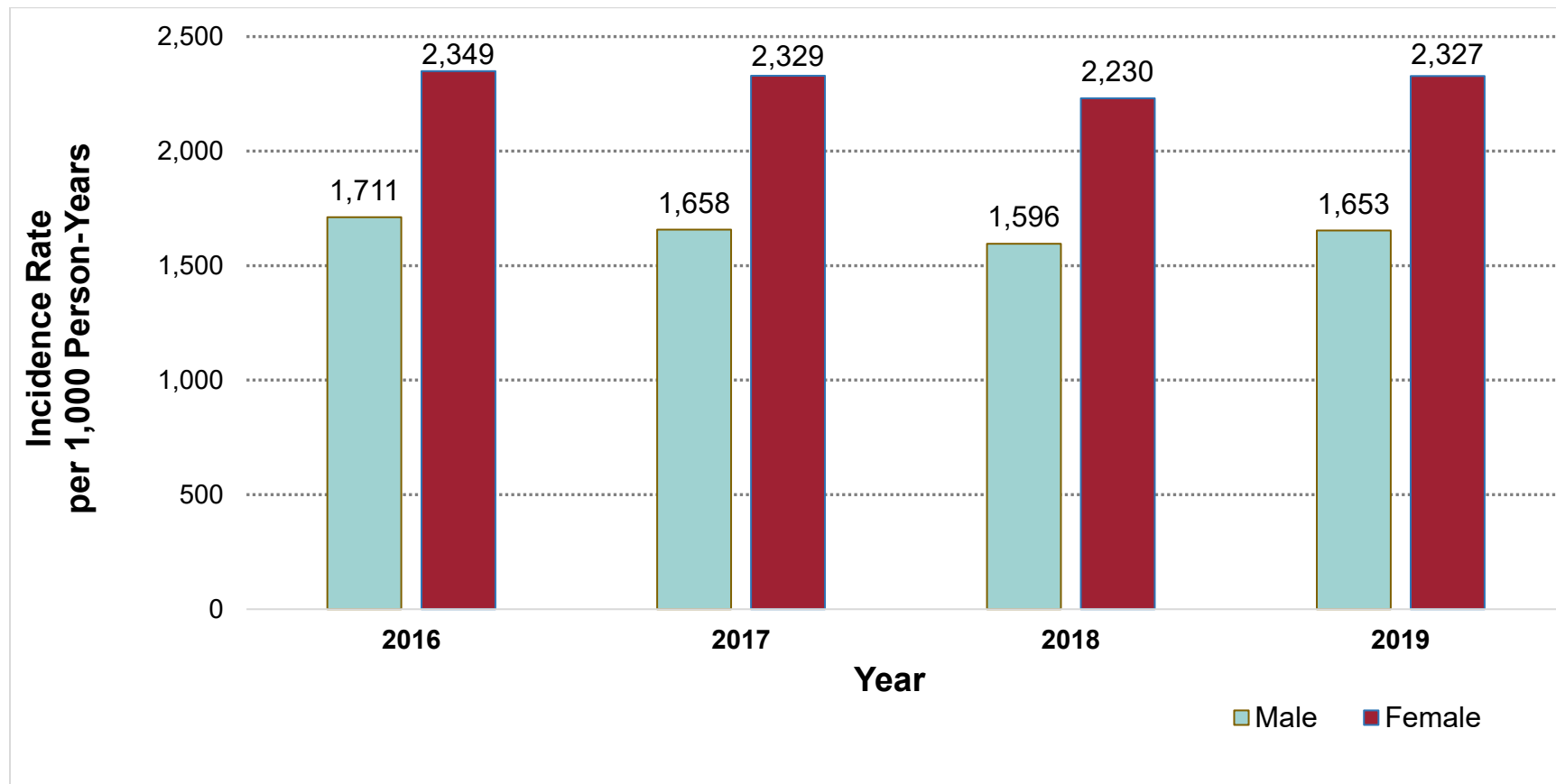
All Injury and Cumulative Micro-traumatic Musculoskeletal Incident Injury Visit Rates by Sex, U.S. Army Active Duty, 2019

Notes:

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries.

Prepared by APHC Injury Prevention Program.

The rates of incident injuries among female Army Soldiers were consistently and significantly higher than male Soldiers from 2016 to 2019 ($p < 0.001$). No significant changes in rates were observed for either sex, 2016-2019 ($p > 0.05$).



**All Injury Incident Injury Visit Rates by Sex,
U.S. Army Active Duty, 2016-2019**

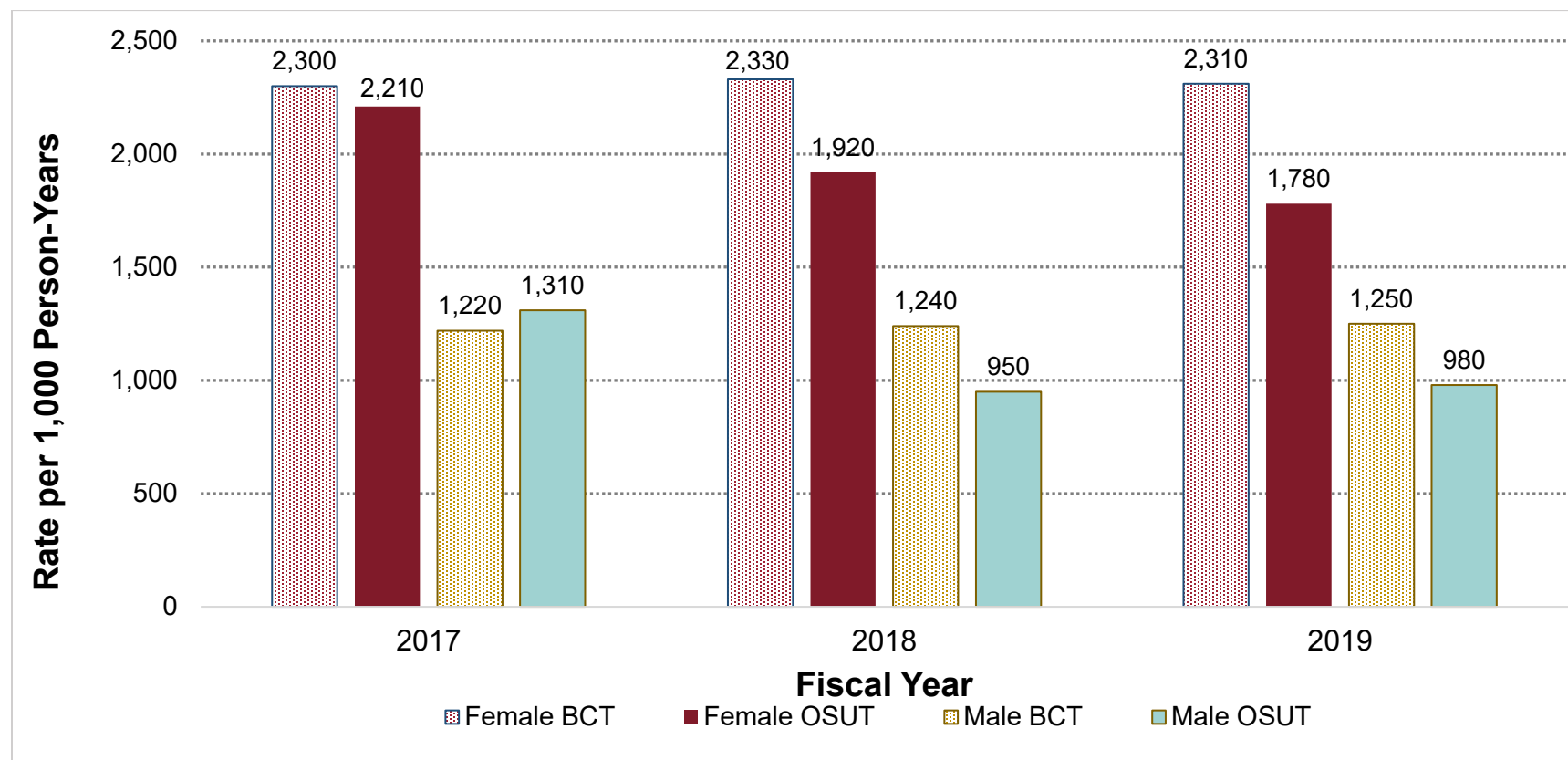
Notes:

Active Duty injury adjusted to remove deployed injury and deployed person-time.

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries.

Prepared by APHC Injury Prevention Program.

Incident injury rates among female trainees in Basic Combat Training (BCT) and One Station Unit Training (OSUT) were significantly higher than male trainees from 2017-2019 ($p < 0.001$). In 2018 and 2019, injury rates during BCT were significantly higher than rates during OSUT for both males and females ($p < 0.001$); for both sexes, rates in the two environments were closer in 2017 ($p > 0.05$). Injury rates among males and females during OSUT were both significantly lower in 2019 when compared to 2017 rates ($p < 0.001$). There were no significant differences in the injury rates among males and females during BCT from 2017 to 2019 ($p > 0.05$).



Overall Incident Injury Visit Rates, U.S. Army Active Duty vs. Trainee, 2017-2019

Notes:

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries.

Prepared by APHC Injury Prevention Program.

INJURY DISTRIBUTION

Injuries resulting from mechanical energy are categorized as those that exceed tissue tolerance suddenly (acute trauma) or gradually over time (cumulative micro-trauma). Over three-quarters (77%) of incident injury encounters among Active Duty Soldiers were due to cumulative micro-trauma (overuse). With regard to body region, most injuries were to the lower extremities (46%), followed by the spine and back (24%) and upper extremities (22%).

Incident Mechanical Injuries by Body Region and Acute/Overuse*, U.S. Army Active Duty, 2019

Body Region	Acute Traumatic (Trauma)	Cumulative Micro-traumatic (Overuse)	All
Lower Extremity	60,349 (39.4)	284,494 (48.1)	344,843 (46.3)
Spine & Back	8,944 (5.8)	168,963 (28.6)	177,907 (23.9)
Upper Extremity	49,148 (32.1)	112,064 (18.9)	161,212 (21.6)
Head, Face & Neck	25,506 (16.6)	16,906 (2.9)	42,412 (5.7)
Torso	8,566 (5.6)	816 (0.1)	9,382 (1.3)
Other	802 (0.5)	8,369 (1.4)	9,171 (1.2)
Total (%)	153,315 (100)	591,612 (100)	744,927 (100)

Notes:

*In order of most frequently injured body region

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries.

Prepared by APHC Injury Prevention Program.

Musculoskeletal tissue damage like joint pain, tendinitis, and bursitis accounted for nearly three-quarters (74%) of incident mechanical injury encounters during 2019.

Incident Mechanical Injury Diagnoses by Body Region, U.S. Army Active Duty, 2019

Diagnosis	Head, Face & Neck		Spine & Back		Torso		Upper Extremity		Lower Extremity		Other		Total	% Total
	Acute (ACT)	Cumulative (CMT)	ACT	CMT	ACT	CMT	ACT	CMT	ACT	CMT	ACT	CMT		
Msk Tissue Damage, Other	47	105	29	153552	51	2	3494	103607	7873	274172	133	8182	551,247	74.0%
Tissue Damage, Other	7929	16784	2048	0	1769	0	5514	0	4054	0	574	0	38,672	5.2%
Sprain/Joint Damage	16	0	1774	4	593	0	6202	629	22934	2698	68	24	34,942	4.7%
Nerve	40	0	19	15397	5	425	3868	3921	898	801	0	0	25,374	3.4%
Strain/Tear	2206	0	4063	0	2028	0	4932	3775	7337	4	27	1	24,373	3.3%
Contusion/Superficial	5032	17	0	0	2241	21	5744	118	6544	3823	0	0	23,540	3.2%
Fracture	1484	0	849	10	765	368	8682	14	7230	2996	0	162	22,560	3.0%
Open wound	3861	0	0	0	414	0	7616	0	2489	0	0	0	14,380	1.9%
Internal Organ & Blood Vessel	4824	0	118	0	642	0	69	0	23	0	0	0	5,676	0.8%
Dislocation	49	0	44	0	40	0	2188	0	702	0	0	0	3,023	0.4%
Crush	15	0	0	0	15	0	676	0	225	0	0	0	931	0.1%
Amputation	3	0	0	0	3	0	163	0	40	0	0	0	209	<0.1%
Total	25,503	16,906	8,944	168,963	8,563	816	48,985	112,064	60,309	284,494	802	8,369	744,927	100.0
% Total	3.3%	2.2%	1.2%	22.0%	1.1%	0.1%	6.4%	14.6%	7.9%	37.1%	0.1%	1.1%		100.0

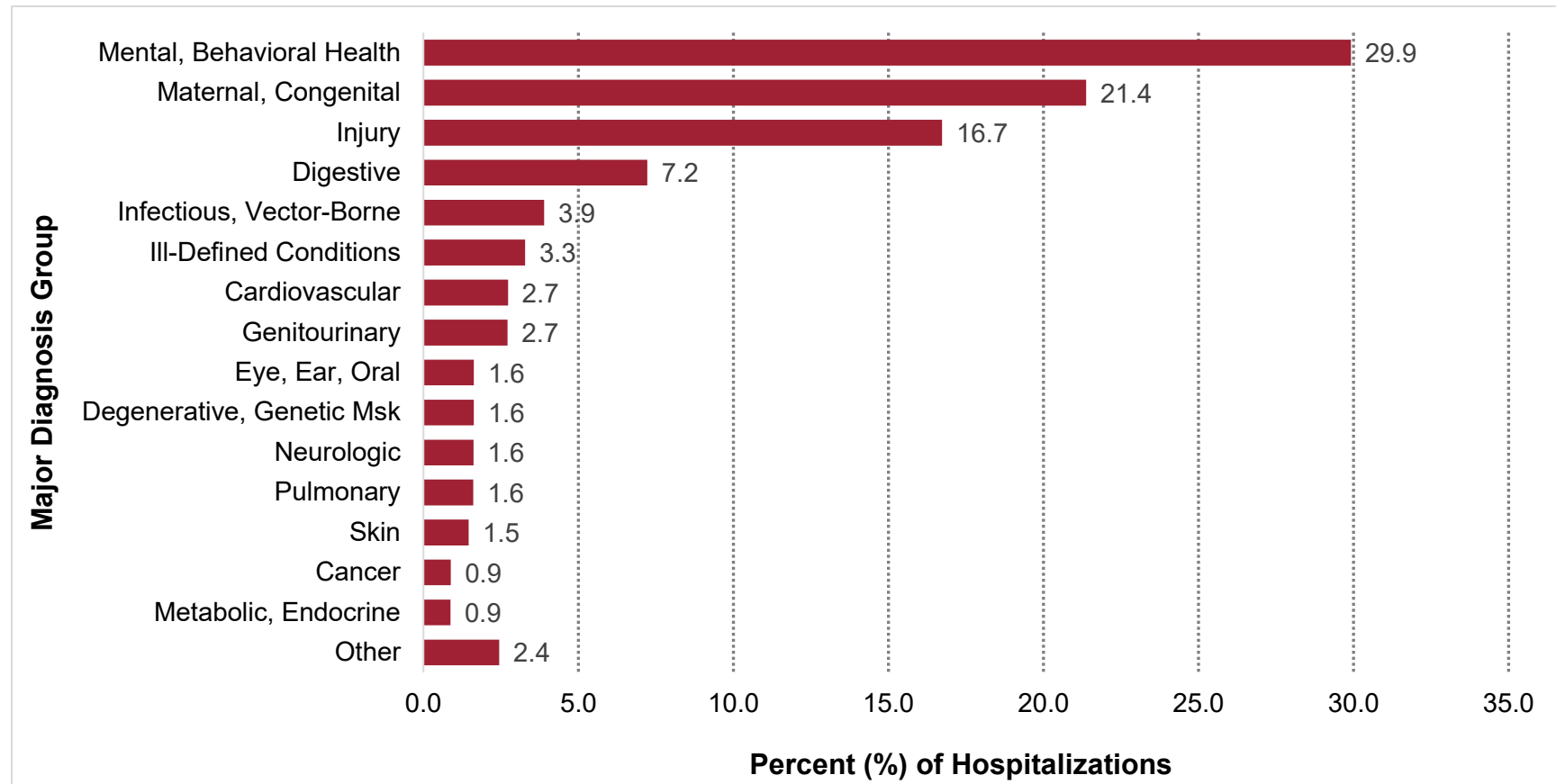
Notes:

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries.

Prepared by APHC Injury Prevention Program.

HOSPITALIZATIONS

Injuries were the third leading cause of hospitalizations during 2019, accounting for 17% of all hospitalizations among Active Duty Army Soldiers. See the appendix for data on causes of injury hospitalizations.



Major Diagnosis Groups Resulting in Hospitalizations, U.S. Army Active Duty, 2019

Notes:

Total number of hospitalizations = 21,082

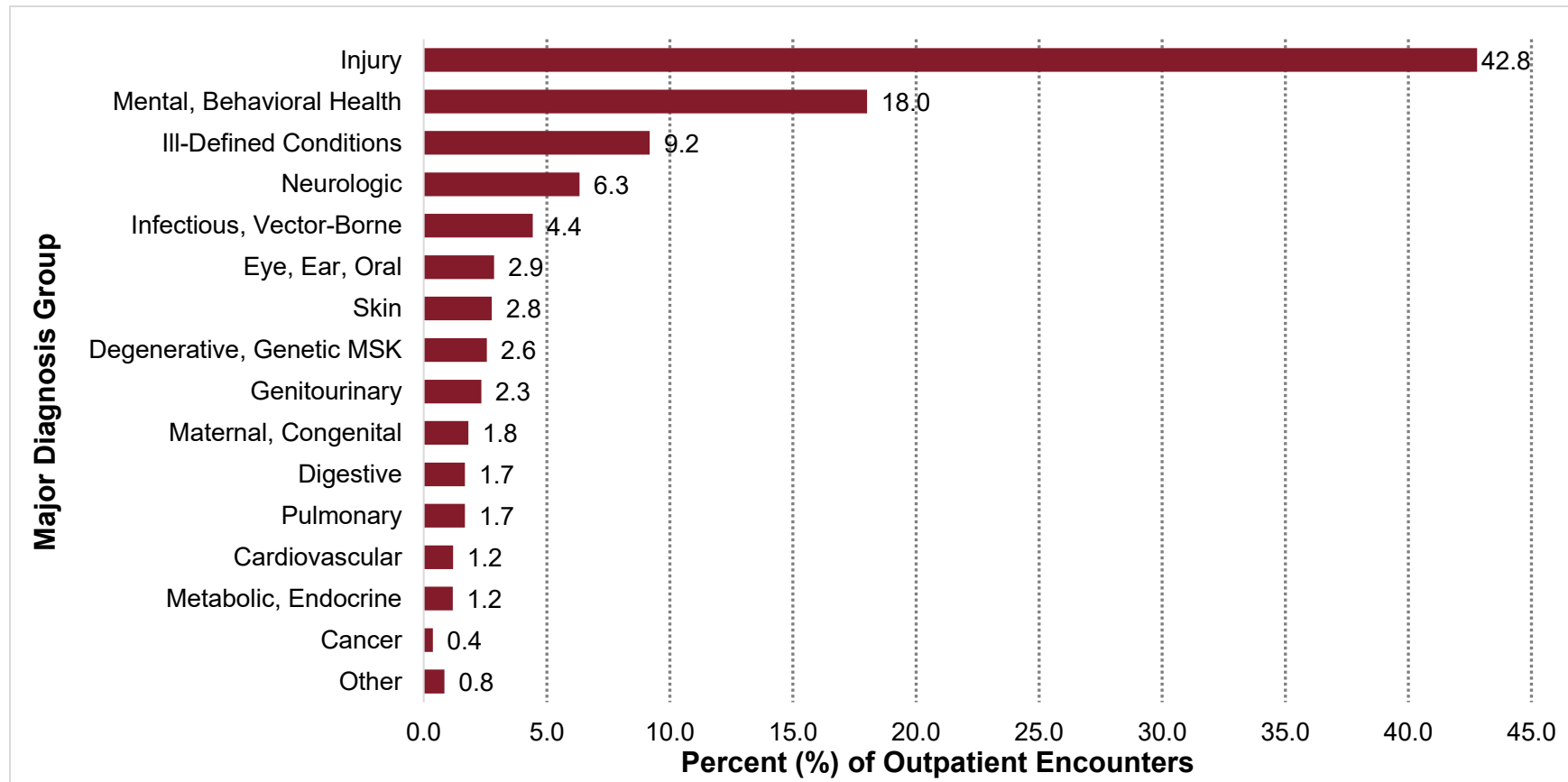
Diagnosis group "Other" includes adverse effects of drugs, blood disorders, and other neoplasms (not cancer).

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries.

Prepared by APHC Injury Prevention Program.

OUTPATIENT ENCOUNTERS

Injuries were the leading cause of outpatient encounters during 2019, accounting for 43% of all outpatient visits among Active Duty Army Soldiers.



Major Diagnosis Groups Resulting in Outpatient Visits U.S. Army Active Duty, 2019

Notes:

Total number of outpatient visits = 4,080,898

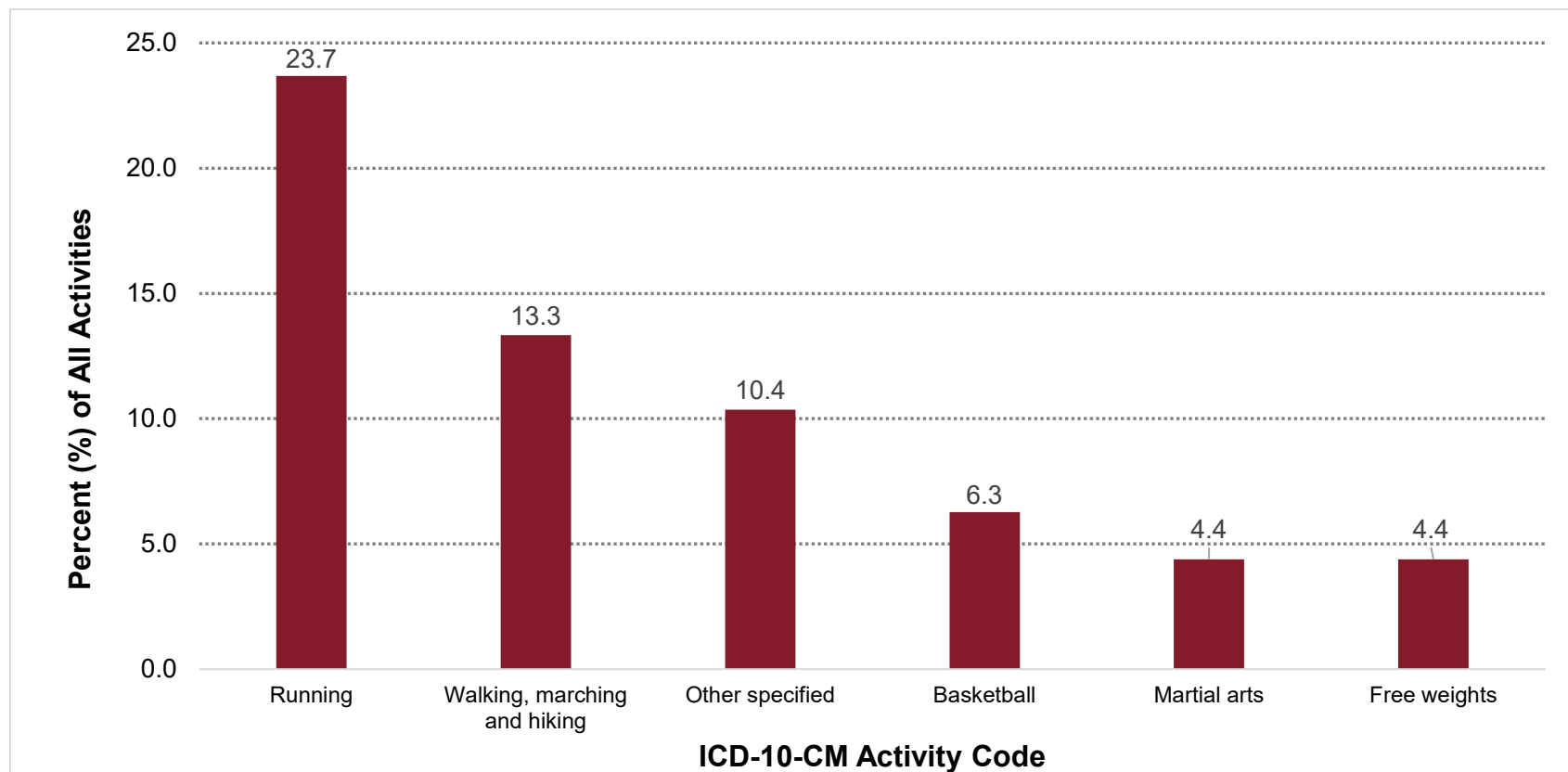
Diagnosis group "Other" includes adverse effects of drugs, blood disorders, and other neoplasms (not cancer).

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries.

Prepared by APHC Injury Prevention Program.

ACTIVITIES ASSOCIATED WITH INJURIES

In 2019, the leading activity associated with unintentional injuries among Active Duty Army Soldiers was running (24%), followed by walking, marching, and hiking (13%).



Leading Activities Associated with Unintentional Injuries, U.S. Army Active Duty, 2019

Notes:

Total number of unintentional outpatient encounters with activity codes = 38,278 (5%); may not be representative of the distribution of activities for all injuries.

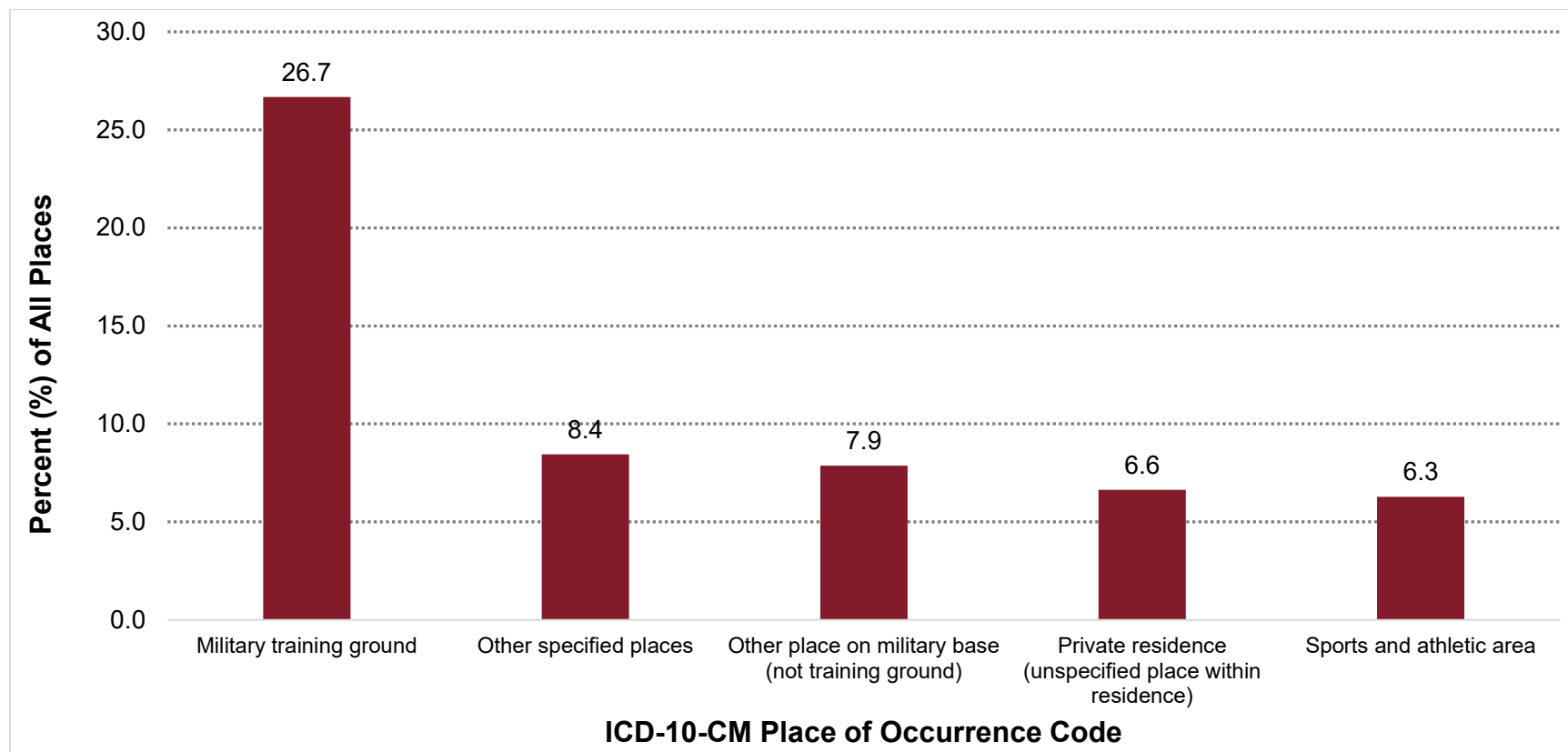
Note: Based on ICD-10-CM cause codes meeting the National Center for Health Statistics definition for unintentional injuries (excludes intentional self-harm, abuse, and violence).

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries.

Prepared by APHC, Injury Prevention Program.

PLACES OF OCCURRENCE ASSOCIATED WITH INJURIES

The leading place of occurrence associated with unintentional injuries among Active Duty Army Soldiers in 2019 was a military training ground (27%).



Leading Places Associated with Unintentional Injuries, U.S. Army Active Duty, 2019

Notes:

Total number of unintentional outpatient encounters with place of occurrence codes = 22,007 (3%); may not be representative of the distribution of places for all injuries.

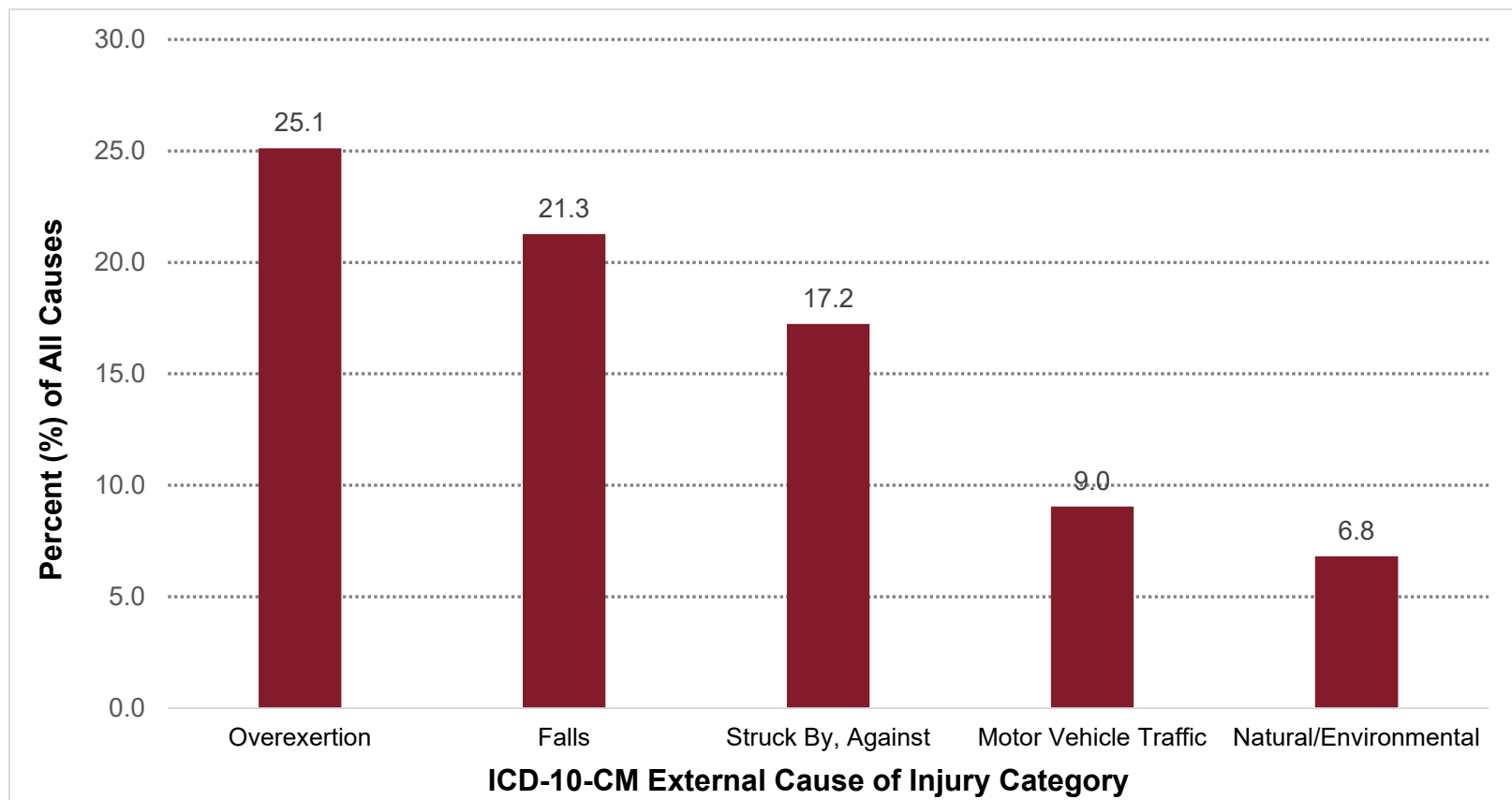
Note: Based on ICD-10-CM cause codes meeting the National Center for Health Statistics definition for unintentional injuries (excludes intentional self-harm, abuse, and violence).

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries.

Prepared by APHC, Injury Prevention Program.

MECHANISMS ASSOCIATED WITH INJURIES

Among outpatient injury encounters with a cause code in 2019, leading mechanisms of injuries were overexertion (25%) and falls (21%).



Leading External Causes of Unintentional Injury, Outpatient Visits, U.S. Army Active Duty, 2019

Notes:

Total number of cause-coded unintentional outpatient visits = 70,802 (9%); may not be representative of the distribution of causes for all injuries.

Note: Based on ICD-10-CM cause codes meeting the National Center for Health Statistics definition for unintentional injuries (excludes intentional self-harm, abuse, and violence).

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries.

Prepared by APHC Injury Prevention Program.

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.
- Cumulative micro-traumatic MSK (overuse) injuries account for a greater proportion of all Active Duty Army injuries than acute traumatic injuries.
- The most common injury types are musculoskeletal tissue damage such as joint pain, tendinitis, and bursitis. The most frequently injured body regions are the lower extremities, spine and back, and upper extremities.
- Among those injuries receiving additional provider coding of injury details, activities most frequently associated with injuries were running and walking/marching/hiking and leading causes of outpatient injuries are overexertion and falls. 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

- Canham-Chervak M, RA Steelman, A Schuh, and BH Jones. 2016. Importance of External Cause Coding for Military Injury Surveillance: Lessons from Assessment of Overexertion Injuries among U.S. Army Soldiers in 2014. *MSMR* 23(11):10-15.
<https://europepmc.org/abstract/med/27880039>
- Hauret KG, BH Jones, SH Bullock, M Canham-Chervak, and S Canada. 2010. Musculoskeletal Injuries: Description of an Under-Recognized Injury Problem among Military Personnel. *Am J Prev Med* 38(S1):S61-S70.
<https://phc.amedd.army.mil/PHC%20Resource%20Library/Musculoskeletal%20Injuries%20Description%20of%20an%20Under-Recognized%20Injury%20Problem%20among%20Military%20Personnel.pdf>
- Jones BH, M Canham-Chervak, S Canada, TA Mitchener, and S Moore. 2010. Medical Surveillance of Injuries in the U.S. Military: Descriptive Epidemiology and Recommendations for Improvement. *Am J Prev Med* 38(S1):S42-S60.
<https://phc.amedd.army.mil/PHC%20Resource%20Library/Medical%20Surveillance%20of%20Injuries%20in%20the%20U.S.%20Military%20Descriptive%20Epidemiology%20and%20Recommendations%20for%20Improvement.pdf>

Jones BH, PJ Amoroso, ML Canham, JB Schmitt, and B Weyandt. 1999. 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.

https://academic.oup.com/milmed/article/164/suppl_8/548/4832959?searchresult=1

Schuh A, M Canham-Chervak, and BH Jones. 2017. Statistical process control charts for monitoring military injuries. *Inj Prev* 23(6):416-422.

<https://injuryprevention.bmj.com/content/23/6/416>

U.S. Army Public Health Command (Provisional). 2009. Injury Epidemiology Report No. 12-HF-0APLa-09. U.S. Army Annual Injury Epidemiology Report 2008

<https://apps.dtic.mil/docs/citations/ADA523368>

Military Injury Definition

APHC. 2017. Public Health Information Paper No. 12-01-0717, *A Taxonomy of Injuries for Public Health Monitoring and Reporting*.

<https://apps.dtic.mil/sti/citations/AD1039481>

Hauschild VD, A Schuh-Renner, T Lee, MD Richardson, K Hauret, and BH Jones. 2019. Using Causal Energy Categories to Report the Distribution of Injuries in an Active Population: An Approach Used by the U.S. Army. *J Sci Med Sport* 22(9):997-1003.

<http://jsams.org/retrieve/pii/S1440244019300994>

Schuh-Renner A, M Canham-Chervak, TL Grier, VD Hauschild, and BH Jones. 2019. Expanding the Injury Definition: Evidence for the Need to Include Musculoskeletal Conditions. *Public Health* 169:69-75.

<https://www.sciencedirect.com/science/article/abs/pii/S0033350619300022?via%3Dihub>

Military Injury Prevention Overview

Canham-Chervak M, TI Hooper, FH Brennan, SC Craig, DC Girasek, RA Schaefer, G Barbour, KS Yew, and BH Jones. 2010. A Systematic Process to Prioritize Prevention Activities: Sustaining Progress toward the Reduction of Military Injuries. *Am J Prev Med* 38(1S):S11-S18.

<https://phc.amedd.army.mil/PHC%20Resource%20Library/Systematic%20Process%20to%20Prioritize%20Prevention%20Activities%20Sustaining%20Progress%20toward%20the%20Reduction%20of%20Military%20Injuries.pdf>

Jones BH, VD Hauschild, and M Canham-Chervak. 2018. 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.

<https://www.sciencedirect.com/science/article/pii/S144024401830063X>

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

Marshall SW, M Canham-Chervak, EO Dada, and BH Jones. 2014. Burden of Musculoskeletal Diseases in the United States: *Military Injuries*.
<https://www.boneandjointburden.org/2013-report/military-injuries/vi5>

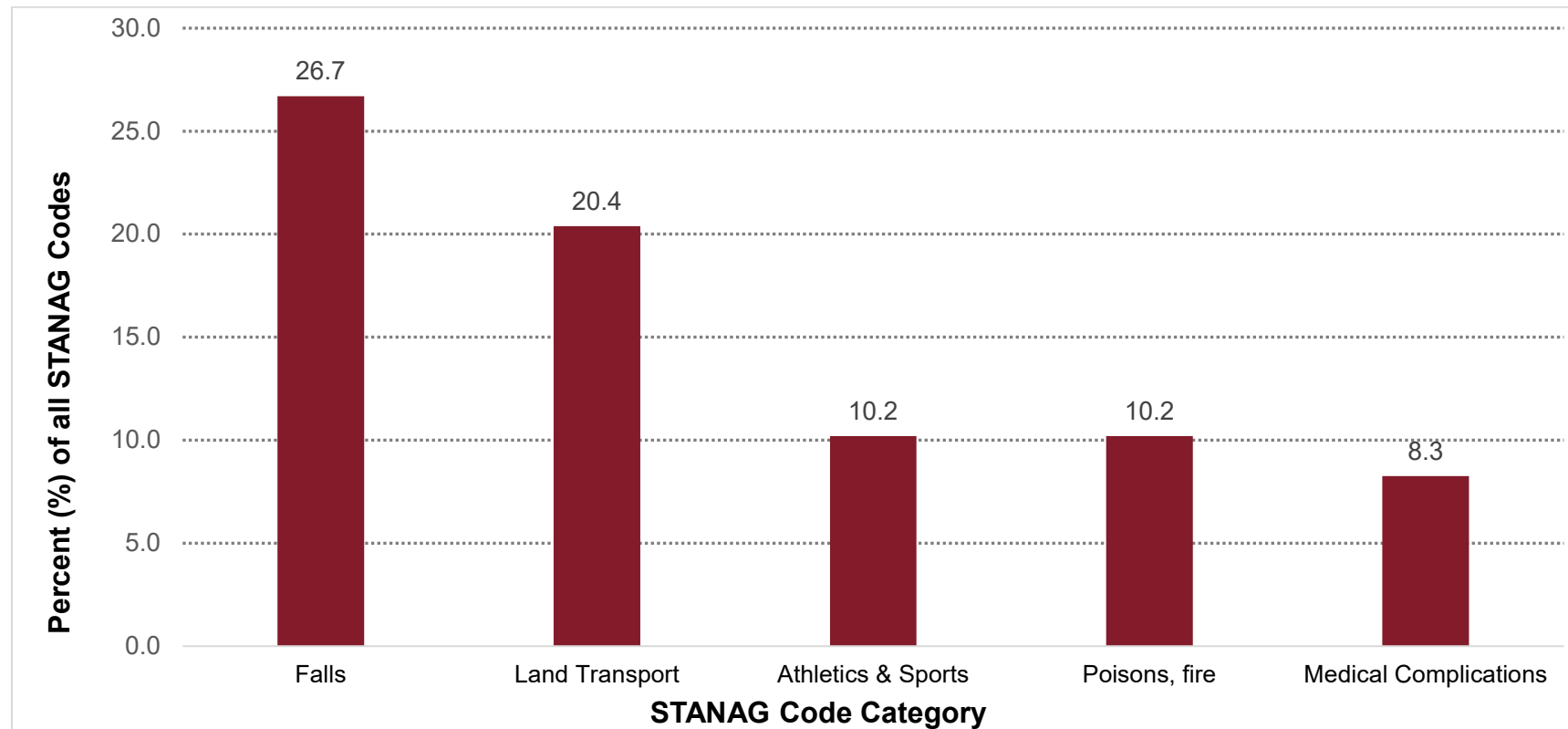
Molloy JM, TL Pendergrass, IE Lee, MC Chervak, KG Hauret, and DI Rhon. 2020. Musculoskeletal Injuries and United States Army Readiness Part I: Overview of Injuries and their Strategic Impact. *Mil Med*, ePub ahead of print.
<https://academic.oup.com/milmed/advance-article/doi/10.1093/milmed/usaa027/5805225>

Molloy JM, TL Pendergrass, IE Lee, KG Hauret, MC Chervak, and DI Rhon. 2020. Musculoskeletal Injuries and United States Army Readiness. Part II: Management Challenges and Risk Mitigation Initiatives. *Mil Med* 185(9-10):e1472-1480.
<https://academic.oup.com/milmed/advance-article/doi/10.1093/milmed/usaa028/5762817>

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Dated: December 2020

APPENDIX A CAUSES OF INJURY HOSPITALIZATIONS

In 2019, a total of 206 hospitalizations for injuries received Standardized Agreement Codes (STANAG) cause codes. The leading causes were falls (27%) and land transport (motor vehicles) (20%).



Leading STANAG Cause Codes for Injury Hospitalizations, U.S. Army Active Duty, 2019

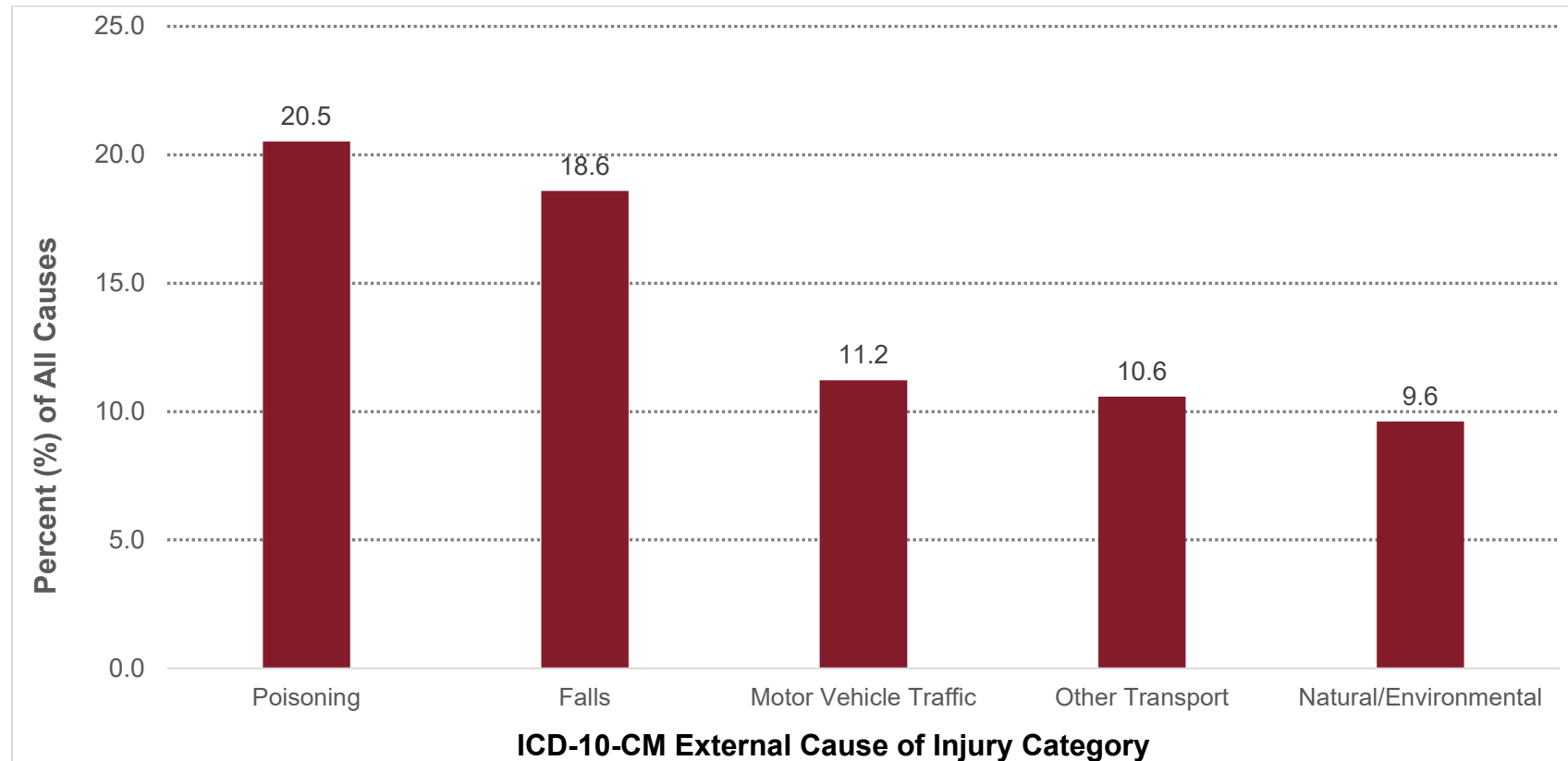
Notes:

Total number of STANAG-coded injury hospitalizations = 206; may not be representative of the distribution of causes for all injuries

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries

Prepared by APHC Injury Prevention Program

Among those injury hospitalizations that were given an ICD-10-CM medical diagnosis cause code in 2019 (22%), leading causes were poisoning (21%), falls (19%), and motor vehicle traffic (11%).



Leading External Causes of Unintentional Hospitalizations, U.S. Army Active Duty, 2019

Notes:

Total number of cause-coded unintentional injury hospitalizations = 312 (22%); may not be representative of the distribution of causes for all injuries

Data source: Military Health System Data Repository (MDR); injuries defined using the U.S. Army Public Health Center (APHC) Taxonomy of Injuries

Prepared by APHC Injury Prevention Program