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.

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.

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

All Army Injuries: \( N = 807,718 \)

All Active Duty initial medical encounters, 2016

#### Mechanical Energy Injuries
\( n = 781,006 \) (97%)
- Acute Trauma \( n = 167,804 \) (21%)
  - MSK \( n = 101,879 \) (13%)
  - Non-MSK \( n = 65,925 \) (8%)
- Cumulative Micro-trauma \( n = 613,202 \) (76%)
  - MSK \( n = 570,774 \) (71%)
  - Non-MSK \( n = 42,428 \) (5%)

#### Non-Mechanical Energy Injuries
\( n = 8,248 \) (1%)
- Environmental
  - Heat & Sun \( n = 2,833 \) (<1%)
  - Cold \( n = 366 \) (<1%)
- Poisons \( n = 3,059 \) (<1%)
- Non-Environmental \( n = 1,838 \) (<1%)
  - Chemicals \( n = 664 \) (<1%)
  - Electrical \( n = 21 \) (<1%)
  - Nuclear/Radiation \( n = 2 \) (<1%)

#### Other/Unspecified Injuries
\( n = 18,464 \) (2%)
- Operative/Medical Complications \( n = 7,201 \) (1%)
  - Operative/Medical complications
  - Food/foreign body in natural orifice \( n = 451 \) (<1%)
  - Other reaction to external cause \( n = 2,812 \) (<1%)
  - Abuse/Intentional \( n = 4,615 \) (1%)
- Lack of essential element \( n = 152 \) (<1%)
- Unspecified/multiple injuries \( n = 3,193 \) (<1%)

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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.


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.


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%).

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

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.

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

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Head, Face &amp; Neck</th>
<th>Spine &amp; Back</th>
<th>Torso</th>
<th>Upper Extremity</th>
<th>Lower Extremity</th>
<th>Other</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acute Trauma (ACT)</td>
<td>Cumulative Micro-traumatic (CMT)</td>
<td>ACT</td>
<td>CMT</td>
<td>ACT</td>
<td>CMT</td>
<td>ACT</td>
</tr>
<tr>
<td>MSK Tissue Damage</td>
<td>36</td>
<td>0</td>
<td>55</td>
<td>159,080</td>
<td>52</td>
<td>3</td>
<td>3,736</td>
</tr>
<tr>
<td>Sprain/Joint Damage</td>
<td>8</td>
<td>0</td>
<td>2,775</td>
<td>0</td>
<td>911</td>
<td>0</td>
<td>8,384</td>
</tr>
<tr>
<td>Tissue Damage, Other</td>
<td>6,350</td>
<td>16,274</td>
<td>1,619</td>
<td>0</td>
<td>1,627</td>
<td>0</td>
<td>4,006</td>
</tr>
<tr>
<td>Strain/Tear</td>
<td>2,619</td>
<td>0</td>
<td>3,477</td>
<td>0</td>
<td>2,125</td>
<td>0</td>
<td>6,285</td>
</tr>
<tr>
<td>Nerve</td>
<td>32</td>
<td>0</td>
<td>26</td>
<td>17,253</td>
<td>4</td>
<td>447</td>
<td>3,989</td>
</tr>
<tr>
<td>Contusion/Superficial</td>
<td>5,823</td>
<td>50</td>
<td>0</td>
<td>2,553</td>
<td>21</td>
<td>6,453</td>
<td>123</td>
</tr>
<tr>
<td>Fracture</td>
<td>1,023</td>
<td>0</td>
<td>969</td>
<td>17</td>
<td>830</td>
<td>352</td>
<td>9,421</td>
</tr>
<tr>
<td>Open Wound</td>
<td>4,348</td>
<td>0</td>
<td>0</td>
<td>426</td>
<td>0</td>
<td>8,060</td>
<td>0</td>
</tr>
<tr>
<td>Internal Organ &amp; Blood Vessel</td>
<td>5,109</td>
<td>0</td>
<td>107</td>
<td>0</td>
<td>709</td>
<td>0</td>
<td>120</td>
</tr>
<tr>
<td>Dislocation</td>
<td>5</td>
<td>0</td>
<td>40</td>
<td>0</td>
<td>45</td>
<td>0</td>
<td>2,661</td>
</tr>
<tr>
<td>Crush</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>0</td>
<td>524</td>
</tr>
<tr>
<td>Amputation</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>191</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25,367</strong></td>
<td><strong>16,324</strong></td>
<td><strong>9,068</strong></td>
<td><strong>176,350</strong></td>
<td><strong>9,298</strong></td>
<td><strong>823</strong></td>
<td><strong>53,830</strong></td>
</tr>
<tr>
<td><strong>% Total</strong></td>
<td><strong>3.2%</strong></td>
<td><strong>2.1%</strong></td>
<td><strong>1.2%</strong></td>
<td><strong>22.6%</strong></td>
<td><strong>1.2%</strong></td>
<td><strong>0.1%</strong></td>
<td><strong>6.9%</strong></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>ICD 10 External Cause of Injury Code</th>
<th>Percent of All Cause-coded Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>23.0</td>
</tr>
<tr>
<td>Struck By, Against</td>
<td>19.0</td>
</tr>
<tr>
<td>Motor vehicle</td>
<td>10.1</td>
</tr>
<tr>
<td>Cut/pierce</td>
<td>6.2</td>
</tr>
<tr>
<td>Transport</td>
<td>5.5</td>
</tr>
</tbody>
</table>

**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**


**Military Injury Definition**


**Military Injury Prevention Overview**


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

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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.

**ICD 10 External Cause of Injury Code**

**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