2019 HEALTH OF THE FORCE

Create a **healthier force** for tomorrow.

U.S. ARMY

APHC

— U.S. Army Public Health Center —

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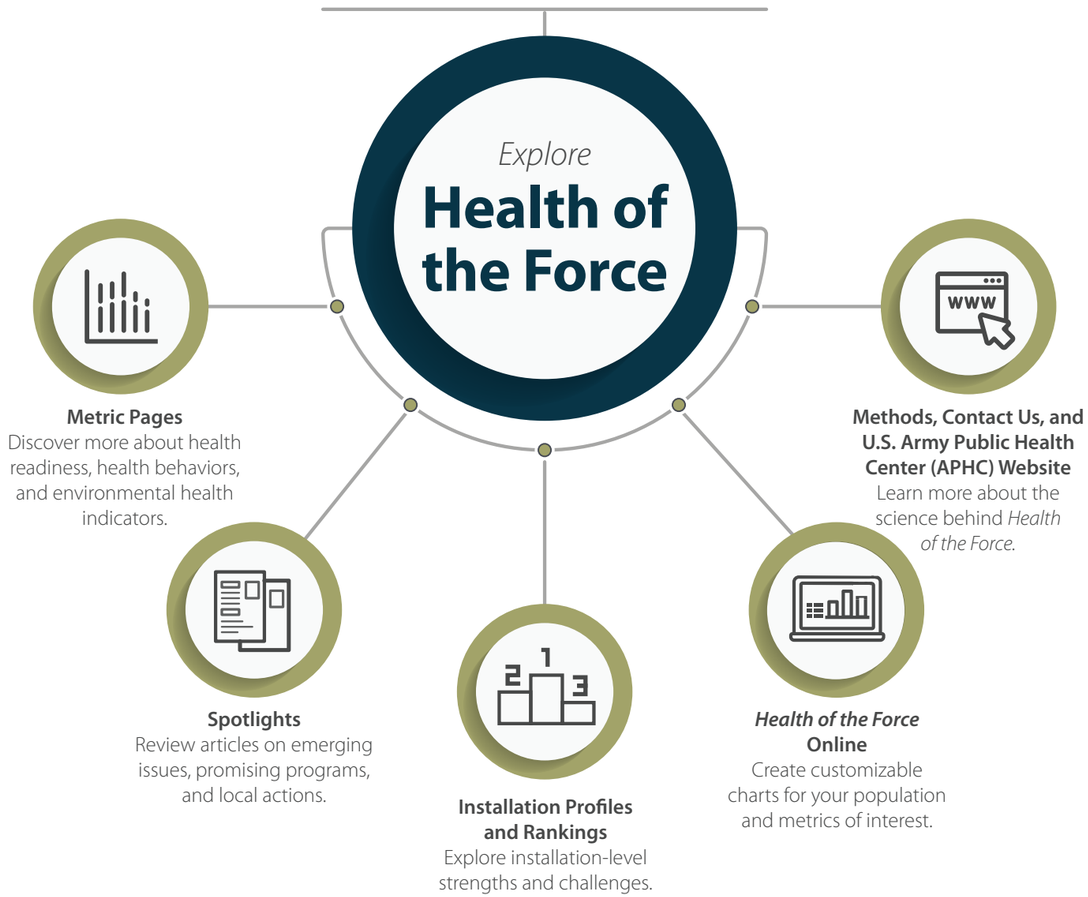
A suite of products to help YOU improve Force readiness!



Our Purpose

Empower Army senior leaders with knowledge and context to improve Army health and Soldier readiness.

Scan Here

Welcome to the 2019 *Health of the Force* Report

OVERVIEW

The health of the individual Soldier is the foundation of the Army's ability to deploy, fight, and win against any adversary. The 2019 *Health of the Force* report is the Army's 5th annual population health report documenting conditions that influence the health and medical readiness of the U.S. Army Active Component (AC) Soldier population. Leaders can use *Health of the Force* to optimize health promotion measures and effect culture changes that align with Army modernization efforts to achieve Force dominance. *Health of the Force* presents Army-wide and installation-level demographics and data for more than 20 health, wellness, and environmental indicators at 40 installations worldwide. Installations included in *Health of the Force* are those where the AC population exceeds 1,000 Soldiers. Data presented in this report reflect status for the prior year (i.e., the 2019 report reflects calendar year 2018 data).

READY AND RESILIENT

During 2018, 7%–12% of AC Soldiers were classified as non-deployable, and 70% of these classifications were due to medical non-readiness. As in prior years, musculoskeletal injuries and behavioral health issues are the conditions contributing to the majority of temporary and permanent medical non-readiness.

The range of health metrics detailed in *Health of the Force* represents an evidence-based resource that can help Army leaders understand the causes of and contributors to medical non-readiness, and direct informed policy and programmatic efforts to optimize Soldier health.

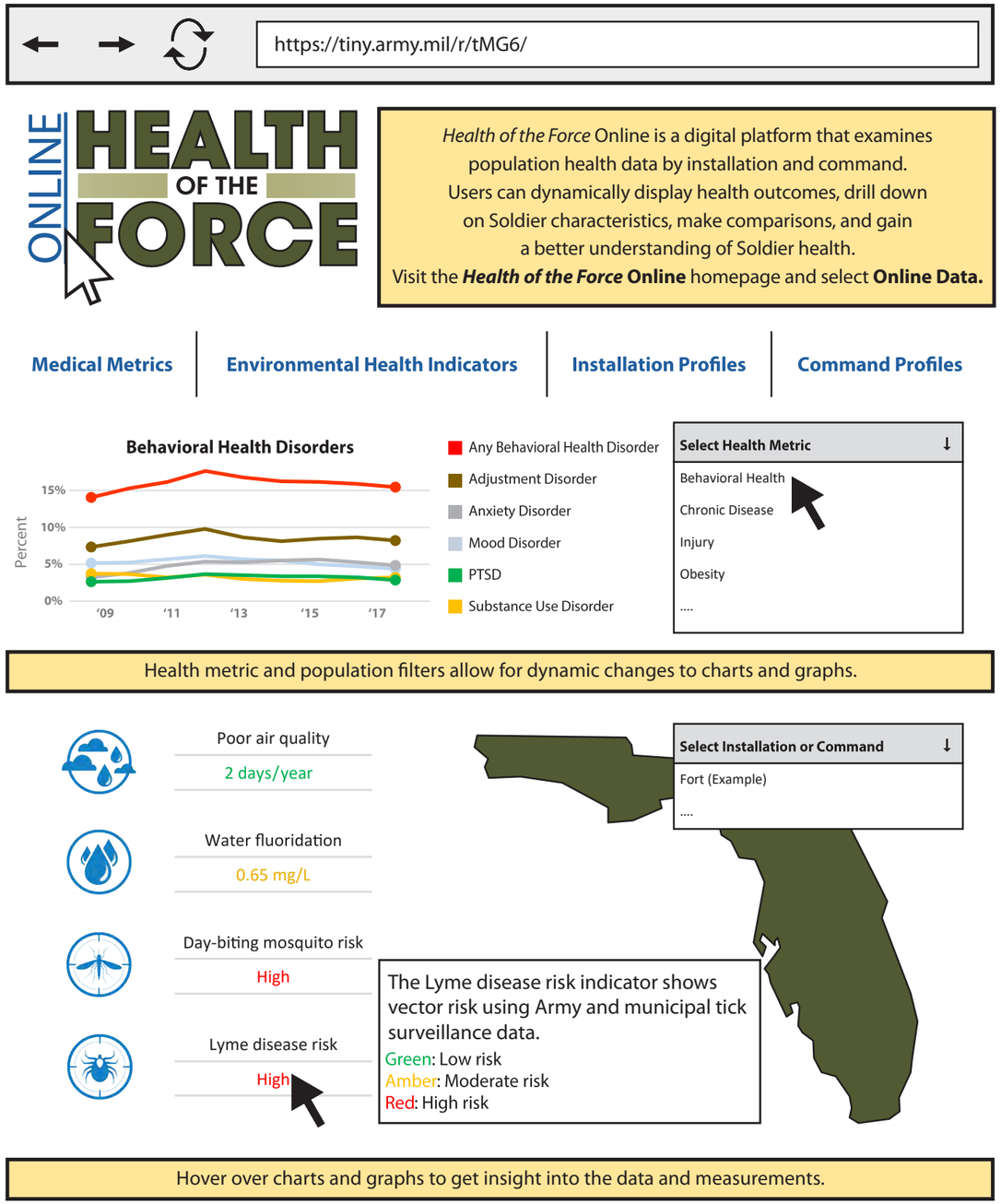
NEW PARTNERSHIPS, NEW INSIGHTS

For the first time, most of the medical and personnel data in the 2019 *Health of the Force* were provided through a new partnership with the Army Analytics Group (AAG). This partnership enabled access to line-level medical record data. The improved granularity of this dataset permitted detailed demographic analysis and customized summarizations of health metrics to meet the needs and priorities of Army stakeholders.

Recent increases in Army training-related heat illness and rising temperatures influenced by a changing climate point to a need for additional awareness and surveillance of the contributors to heat-related health effects. In 2019, the *Health of the Force* introduces a new environmental health indicator that quantifies the portion of the year likely to experience heat risk at garrison population centers, and compares it to historic trends for the region.

ENGAGE, EXPLORE, AND CONNECT WITH THE DATA

The 2019 print edition is enhanced by *Health of the Force* Online, an interactive online interface that allows readers to drill down into Army population health datasets. Users can create customized data visualizations to explore subpopulations or metrics of interest. Together, these *Health of the Force* products facilitate informed decisions that will improve the readiness, health, and well-being of Soldiers and the Total Army Family.



***Health of the Force* Online** enhances the report and **your** evidence-based decision making!

SPOTLIGHT

ARMY PUBLIC HEALTH:
A FORCE MULTIPLIER IN MULTI-DOMAIN OPERATIONS

THE U.S. ARMY IS FACING A CHANGING CHARacter of war. This challenge necessitates a rapid, revolutionary response involving modernization and a new operational concept. Multi-Domain Operations (MDO), the Army's new operational concept, asserts that the Army is now in constant competition worldwide, both as an institution and as a Force. Its success depends on its ability to embrace the ambiguous and the unknown. To become a more lethal Force, Soldiers, as well as their equipment, must modernize. Army Public Health is uniquely-positioned to play an integral part in meeting this challenge.

Army Public Health brings the synergy of multiple health domains to confront the complex and even chaotic challenges of the Army's future fight. Comprehensive, anticipatory interventions are required to reduce the impact of injury and prepare the Force to remain agile and resilient in changing conditions. Proper sleep, exercise, and nutrition sustain and strengthen the modern Soldier for optimal performance.

However, potential hazards also accompany modernization priorities. Long-range precision fires, next-generation vehicles, and vertical lift platforms can possess known and emerging hazards. Army Public Health is a vital member of the cross-functional team helping to identify potential occupational hazards early in the acquisition cycle to mitigate Soldier exposure and enhance performance. For example, Soldier exposures to vibration and non-neutral postures in combat vehicles risk spinal injury and musculoskeletal fatigue. Army Public Health is working closely with program managers to improve designs for future systems. In addition, sound levels from a shoulder-fired weapon system (such as the AT-4) are sufficiently loud to rupture the eardrum and cause irreparable hearing damage to unprotected or poorly protected Soldiers. Proper use of hearing protection in both training and combat when using these weapons is critical to Soldier hearing health.

The unforgiving nature of combat and uncertain international environment demand an integrated health approach that is adaptive and flexible. Army Public Health strives to deliver optimal preventive and risk mitigation services as a force multiplier in MDO.

> **"As we reform and reorganize, we are committed to providing ready and responsive health services and force health protection."**
>
> **—LTG R. Scott Dingle**
> Surgeon General of the Army

2019 *HEALTH OF THE FORCE*

Report Highlights

DEMOGRAPHICS:

Approximately 460,000 AC Soldiers
78% under 35 years old, 15% female

INJURY

In 2018, approximately **1,670** new injuries were diagnosed per 1,000 person-years.

53% of Soldiers had a new injury.

71% of all injuries were cumulative micro-traumatic musculoskeletal "overuse" injuries.

BEHAVIORAL HEALTH

16% of Soldiers had a diagnosis of one or more behavioral health disorders.

The most common behavioral health diagnosis was adjustment disorder. The prevalence of behavioral health diagnoses was higher among female Soldiers.

SUBSTANCE USE

Overall, **3.7%** of Soldiers had a substance use disorder diagnosis.

Rates were highest among male Soldiers <25 years of age.

SLEEP DISORDERS

14% of Soldiers had a diagnosed sleep disorder in 2018.

Sleep apnea and insomnia diagnoses made up more than **50%** of the diagnosed sleep disorders.

OBESITY

17% of Soldiers were classified as obese, compared to

26% of a similar population of U.S. adults.

TOBACCO PRODUCT USE

26% of Soldiers reported tobacco use (not including electronic cigarettes).

7.2% of Soldiers reported the use of electronic cigarettes.

The majority of tobacco product users are 34 years of age or younger.

SEXUALLY TRANSMITTED INFECTIONS

Reported chlamydia infection rates were **58%** higher than in 2014.

The rate of reported chlamydia infections was three times higher in female Soldiers compared to males; this may be partially due to increased screening among pregnant females and female Soldiers under 25 years.

CHRONIC DISEASE

19% of Soldiers had a chronic disease, a decrease since 2015.

In 2018, the most prevalent chronic disease was arthritis, **(9.3%)** followed by cardiovascular disease. **(6.0%)**

VECTOR-BORNE DISEASE

42% of Soldiers were at installations with high risk of disease transmission from day-biting mosquitoes.

11% of Soldiers were at installations with high risk of Lyme disease transmission.

HEAT RISK

39% of Soldiers were stationed at an installation with more than 100 heat risk days, mostly concentrated in the south and southeast U.S.

PERFORMANCE TRIAD

39% of Soldiers attained 7 or more hours of sleep on weeknights/duty nights.

90% of Soldiers achieved moderate and/or vigorous aerobic activity targets.

Demographics

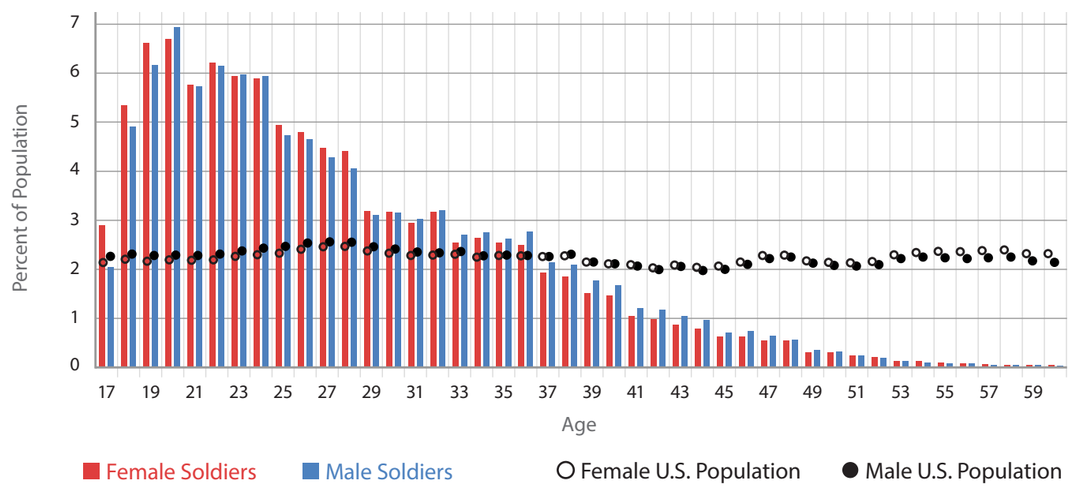
POPULATION DISTRIBUTIONS

The *Health of the Force* references the U.S. population to provide context for how Soldiers' health compares to that of the U.S. population. The U.S. Army AC Soldier population differs from the U.S. population in two important ways: age and sex distributions. Over 78% of AC Soldiers are under the age of 35 years, compared to 37% of the employed civilian population. The age distribution of the U.S. population is approximately uniform across ages 18–60 years. The AC Soldier population is 85% male, whereas the U.S. population is roughly 50% male and 50% female. Because age and sex are often strongly linked to health status, these differences in population distributions have profound implications for comparisons of population health between the AC Soldier population and the U.S. population. For example, it can be inappropriate and misleading to directly compare disease prevalence among relatively young Soldiers to disease prevalence among the U.S. adult population.

When using a comparison population, it is preferable to adjust that population to the Army population. Specifically, the employed U.S. population is adjusted to match the age and sex distribution of the U.S. Army AC Soldier population to accurately compare disease prevalence between these populations.

Age Distribution by Sex, AC Soldiers, 2018

Adults of military age in the U.S. are approximately uniformly distributed by age, and 50% are male. AC Soldiers are younger and more likely to be male than the U.S. population.



The prevalence of chronic medical conditions (e.g., hypertension, arthritis, cancer) increases markedly with age. Similarly, body composition changes as people age, leading to a higher prevalence of obesity among older people. The U.S. population will appear to have a higher prevalence of obesity relative to Soldiers simply because the U.S. population is older, on average, than the AC Soldier population. After adjusting the employed U.S. population to fit the age and sex distribution of the U.S. Army AC Soldier population, the obesity prevalence falls from 31% to 26%. However, the adjusted U.S. population obesity prevalence of 26% is still substantially higher than the obesity prevalence of 17% among AC Soldiers.

HEALTHY SOLDIER EFFECT

Healthy workers are more likely to remain in the work force compared to less healthy workers; this healthy worker effect is also seen in the AC Soldier population.

ARMY DATA VS. U.S. POPULATION DATA

Figures from the U.S. population are commonly derived by surveying a much smaller sample. For example, the Behavioral Risk Factor Surveillance System (BRFSS) is used to determine health-related risk behaviors and chronic health conditions, and it samples about 400,000 adults per year. Prevalence figures in this smaller sample are then used to estimate the prevalence of the entire U.S. population. In contrast, AC Soldiers are eligible for medical care through a common insurer (TRICARE) and have physical examination, screening, and vaccination requirements; therefore, reporting on the health of the entire AC population is much more feasible. This means that data for the AC Soldier population will be more accurate than data reported for the U.S. population.

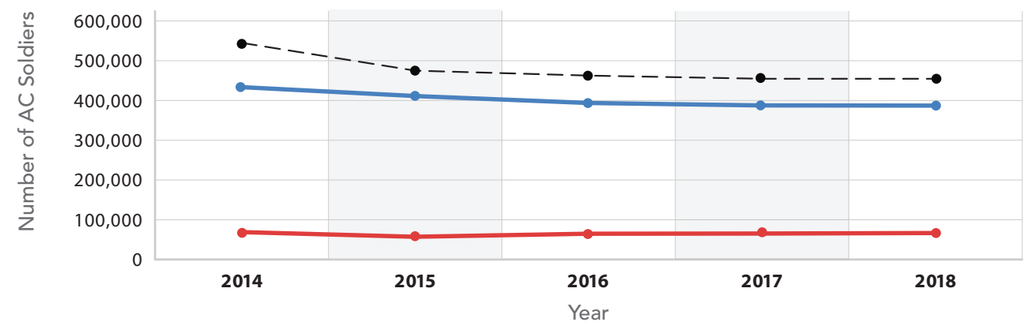
POPULATION ESTIMATES AND PERSON-TIME

Because the AC Soldier population is ever-changing, *Health of the Force* analysts estimate reporting unit populations by summing the months Soldiers are assigned to an installation during the reporting year. This provides an estimate of the population for a given location and approximates the mean end strength over 12 months. Epidemiologists call this "person-time" ("person-years" in the *Health of the Force*). A person-year is analogous to a full-time equivalent (FTE) employee.

Demographics

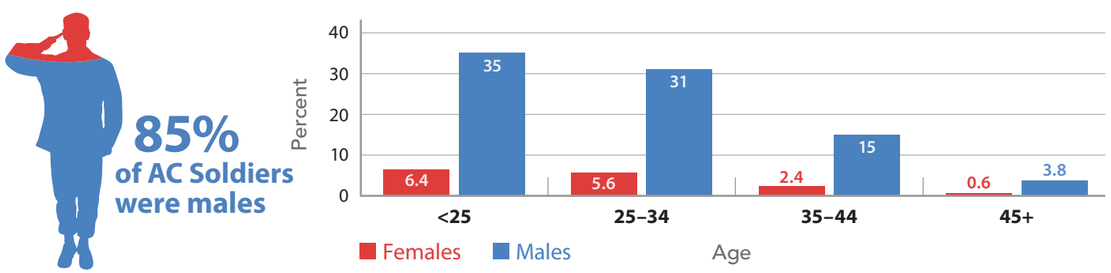
Population by Sex and Year, AC Soldiers, 2014–2018

In 2018, the estimated average monthly AC Soldier population was 463,698 Soldiers. Enlisted personnel accounted for 80% of AC end strength.



	2014	2015	2016	2017	2018
Female	70,302	60,485	68,184	68,652	69,274
Male	441,088	416,274	401,003	395,059	394,424
Total	511,389	484,759	469,187	463,711	463,698

Population Distribution by Sex and Age, AC Soldiers, 2018



SPOTLIGHT

BETTER INITIATIVES. HEALTHIER FORCE.

MOVING FROM INTUITION-BASED TO EVIDENCE-BASED PROGRAM DECISION-MAKING

THERE'S TRUTH IN DATA! LEADERS THROUGHout the Army use the *Health of the Force* report to identify areas in which they are doing well and opportunities to improve the readiness, health, and well-being of their Soldiers and the Total Army Family. If a potential concern is identified, how can leaders develop and implement a solution that will likely have a positive impact? How do they know if these initiatives are effective?

The APHC, along with the U.S. Army SHARP Ready & Resilient Directorate (SR2), recently released the *U.S. Army's Ready and Resilient Initiative Evaluation Process* (IEP Guide) (APHC, 2019a). The IEP is an initiative planning, evaluation, and review process that will help Army leaders develop and expand effective initiatives aimed at improving the health of the Total Army Family.

The IEP Guide was created based on best practices from the fields of business, public health, strategic planning, and prevention science. It uses concepts from public health and the Military Decision Making Process (MDMP) to allow readers with different educational backgrounds and experiences to leverage their current knowledge and skills when developing, implementing, and evaluating initiatives. The Guide is constructed using a modular format so users can go directly to the component most relevant for their phase of initiative development. Each section includes a rationale, instructions, tools, examples, templates, and external resources.

The IEP Guide is available to anyone who is interested in developing, implementing, or expanding an initiative to improve the health, readiness, or resilience of an Army population. The Guide will walk initiative developers through each stage of initiative planning, with tools they can use to document the initiative's development, implementation, and evaluation activities. The Guide can help ensure the initiative is well planned, is a good steward of resources, collects the right data, and provides evidence to determine its effectiveness. The IEP Guide's systematic planning process allows leaders at all Army levels to make evidence-based resource decisions when considering whether an initiative should be implemented, maintained, or expanded.

Leaders who need to make a decision about an initiative or are looking to develop and implement a solution to any challenge identified within this report can use the IEP Guide to ensure their initiative leads to a healthier Force.

SPOTLIGHT

EPIDEMIOLOGICAL CONSULTATIONS:
INVESTIGATING EMERGING THREATS TO THE ARMY'S HEALTH

THE U.S. ARMY PUBLIC HEALTH CENTER (APHC) conducts Epidemiological Consultations (EPICONs) to provide expert advice and assistance for medical situations impacting readiness or public health across the Army. During an EPICON, a problem (e.g., infectious disease outbreak, environmental health issue, or other emerging health risk) is verified through consideration of a differential list of potential causes, and recommendations are generated to remedy and prevent the problem.

Multi-disciplinary EPICON teams are strategically staffed based on the nature, scope, and urgency of the mission and can contain personnel with expertise in medicine, epidemiology, public health, psychology, social work, sociology, public health nursing, or data management. Consultation services include advice or direct participation in the steps of the epidemiologic investigation process (e.g., design, data collection, data entry, analysis, and interpretation). Investigation services can include, but are not limited to, review and analysis of Army administrative data, interviews, surveys, focus groups, and geospatial analysis. The scope of EPICON activities includes investigation of infectious and occupational diseases; behavioral and social health; chronic diseases; injuries; environmental exposures and diseases; and other acute and chronic conditions of public health interest. As a consultation service, the EPICON team is not responsible or accountable for managing the public health situation but instead offers possible solutions in the form of actionable recommendations for control and/or prevention of public health issues.

EPICONs are typically requested by line leaders or commanders when there is a perceived increase in disease, injury, or a behavioral health outcome that negatively impacts Soldier health and readiness. As an entity of the U.S. Army Medical Command (MEDCOM), the APHC does not have the authority to conduct EPICONs without a formal tasking. Requests for EPICONs should originate through the senior commander and be routed through the U.S. Army Medical Command, Office of the Surgeon General to initiate a formal tasking to the APHC.

> **"People are always my #1 priority. We must take care of our people and treat each other with dignity and respect. It is our people who will deliver on our readiness, modernization, and reform efforts."**
>
> **—General James C. McConville**
> Chief of Staff of the Army

SPOTLIGHT

BITE BACK:
YOUR DENTAL CARIES RISKS

ORAL HEALTH IS COMPROMISED BY THE presence of dental caries, more commonly known as tooth decay. Tooth decay is a preventable yet highly prevalent chronic disease caused by a breakdown of tooth structure as a result of the acid produced by bacteria. Identification of those at high risk of tooth decay is an effective means of preventing and controlling this disease. An assessment of a Soldier's risk of tooth decay is performed at the periodic dental examination. Multiple factors determine a Soldier's risk, including oral hygiene habits, diet, tobacco use, salivary flow, and clinical signs that tooth decay is or has been present.

The High Caries Risk (HCR) program is designed to identify and address individual risk factors for future tooth decay. Enrollment and participation in this program is voluntary for Soldiers determined to be at high risk of developing tooth decay; however, high-risk patients are strongly encouraged to take advantage of it. The HCR program offers a multitude of services, the first of which is a dietary analysis that identifies a Soldier's specific risk factors as they relate to food and beverage consumption, hydration, tobacco product use type and amount, and sleep adequacy. A history of inadequate sleep may be a sign of sleep apnea and accompanied by symptoms which increase the risk of developing tooth decay including dry mouth or bruxism (teeth grinding). Once specific risk factors have been identified, the Soldier will receive nutrition counseling. The dental provider will review the habits that are increasing the Soldier's risk of dental decay and suggest ways to improve them. Other methods of intervention and prevention included in this program are professional fluoride varnish treatments, sealants on at-risk tooth surfaces, prescription fluoride and antimicrobial products, and an explanation of the disease etiology. Upon completing the program, the Soldier will receive a dental decay risk re-assessment.

U.S. Army photo, APHC

Taking the first step towards reducing the risk of dental decay.

The focus of the HCR program is to identify and address a Soldier's individual dental decay risk factors to prevent the disease before it starts. Disease prevention is just one of many strategies used to improve and sustain the dental readiness and oral health of the Force. Improving the oral health of the Force will strengthen the health of the Nation.

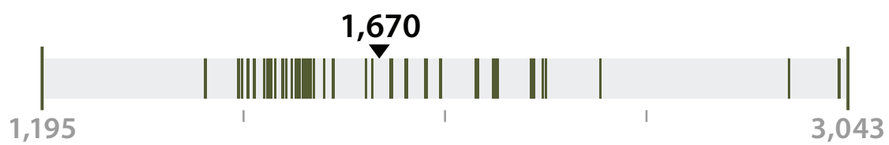
Medical Metrics

- INJURY
- BEHAVIORAL HEALTH
- SUBSTANCE USE
- SLEEP DISORDERS
- OBESITY
- TOBACCO PRODUCT USE
- HEAT ILLNESS
- HEARING
- SEXUALLY TRANSMITTED INFECTIONS
- CHRONIC DISEASE

U.S. Army photo

Injury

Injury is a significant contributor to the Army's healthcare burden, impacting medical readiness and Soldier health. Injuries were defined as damage or interruption of body tissue function caused by an energy transfer that exceeds tissue tolerance suddenly (acute trauma) or gradually (cumulative micro-trauma) (APHC, 2017a). Each year, over half of all Soldiers experience an injury or injury-related musculoskeletal (MSK) condition, accounting for approximately 2 million medical encounters and roughly 10 million days of limited duty. In *Health of the Force*, injury incidence was estimated using specific diagnostic codes from inpatient and outpatient medical encounter records in the Military Health System Data Repository (MDR). Cumulative micro-traumatic MSK injuries are referred to as "overuse" injuries.

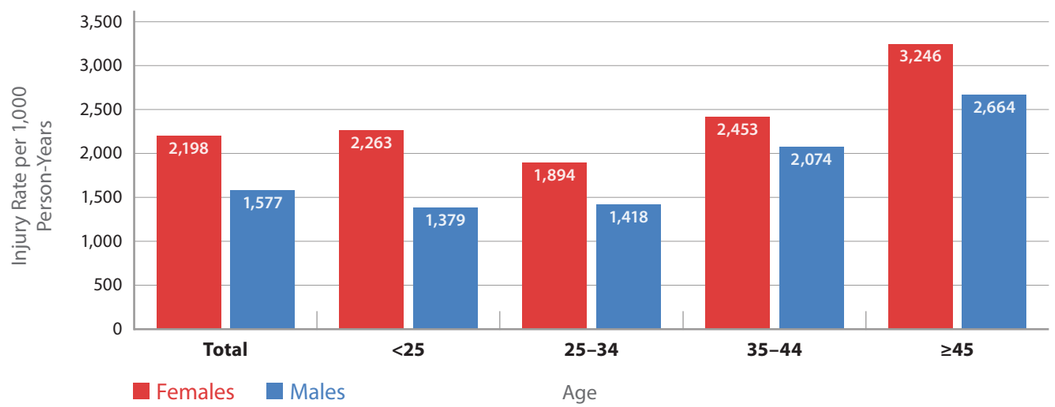


Overall, 1,670 new injuries were diagnosed among Soldiers per 1,000 person-years.

Incidence ranged from 1,195 to 3,043 injuries per 1,000 person-years across Army installations.

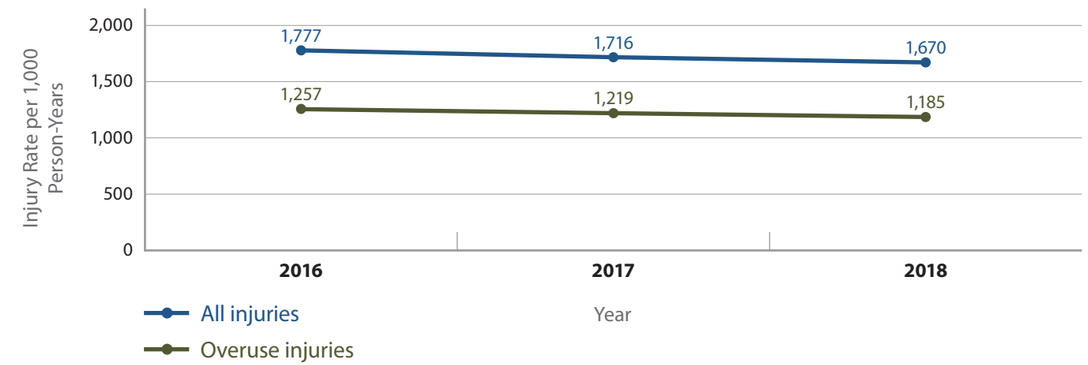
Incidence of Injury by Sex and Age, AC Soldiers, 2018

Among AC Soldiers, 1,670 new injuries were diagnosed per 1,000 person-years in 2018. The rate reflects the potential occurrence of multiple injuries per Soldier. **Injury rates were higher among females and older Soldiers.**



Incidence of Injury per 1,000 Person-Years, AC Soldiers, 2016–2018

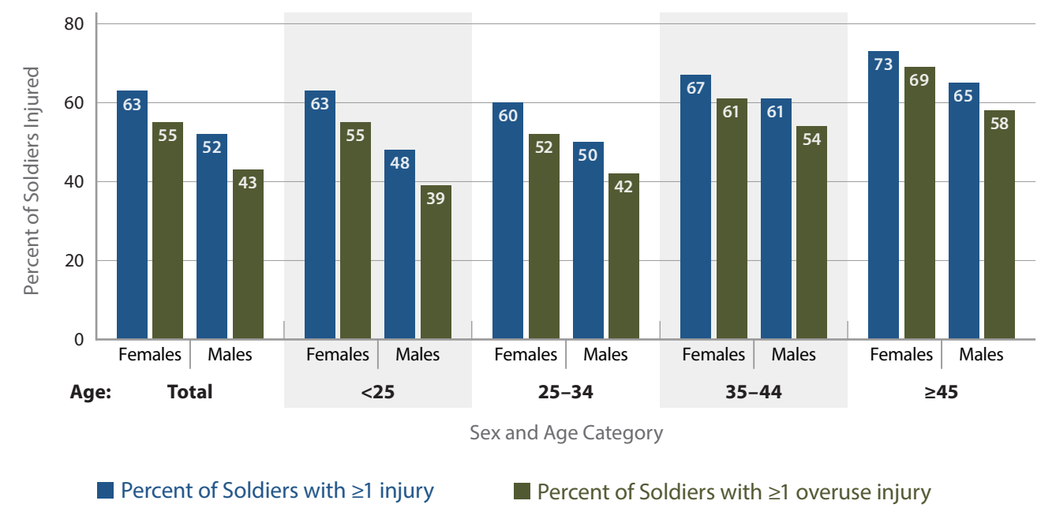
The incidence of all new injuries and new overuse injuries decreased in 2018, compared to previous years.



A comprehensive re-classification of injury diagnosis codes was necessitated by the Military Health System's transition to the ICD-10-CM medical coding system in October 2015. All three full calendar years of data under the new coding system are presented.

Proportion Injured by Sex and Age, AC Soldiers, 2018*

Overall, 53% of Soldiers had a new injury in 2018. Of these injuries, 71% were overuse injuries. Injuries affected 66% of Soldiers age 45 and older, compared to 50% of Soldiers under age 25. Sixty-three percent of females had a diagnosed injury in 2018, compared to 52% of males. For both males and females across all age groups, overuse injuries, commonly attributed to military training, accounted for the majority of injuries. These injury trends are comparable to previous years.



**Soldiers are represented in both injury categories if applicable.*

SPOTLIGHT

REPORT CHARACTERIZES INJURY IN TRAINEE POPULATIONS

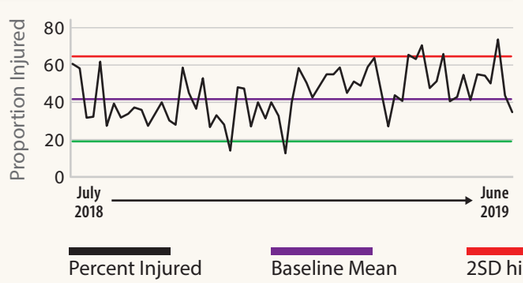
INJURY RATES AMONG ARMY TRAINEES HAVE historically been 1.3 to 1.7 times higher than rates for AC Soldiers (APHC, 2018). To better understand injuries in the trainee population, the Training-Related Injury Report (TRIR) was developed in the early 2000s to monitor monthly Basic Combat Training (BCT) injury rates at Forts Benning, Jackson, Leonard Wood, and Sill.

The TRIR focuses on the most common MSK injuries in training populations (i.e., injuries affecting the lower back and lower extremities) and initially provided monthly rates by sex for each installation. In 2018, the APHC collaborated with the U.S. Army Training and Doctrine Command (TRADOC) Surgeon's Office, The Office of the Surgeon General (OTSG) Physical Performance Service Line, and the Armed Forces Health Surveillance Branch (AFHSB) of the Defense Health Agency (DHA) to enhance this monitoring tool by reporting TRIR metrics by training cycle. These metrics were reported for each BCT cycle at all four installations and for the One Station Unit Training (OSUT) cycles conducted at Forts Benning and Leonard Wood.

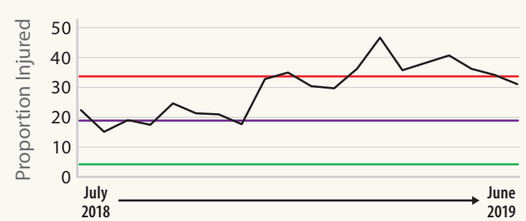
The new Quarterly TRIR provides the proportion of trainees (males and females separately) that were injured during each training cycle of BCT and OSUT at each training center. Data visualizations in the Quarterly TRIR allow leaders to monitor training cycle-based and battalion-level injury incidence (proportion of trainees that were injured) for the most recent quarter and the previous 12 months. By providing more actionable metrics, the new format allows leaders to compare injury rates across cycles, units, and installations.

Figures 1 and 2 are examples of BCT installation- and battalion-level statistical process control charts, respectively, from the Quarterly TRIR. They show the proportion of trainees that were injured in each training cycle conducted between July 2018 and June 2019. Cycles with data points at or above the red line had statistically significantly larger proportions of injured trainees compared to the sex-specific 2017 mean for all BCT cycles (2 standard deviations (2SD) above the mean). Training units with large proportions of injured trainees in consecutive training cycles, such as Battalion Y, should prioritize strategic initiatives to reduce injuries. Data at or below the green line represent significantly smaller proportions of injured trainees compared to the sex-specific mean for training cycles (2SD below the mean). Any initiatives implemented to achieve these smaller proportions of injured Soldiers, such as changes to training intensity or participation in other strategic injury reduction initiatives, should be shared with leaders in other training units (Schuh et al., 2017).

Injured Female Soldiers by BCT Training Cycle, Installation X, July 2018–June 2019



Injured Male Soldiers by BCT Training Cycle, Battalion Y, July 2018–June 2019



SPOTLIGHT

OCCUPATIONAL PHYSICAL ASSESSMENT TEST AND INJURY RISK

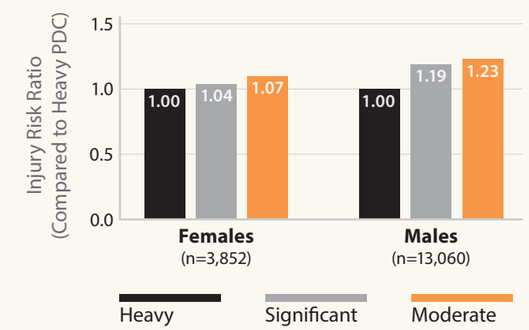
IN 2017, THE U.S. ARMY IMPLEMENTED THE Occupational Physical Assessment Test (OPAT) for all recruits (HQDA, 2016). The OPAT is a 4-event battery of physical fitness assessments that sets minimum fitness standards for entry into the Army and for each military occupational specialty (MOS). The OPAT is a tool that matches recruits with an MOS for which they should be physically qualified by the end of Initial Entry Training (IET) (i.e., BCT and OSUT).

Each Army MOS was assigned a physical demand category (PDC) of Heavy (highest PDC), Significant, or Moderate (lowest passable PDC) based on the MOS's physically demanding tasks. OPAT fitness standards were established for each PDC. To begin their IET, recruits must meet at least the Moderate PDC standard on each OPAT event, thus establishing a minimum fitness standard for both entry into the Army and for each MOS.

Studies show lower injury risks for trainees and Soldiers with higher levels of physical fitness, particularly aerobic fitness (Knapik et al., 2001). Training to pass the OPAT at the required PDC may have a positive impact on training-related injury rates through fitness improvement, especially during IET. Additionally, OPAT implementation may reduce overall injury rates because recruits are matched with the MOS for which they should be physically qualified by the end of IET.

The APHC and TRADOC monitor the association of OPAT performance during recruitment with injury risk during IET. For example, injuries during BCT were identified from the electronic health records for trainees who took the OPAT before starting BCT in 2017. For both sexes, the percentage of injured trainees increased as OPAT performance decreased from the Heavy PDC standard to the Moderate PDC standard (see figure). Among males, trainees who met only the Significant and Moderate PDC standards had statistically significant higher injury risks (19% and 23% higher, respectively) compared to trainees who met the Heavy PDC standard. Among females, trainees who met the Moderate PDC standard had a 7% higher injury risk compared to trainees who met the Heavy PDC standard (APHC, 2018).

Increased Injury Risk in BCT by Overall OPAT Performance, Fiscal Year (FY)18



Notes:
Increased risk of injury presented within PDC bars was calculated from the risk ratio (RR), comparing the percentage of injured trainees in the designated PDC to the Heavy PDC within sex. RRs (95% confidence interval) were as follows:

- Females (Significant): 1.04 (0.97–1.12).
- Females (Moderate): 1.07 (1.00–1.15).
- Males (Significant): 1.19 (1.12–1.27).
- Males (Moderate): 1.23 (1.15–1.31).

SPOTLIGHT

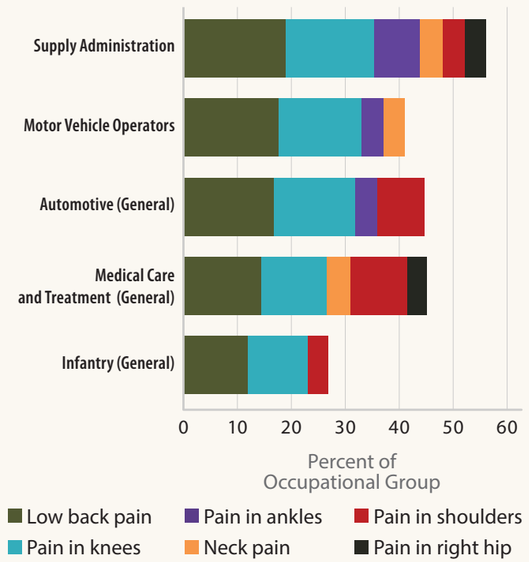
WHO REPORTS THE "MOS"T LOW BACK PAIN?

MSK CONDITIONS RELATED TO EXPOSURE to force, vibration, non-neutral postures, duration, and repetition during occupational tasks can lead to discomfort and acute or chronic disability. Back injuries have high incidence and high associated costs and are frequently linked to exposure to occupational hazards. From 2016 through 2018, low back pain had the highest number of associated encounters and costs of all diagnoses for AC Soldiers (with the exception of encounters associated with immunizations and periodic health assessment office visits).

Even physically fit Soldiers may face undue risk of MSK discomfort and injury in physically demanding jobs. Occupational work-related MSK hazards are present in many Soldier job tasks. Ergonomic changes to designs or equipment may reduce some injury burden (Hollander & Bell, 2010). Evaluating Soldier exposure to external ergonomic risk factors, as well as preventing injury through job task assessment and equipment or job redesign, can reduce overall exposure and minimize the occurrence and severity of injury and discomfort. Such actions support the Army's environment, safety, and occupational health (ESOH) strategy of enhancing mission effectiveness and resilience by ensuring that physical environment and work processes protect Soldiers, Civilians, and Families (DA, 2017a).

When considering only conditions of the MSK system and connective tissue, the five MOS groups with the highest number of Soldier encounters for MSK conditions, and highest percentage of the population with reported encounters, were Supply Administration, Motor Vehicle Operators, Automotive (general), Medical Care and Treatment (general), and Infantry (general). For each of these MOSs, low back pain was the most frequent MSK diagnosis (see figure).

Percent of Occupational Group with Encounters by Body Part, 2018



Data were extracted from the Military Health System Management and Reporting Tool.

Percent of MSK Condition Encounters Related to Low Back Pain, 2016–2018

2016 ⇨	**21%**
2017 ⇨	**20%**
2018 ⇨	**37%**

From 2016 to 2018, 16% of the full cost (i.e., encounters, treatment, etc.) of MSK conditions was related to low back pain.

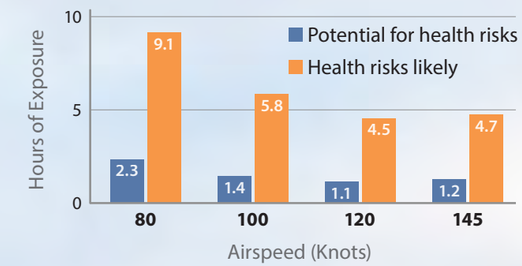
SPOTLIGHT

VIBRATION EXPOSURE AND BACK PAIN IN THE ARMY AVIATION COMMUNITY

HELICOPTER PILOTS SUFFER FROM CERVICAL and lumbar spinal degeneration (Byeon et al., 2013). Similarly, a high incidence of back pain in helicopter pilots was attributed to vibration and in-flight posture (De Oliveira & Nadal, 2005). In a survey of military helicopter pilots, the U.S. Army Aeromedical Research Laboratory (USAARL, 2017) found that 85% of pilots reported back pain at some time during their flying career; 78% of pilots reported back pain in the previous calendar year. The median flight time to back pain onset was 60 minutes, well within normal flight operations.

Characterizing and assessing aircrew vibration exposure during flight operations presents challenges. Consequently, vibration exposure data are lacking. With funding provided by the National Defense Center for Energy and Environment (NDCEE), the APHC and the Air Force Research Laboratory collected multi-axis vibration data on board a UH-60L Blackhawk helicopter. Recorded vibration during level flight conditions indicated that the pilot may be exposed to levels where a "potential for health risks" occurs in as little as 1.1 hours or where "health risks are likely" in fewer than 4.5 hours, according to international standards (see figure).

UH-60L Level Flight Exposure Limit, FY18



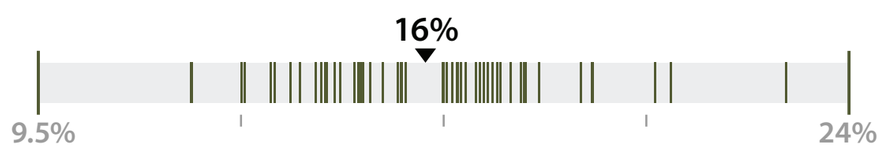
Current commercial research has focused on designing actively controlled vibration damping helicopter seat mounts and air bladder cushions to reduce vibration exposure and improve aircrew ergonomics.

Photo taken by Erich Backes, VI Specialist, TSC Baumholder / Released

Behavioral Health

The stressors of military life can strongly influence the psychological well-being of Soldiers and their Families. Behavioral health (BH) conditions, particularly when unrecognized and untreated, can lead to medical non-readiness, early discharge from the Army, suicidal behavior, and many other outcomes.

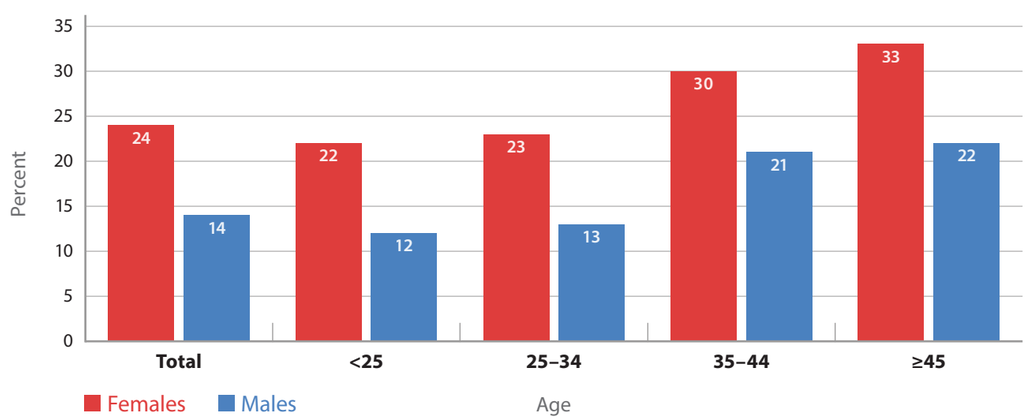
The prevalence of BH disorders was estimated using specific diagnostic codes from inpatient and outpatient medical encounter records in the MDR. In 2018, **16% of Soldiers had a diagnosis of one or more BH disorders,** which include adjustment disorder, mood disorder, anxiety disorder, posttraumatic stress disorder (PTSD), substance use disorders (SUDs), personality disorders, and psychoses.



Overall, 16% of Soldiers had a diagnosed behavioral health disorder.
Prevalence ranged from 9.5% to 24% across Army installations.

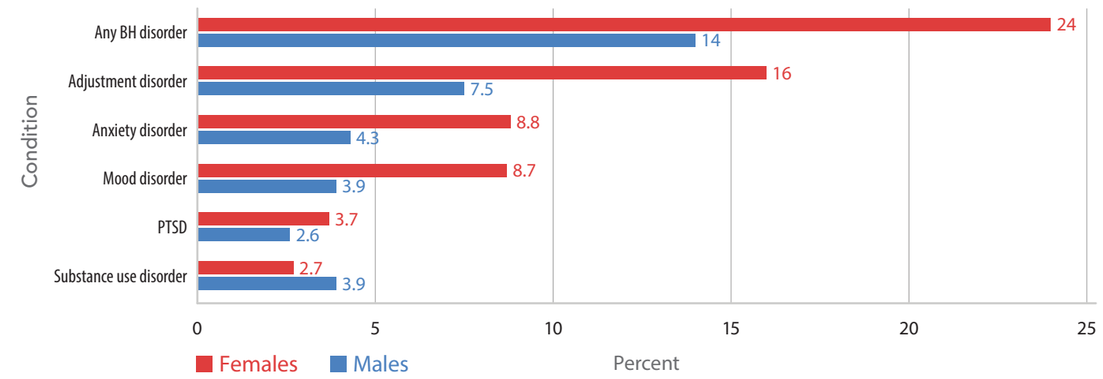
Prevalence of Behavioral Health Disorder Diagnoses by Sex and Age, AC Soldiers, 2018

The prevalence of BH diagnoses was higher among female Soldiers (24%) than male Soldiers (14%). Diagnoses of PTSD, anxiety disorders, and mood disorders were more common among older Soldiers than younger Soldiers (under 35 years of age) (e.g., PTSD 8.0% and 1.4%, respectively), whereas SUD diagnoses were more common among younger Soldiers than older Soldiers (4.1% and 2.2%, respectively).



Prevalence of Behavioral Health Disorder Diagnoses by Sex and Condition, AC Soldiers, 2018

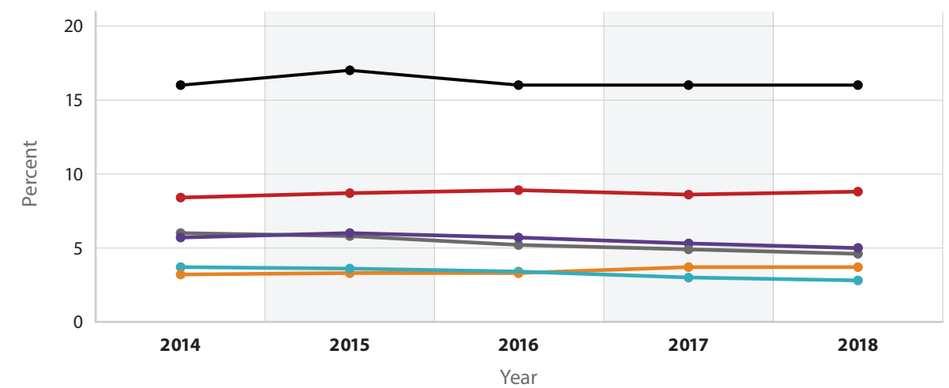
The most common BH diagnosis was adjustment disorder. The proportion of female Soldiers who received a diagnosis of adjustment disorder, anxiety disorder (excluding PTSD), or mood disorder was twice that of male Soldiers (e.g., 16% and 7.5% for adjustment disorder, respectively). SUD was the only BH condition for which the prevalence among male Soldiers exceeded that among female Soldiers (3.9% and 2.7%, respectively).



Prevalence of Behavioral Health Disorder Diagnoses by Condition, AC Soldiers, 2014–2018

The proportion of AC Soldiers with a diagnosed BH disorder (16%) has changed little over the last 5 years. Anxiety, mood, and PTSD decreased slightly, while adjustment disorder held steady, and SUD increased.

Identifying behavioral health concerns early and encouraging Soldiers to seek treatment are priority goals of the Army and lead to better long-term outcomes. Soldiers who do not receive timely treatment for behavioral health concerns are at risk for negative outcomes and decreased readiness.



	2014	2015	2016	2017	2018
Any BH disorder	16	17	16	16	16
Adjustment disorder	8.4	8.7	8.9	8.6	8.8
Anxiety disorder	5.9	6.0	5.7	5.3	5.0
Mood disorder	6.1	5.8	5.2	4.9	4.6
Substance use disorder	3.2	3.3	3.3	3.7	3.7
PTSD	3.7	3.6	3.5	3.1	2.8

Less than 1% of AC Soldiers were diagnosed with a personality disorder or psychosis.

SPOTLIGHT

ADDRESSING THE STIGMA OF BEHAVIORAL HEALTH TO IMPROVE SOLDIER READINESS

DESPITE MANY EFFORTS TO IMPROVE ACCESS to behavioral health treatment, barriers remain, and Soldiers may not seek care when they need it. Barriers to care include stigma (e.g., perceptions that one will be seen as weak), organizational barriers (e.g., appointment availability, work/mission priorities), and negative perceptions that Soldiers may have about the utility or the effectiveness of treatment (Adler et al., 2015; Hoge et. al., 2014). In response, the Department of Defense (DOD) and the Army have initiated numerous programs to enhance access and reduce behavioral health stigma (Hoge et al., 2016).

One of the key messages for Soldiers and leaders is that seeking care is a sign of strength that can support a Soldier's career, marriage, relationships, or life goals. Providers are trained to maintain a balance between the requirements (legal and ethical) to provide high-quality, confidential care and the organizational and unit mission needs for a ready Force. If a behavioral health condition interferes with a Soldier's ability to complete the mission, or there are serious safety concerns, specific requirements mandate that clinicians provide limited information to the commander about duty restrictions (e.g., reducing nighttime duty to stabilize sleep, or restricting access to weapons) through the eProfile system to ensure that both the Soldier and the unit receive appropriate levels of support. Most behavioral healthcare visits do not result in lost duty days or the need for eProfiles, but rather enable Soldiers to receive the support they need to maintain health and wellness.

Although *Health of the Force* contains information on behavioral healthcare visits at various installations, it is important not to compare data among installations or draw conclusions based on such comparisons.

Of total lost duty days due to medical conditions,

59% **are due to MSK injury temporary profiles, and**

10% **are due to BH temporary profiles (Jones et al., 2019).**

Many factors can lead to lower or higher utilization of behavioral healthcare services. For example, stigma reduction efforts have led to marked increases in utilization, so in some ways, a higher number of visits may reflect improved access and reduced barriers. Installations with high rates of behavioral healthcare visits may also have larger numbers of personnel who have deployed to war zones or are the site of tertiary facilities that provide care to seriously wounded Soldiers. Of Soldiers with a behavioral health diagnosis, 1.6% received treatment at inpatient care facilities, and 16% received treatment at outpatient care facilities.

Health of the Force does not rank installations by behavioral health data. In 2019, these data were removed from the Installation Health Index (IHI) score, not as a reflection of the level of importance of behavioral health to overall Soldier health, but rather because clinical utilization rates themselves are a poor indicator of population health, and to avoid contributing to existing behavioral health stigma. Behavioral health concerns are common among Soldiers, and their seeking treatment when needed is often the most effective way to support career or life goals and Force readiness.

LOCAL ACTION

Wiesbaden CR2C Leverages Process-based Courses of Action for Senior Leaders

The Wiesbaden Senior Responsible Officer (SRO) chairs the U.S. Army Garrison (USAG) Wiesbaden Commander's Ready and Resilient Council (CR2C). The CR2C consists of three working groups—family/social, physical/emotional, and spiritual/ethical—representing five resiliency dimensions. The SRO focused these working groups by identifying three priorities: creating a ready and resilient community, reducing high-risk behaviors, and supporting Army Families. Priority determination was influenced by the Community Strengths and Themes Assessment (CSTA), subordinate commander feedback via the CR2C and associated working groups, and U.S. Army Europe CR2C priorities.

Each working group must consider how its initiatives meet these priorities and complement the other working groups. For example, the physical/emotional working group not only focuses on medical and behavioral health but also includes the dining facility and the physical fitness center director for nutrition and physical readiness expertise, respectively. Tenant activity commanders chair the working groups, thus enabling commander input, creating community buy-in, and providing appropriate subject matter expertise.

The USAG Wiesbaden CR2C utilized the most recent CSTA to identify the areas the community had indicated as needing special focus or attention. The working groups then applied the CSTA findings to their respective areas to create process-driven initiatives whose progress is monitored each quarter through the APHC Impact Tracker. A quarterly CR2C Steering Committee meeting chaired by the Garrison Commander served as an In-progress Review, and the CR2C, chaired by the SRO, reviewed final general officer guidance and comments. The USAG Wiesbaden CR2C leverages these tools to facilitate a process-based method that provides senior officers and commanders with courses of action tailored to promote the health of the Force across the community. For example, the Wiesbaden CR2C Physical/Emotional Working Group is using the Army Combat Fitness Test (ACFT) transition as an action plan to develop educational materials with exercises to show Soldiers how to better prepare for the ACFT.

The utilization of the CSTA helped identify areas that would benefit from additional focus by giving a voice to—and creating a partnership with—the USAG Wiesbaden community. The CSTA is a critical component of a process that is designed to be community-driven and community-focused.

SPOTLIGHT

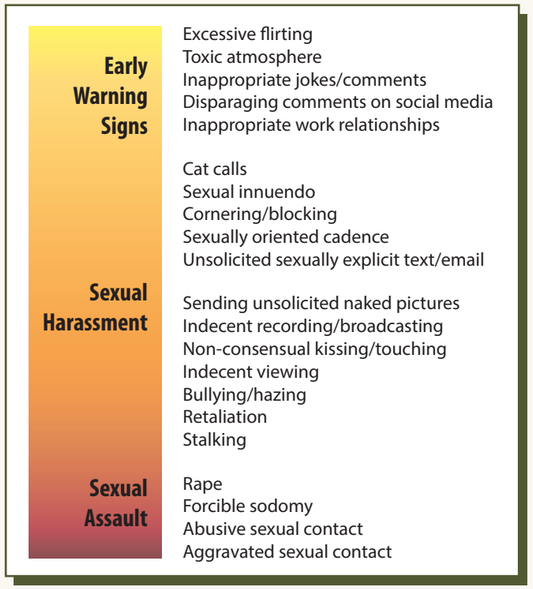
PREVENTING SEXUAL VIOLENCE AND SEXUAL HARASSMENT IN THE U.S. ARMY

SEXUAL VIOLENCE IS A SERIOUS PUBLIC HEALTH problem that affects millions of people in the U.S. each year. Sexual violence can happen to anyone, regardless of age, sexual orientation, or gender identity. According to the Centers for Disease Control and Prevention (CDC), more than one in three females and nearly one in four males experience sexual violence during their lifetime (CDC, 2019a).

Sexual violence has a devastating impact on survivors. Research shows the risk of sexual violence increases significantly when a precursor such as sexual harassment is condoned or goes unrecognized (DOD, 2019a). DOD and U.S. Army studies indicate that approximately 30% of sexual assaults are accompanied by sexual harassment before or after the assault. The attitudes and behaviors that enable harassment also foster more egregious acts.

The U.S. Army is committed to eliminating sexual violence within its formations through efforts that focus on promoting professional unit climates and a strong Army culture that respects the dignity of everyone. The Army's efforts are also designed to stop the escalation of incidents within the context of the sexual violence continuum of harm (see figure).

The Army intends to further its capacity for and capabilities in primary prevention, which includes efforts to stop sexual assault and sexual harassment before they occur. The U.S. Army Sexual Harassment/Assault Response and Prevention (SHARP) program is updating its campaign plan and developing a comprehensive prevention strategy to guide the development, implementation, and assessment of prevention efforts. Experts in prevention, research-based theories of attitude and behavior change, effective prevention programs, and potential factors that lead someone to perpetrate sexual misconduct are informing this strategy.



In alignment with the DOD and CDC, the Army is incorporating the Social-Ecological Model (SEM) into its prevention strategy. By leveraging the SEM, the Army will consider the factors that put people at risk for, or protect people from, sexual violence at four interconnected spheres of influence: individual, relationship, community, and societal. The Army recognizes that to sustain long-term effects, prevention efforts must occur within each sphere. SHARP will leverage mutually supporting policies, programs, and practices as it advances toward the ultimate goal of eliminating sexual harassment, sexual assault, and associated retaliatory behaviors. These offenses have no place in the U.S. Army. Beyond being morally unacceptable and conflicting with Army Values, they are readiness issues, which affect our ability to fight and win our Nation's wars.

SPOTLIGHT

SOLDIER USE OF PORNOGRAPHY CORRELATES WITH INTIMATE PARTNER VIOLENCE

SOCIETAL, RELATIONSHIP, AND INTRAPERSONAL factors are associated with intimate partner violence (IPV); emerging evidence suggests that problematic pornography use may be another contributor (Brem et al., 2018). Using cross-sectional data collected from a U.S. Army installation in 2018, public health analysts analyzed how problematic pornography use may be associated with self-reported perpetration of IPV (Beymer et al., in review). After accounting for other predictors of IPV (i.e., gender, age group, race/ethnicity, relationship status, education, rank, hazardous alcohol use, illicit substance use, depression, and PTSD), the study team found that Soldiers who reported pornography use were between two and five times more likely to report ever perpetrating IPV in their lifetimes. The number of hours of pornography viewed per week increased Soldiers' likelihood to self-report IPV perpetration.

Pornography often portrays violence which may normalize IPV among frequent viewers. A previous content analysis of best-selling pornography videos reported 88% of pornography scenes contained physical aggression, while 49% contained verbal aggression (Bridges et al., 2010). It is possible that IPV perpetration preceded problematic pornography consumption, but the current study was not designed to assess causality. However, the strength of association in the present study should warrant further studies in this field. Army health promotion campaigns should focus on encouraging open communication about the difference between sexual conduct depicted in pornography versus healthy, mutually-respectful relationships. In addition, military leaders and clinical providers should foster a supportive environment where IPV survivors are empowered to report abuse confidentially and without fear of retribution.

NATIONAL DOMESTIC VIOLENCE HOTLINE

If you need help, call, chat, or text today.
CALL 1-800-799-SAFE (7233)
TTY 1-800-799-SAFE (7233)
CHAT THEHOTLINE.ORG

SPOTLIGHT

HUMAN ANIMAL BOND SUPPORTS MILITARY FAMILIES

THE HUMAN ANIMAL BOND (HAB) REFERS TO the mutually beneficial connection between companion animals and owners (AVMA, 2019). With approximately 500,000 pets registered at military veterinary treatment facilities (VTFs) worldwide, companion animal ownership is common within the Military Services (APHC, 2016a). Interaction with companion animals is associated with a host of health benefits that include reduced heart rate, blood pressure, and cortisol levels; and increased hormone levels that are associated with well-being (HABRI, 2018).

The HAB is an underappreciated tool that can strengthen resiliency in Soldiers and their Families. Equally underappreciated is the notion that the HAB can support Military Families as they strive to achieve Performance Triad (P3) goals, thus underpinning both readiness and resilience (French, 2016).

Companion animals also strengthen resiliency in Military children through youth-focused animal-assisted interactions (AAI) on the installation. These interactions include dog bite prevention and reading skills improvement programs. Emotional attachment to a pet has been shown to help children develop positive coping strategies during major military life events, such as when a parent is deployed (Mueller & Callina, 2014).

Companion animals also play an important role in strengthening resiliency among individuals recovering from injury. MTFs offering AAI programs can potentially reduce loneliness, improve mood, decrease the use of anxiety medication, and strengthen self-efficacy and the motivation to engage in rehabilitation and medical care (Hosey et al., 2018).

Trained HAB dogs are currently being employed by U.S. Air Force Rescue Squadrons and U.S. Army Combat Operation Stress Control units in the U.S. Central Command Theater of Operations. These animals are utilized by unit animal handlers and licensed military social workers in an effort to reduce deployment-related stress. Emerging research on PTSD treatment in veterans shows that Psychiatric Service Dogs (PSDs) can reduce the symptoms of PTSD, contribute to improved quality of life, and improve social function (O'Haire and Rodriguez, 2018).

The HAB supports the health and wellness of Military Families. In addition to the documented health benefits associated with the HAB, companion animal ownership can assist Military Families in reaching the nutrition, sleep, and activity goals outlined in the P3. Trained HAB animals are also being effectively employed in support of the mental and physical health of Service members in current operational environments, those recovering from injury, and those affected by PTSD.

U.S. Army photo, APHC

SPOTLIGHT

PREVENTIVE CARE IN COMPANION ANIMALS ENSURES HEALTHY SOLDIERS AND FAMILIES AT HOME

EVERY YEAR, TENS OF THOUSANDS OF AMERIcans are sickened by zoonotic diseases, i.e., diseases transmitted from animals to people (e.g., rabies, Lyme disease) (CDC, 2019b). Sixty percent of emerging infectious diseases in people are zoonotic (Cunningham, 2005). Dogs, cats, pocket pets (e.g., hamsters, gerbils, guinea pigs), birds, reptiles, and other companion animals that share our homes can spread zoonotic diseases, causing mild to severe illness that can negatively impact Soldiers, Army Families, and Warfighter readiness.

Human and companion animal interactions provide many benefits to human health by enhancing both physical and psychological well-being. It is important, however, to understand the presence and prevalence of zoonotic diseases within our companion animal population and identify interventions that minimize disease transmission and maximize the benefits of the human-animal bond. The DOD recognizes this and supports many successful zoonotic disease prevention services that rely on collaboration between the installation veterinarian and human health professionals, emulating the interdisciplinary collaboration recognized within the One Health discipline (Gibbs, 2014).

Launched in June 2019, the Government and Privately-owned Animal Worldwide Surveillance System (GPAWSS) is a surveillance tool that gathers data on the frequency and incidence of specific companion animal diseases diagnosed by VTFs. GPAWSS-Zoonoses, the first program within GPAWSS to launch, enables commanders and DOD health professionals to monitor zoonotic disease trends among the Government- and privately-owned animal population and respond to potential risks to U.S. Military personnel and their Families. Diseases currently monitored by GPAWSS-Zoonoses include zoonotic acariasis (mange), anaplasmosis, campylobacteriosis, dermatophytosis, ehrlichiosis, giardiasis, hookworm infection, leishmaniasis, leptospirosis, Lyme disease, rabies, and toxocariasis.

Download milPetED today

milPetEDAPP

The Military Pet Education (milPetED) Mobile application is the one place Service members, beneficiaries, and retirees need to go to obtain animal health information, tips, and resources.

Available for

Many zoonotic diseases in companion animals are easily prevented through annual physical exams, screening for gastrointestinal parasites (fecal exam), ensuring vaccinations are current, and parasite prophylaxis and treatment. Zoonotic disease may be present but is not always accompanied by clinical signs in the companion animal, highlighting the importance of regular wellness examinations and screenings. Service members and their Families can use the MilPetED app to locate their closest VTF to schedule an appointment as well as to read a selection of educational articles on various topics, including zoonotic diseases. There are 138 VTFs operated by Army Veterinary Services on Army, Air Force, Navy, Marine Corps, and Joint bases worldwide. On average, installation veterinarians conduct 330,000 outpatient visits for privately-owned (Service members' pets) and Government-owned (Military Working Dogs, Secret Service, etc.) animals each year.

Service members and their Families should practice good personal hygiene and sanitation to minimize the risk of disease transmission from companion animals:

- Wash hands after contact with an animal or animal waste;
- Ensure food and drink do not become contaminated with animal waste; and
- Always seek advice from a healthcare provider upon becoming ill after contact with animals, especially following any animal bites, scratches, or other injuries.

Substance Use

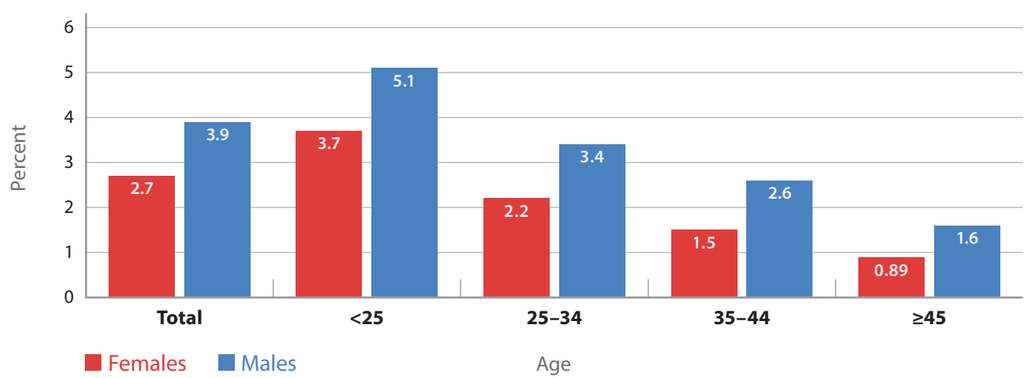
Substance use disorder (SUD) includes the misuse of alcohol, cannabis, cocaine, hallucinogens, opioids, sedatives, or stimulants. According to the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5®), a SUD diagnosis is based on evidence of impaired control, social impairment, risky use, and pharmacological criteria (APA, 2013). The misuse of alcohol, prescription medications, and other drugs can impact Soldier readiness and resilience and may have negative impacts on family, friends, and the Army community. **Drug and alcohol overdose is the leading method of non-fatal suicide attempts** (APHC, 2017b). The Army continues to adapt prevention and treatment to unique characteristics of military life and culture.

In *Health of the Force*, SUD prevalence was estimated using specific diagnostic codes from inpatient and outpatient medical encounter records in the MDR.

Overall, 3.7% of Soldiers had a substance use disorder diagnosis.
Prevalence ranged from 1.7% to 6.9% across Army installations.

Prevalence of Substance Use Disorder Diagnoses by Sex and Age, AC Soldiers, 2018

More than 18,000 Soldiers were diagnosed with a SUD in 2018. Soldiers under the age of 25 had a greater prevalence of SUDs than any other age group. In all age categories, male Soldiers had a higher prevalence of SUD diagnoses compared to female Soldiers.



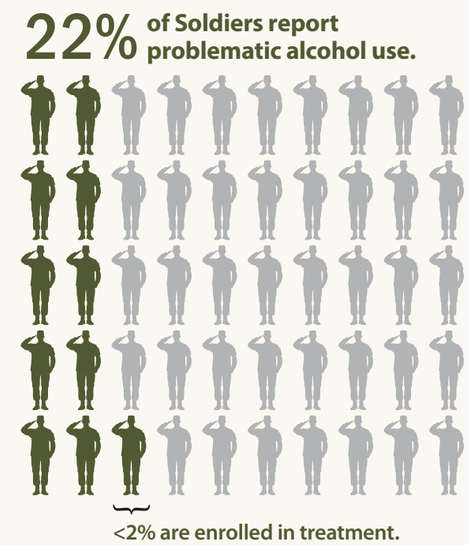
SPOTLIGHT

VOLUNTARY ALCOHOL-RELATED BEHAVIORAL HEALTH CARE AND ITS IMPACT ON READINESS

APPROXIMATELY 22% OF SOLDIERS REPORT problematic alcohol use on Post-Deployment Health Reassessments. However, less than 2% are enrolled in substance abuse treatment, in part, because previous policies and practices discouraged Soldiers from self-referring for alcohol abuse clinical care (DA, 2019a). Barriers to seeking help include stigma, concerns on deployment restrictions, automatic command notification requirements, and negative career impact.

To address these barriers and encourage Soldiers to seek help earlier, the Army created an evidence-based treatment program, Substance Use Disorder Clinical Care (SUDCC) (DA, 2019a), and published Army Directive (ARMY DIR) 2019-12, *Policy for Voluntary Alcohol-Related Behavioral Healthcare* (DA, 2019b). This directive creates a voluntary pathway by which Soldiers can receive treatment for alcohol- related problems. Voluntary care does not require automatic notification to the chain of command, render a Soldier non-deployable, impose limits on the number of times a Soldier can seek care, or carry consequences for discontinuing treatment (DA, 2019a). The goal is for Soldiers to receive help for self-identified alcohol problems before they result in career and legal consequences.

The voluntary pathway is available to Soldiers who meet the following criteria: Soldiers may not have concurrent illegal drug problems; the alcohol problems may not be associated with military or law enforcement investigations, apprehension, or intoxication while on duty; treatment must be completed in a standard outpatient behavioral healthcare setting; and alcohol use cannot cause impairment to the Soldier's judgment, reliability, trustworthiness, or present a risk that would impact the mission. Soldiers not meeting these criteria may instead be referred for alcohol treatment via the mandatory pathway.



Since the publication of ARMY DIR 2019-12, over 5,800 Soldiers have voluntarily received alcohol-related behavioral health care (DA, 2019c; DHA, 2019; DOT, 2019). Soldiers cited not being subject to automatic command notification or enrollment in mandatory substance abuse treatment as the main determining factor for seeking care for their alcohol problems. **The implementation of ARMY DIR 2019-12 has led to a 34% reduction in the deployment ineligibility of Soldiers who are receiving alcohol-related behavioral health treatment** (DHA, 2019; DOT, 2019). The Army has also seen a decrease in emergency room visits for substance abuse problems, thus supporting the effort to create a Force that is less reliant on acute crisis services. Early behavioral health intervention increases the health and readiness of our Force and encourages Soldiers to take personal responsibility to seek help earlier.

Sleep Disorders

High-quality sleep is critical to Soldier readiness and mission success. A good night's sleep can help increase productivity and decrease the risk of accidents, errors, and injuries. Sleep disorders that can impair readiness and function, including sleep apnea, insomnia, hypersomnia, circadian rhythm sleep disorder, and narcolepsy were assessed in *Health of the Force*.

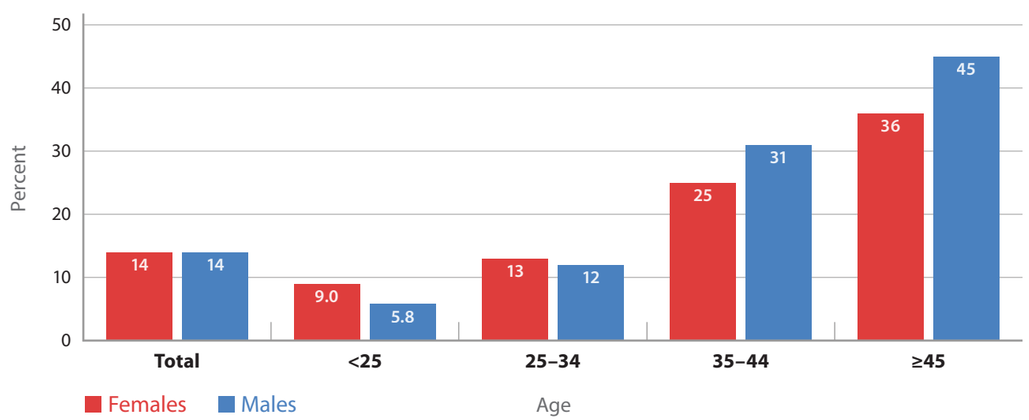
The prevalence of sleep disorders was determined using specific diagnostic codes from inpatient and outpatient medical encounter records in the MDR. Soldiers may have more than one sleep disorder; however, the overall prevalence of sleep disorders represents the proportion of AC Soldiers who have at least one of the sleep disorders assessed.

Overall, 14% of Soldiers had a diagnosed sleep disorder.

Prevalence ranged from 8.0% to 24% across Army installations.

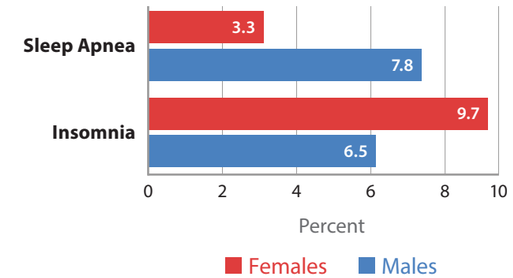
Prevalence of Sleep Disorders by Sex and Age, AC Soldiers, 2018

In 2018, approximately 14% of Soldiers had a sleep disorder. The prevalence of **sleep disorders increased with age and was more common among males than females in the older age categories.** The percentage of Soldiers diagnosed with a sleep disorder has remained relatively constant over the past 5 years.



Most Frequently Diagnosed Sleep Disorders by Sex, AC Soldiers, 2018

Sleep apnea and insomnia diagnoses made up more than 50% of the diagnosed sleep disorders in 2018. Sleep apnea accounted for 37% of all sleep disorder diagnoses. The majority of these diagnoses were for obstructive sleep apnea, a disorder that is linked to being overweight or obese. The percentage of males diagnosed with sleep apnea was over 2 times greater than that of females. Insomnia accounted for 36% of sleep disorder diagnoses. In contrast to sleep apnea, the percentage of females diagnosed with insomnia was over 1.5 times greater than that of males.



SPOTLIGHT

MAXIMIZE SLEEP IN THE OPERATIONAL ENVIRONMENT

IN THE OPERATIONAL ENVIRONMENT, SLEEP OFTEN BECOMES A LOW PRIORITY. MAXIMIZING sleep opportunities in the field is the responsibility of both Soldiers and leaders, and the following recommendations from the Walter Reed Army Institute of Research complement Performance Triad recommendations. **Remember, going without sleep is no more a "badge of honor" than going without food or water.** Soldiers who obtain sufficient sleep have a tactical advantage.

» **PLANNING.** Planning for sleep should be embedded into troop-leading procedures. Make sleep a priority, and provide operational strategies for maximizing sleep.

» **SLEEPING BEHAVIORS.** Exercising to exhaustion, consuming heavy meals, taking certain medications, and consuming caffeine and/or alcohol close to bedtime can disrupt sleep. Obtaining sufficient sleep takes planning; schedule wake-promoting behaviors for times that will not disrupt sleep.

» **TACTICAL NAPPING.** Napping can boost daytime alertness and should be encouraged. During sustained and continuous operations, take advantage of shorter opportunities for sleep while promoting safety until the next opportunity for a longer sleep period occurs.

» **CAFFEINE OPTIMIZATION.** Structured caffeine dosage and timing throughout the 24-hour day can temporarily boost alertness during sustained and continuous operations. Caffeine does not replace sleep, however, and can be disruptive when consumed before bedtime. Avoid consumption of caffeine approximately 6 hours prior to bedtime.

» **SLEEP ENVIRONMENT.** Reducing ambient noise and light, maintaining a cool temperature, and sleeping on a comfortable surface can promote restorative sleep in operational environments. Designate safe sleeping areas away from vehicles/high-risk equipment to reduce the risk of accidents, injury, and/or death.

» **SLEEP BANKING.** Sleep loss has compounding, cumulative effects. Soldiers who are running on little sleep will be less resilient during the next period of sleep loss. When sleep loss is unavoidable, "bank" sleep ahead of time by sleeping more than usual. This investment can help Soldiers be more vigilant and effective.

» **WHEN YOU SLEEP MATTERS.** Exposure to light close to sleep time (especially blue light from electronic devices) can shift the body's internal clock and disrupt sleep. Avoid bright light close to sleep time; if electronics can't be avoided, use a blue-light filter. Get bright light exposure in the morning to prevent misalignment. If possible, try to sleep during the night for more restorative sleep.

Obesity

Body Mass Index (BMI) is used to characterize body fat in adults by dividing weight in kilograms by the square of height in meters. The measurements used to calculate BMI are non-invasive and inexpensive to obtain. The CDC defines BMI greater than 18.5 but less than 25 as "normal weight"; BMI greater than or equal to 25 but less than 30 as "overweight"; and BMI greater than or equal to 30 as "obese." While BMI does not differentiate between lean and fat mass, BMIs of ≥30 typically indicate excess body fat.

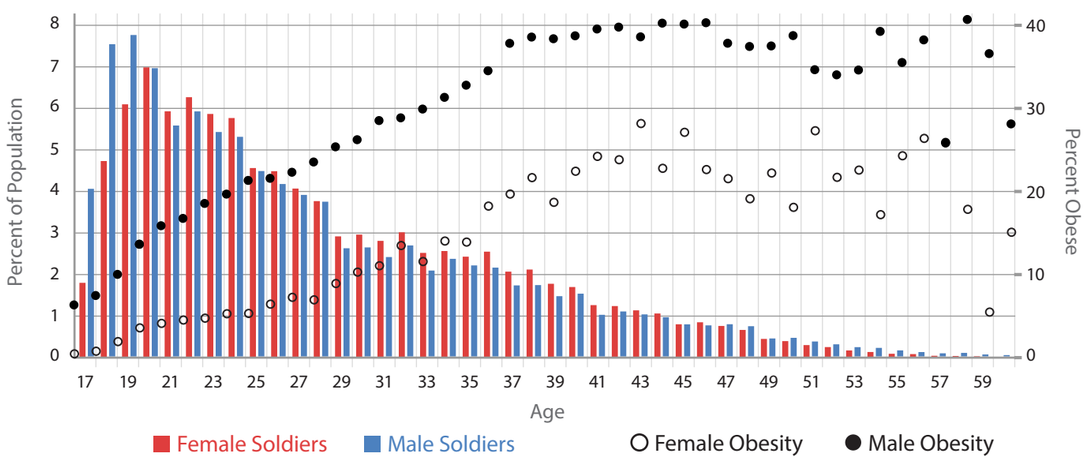
BMI should be interpreted with caution because it does not always provide a good estimate of body fat. The relationship between BMI and body fat is influenced by age and sex. Among males, especially younger males, BMI is more highly correlated with lean muscle mass than percent body fat. As males and females age, they tend to lose muscle mass, and percent body fat increases. Males and females of a given height and weight will have the same calculated BMI; however, females will have, on average, a higher percent body fat compared to males.

Overall, 17% of Soldiers were classified as obese.

Prevalence ranged from 11% to 25% across Army installations.

Age Distribution and Prevalence of Obesity, AC Soldiers, 2018

Among Soldiers, the prevalence of obesity increases linearly with age until the mid-40s. The population distribution of female Soldiers and male Soldiers (bars) is overlaid with the proportion of female Soldiers and male Soldiers who are obese (dots).



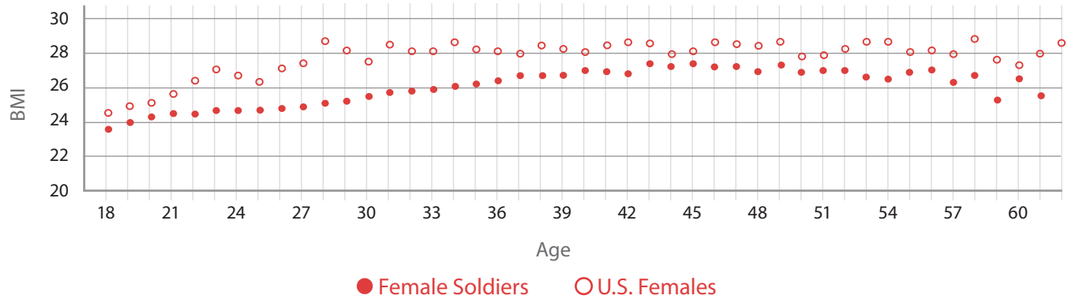
In comparison, 26% of a similar population of U.S. adults were classified as obese.*

** The prevalence of obesity among Soldiers was lower compared to the U.S. population, after adjusting the employed, military-age population to the AC Soldier population by age and sex.*

Source: BRFSS, 2018

Mean BMI for Female AC Soldiers and Female U.S. Civilians, Age 18–62, 2018

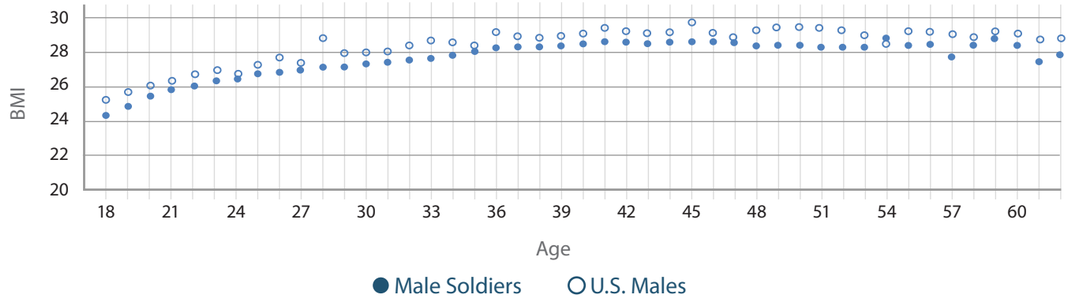
Among females between the ages of 18 and 64, mean BMI was significantly lower among Soldiers compared to civilians. Mean BMI increases with age across both populations, with working U.S. females reaching their peak around age 30 while female Soldiers reach their peak BMI roughly a decade later in their early 40s. This difference may be due to the physical activity and fitness levels required of female Soldiers. The eventual apparent leveling off and decrease in average BMI for females in both populations may be due in part to a healthy worker bias.



Mean BMI for Male AC Soldiers and Male U.S. Civilians, Age 18–62, 2018

Mean BMI for male Soldiers is similar to, or somewhat lower than, mean BMI among civilian males. There is a clear linear trend as mean BMI increases with age until males reach their early 40s. An apparent leveling off and then decrease in average BMI after age 40 is observed in both Soldier and civilian populations, in part due to a healthy worker bias.

Soldiers must be fit enough to fulfill their missions and are required to maintain a "professional military appearance" (DA, 2017b). Therefore, it is not surprising that Soldiers' mean BMI is generally lower (markedly lower for female Soldiers) than that of their civilian counterparts.



LOCAL ACTION

Fort Meade Improves Soldier Health through Synchronization of Services

Based on obesity data presented in 2019 at the CR2C (APHC, 2019b), the leadership at Fort Meade's Kimbrough Ambulatory Care Center established a priority to synchronize the Army Wellness Center (AWC) and Operational Medicine.

As a result, the AWC and Operational Medicine will be co-located within the Kimbrough Campus. Improving the location proximity for these services encourages and improves synchronized operations and optimizes access to care. As Operational Medicine focuses on periodic health assessments and medical readiness, the AWC staff is expanding health education services that focus on sleep, exercise, and nutrition by providing Performance Triad coaching materials, conducting individual fitness assessments, providing Service members and Family members with personalized plans that support individual health and wellness goals (e.g., weight loss, muscle and strength increases, and improved eating habits), leading health and wellness training to reduce stress, and partnering with fitness trainers to support implementation of the ACFT. Through sustained collaboration with installation command teams, the Fort Meade AWC continues to focus on promoting health, building resilience, and increasing readiness.

(Opposite page) *Fort Meade Army Wellness Center staff (from left to right) Michael Crossett, Shelby Beattie, Ursula Ulery, Andrea Navarro, and Fort Meade MEDDAC Commander COL James D. Burk cut the ribbon to officially celebrate the opening of the AWC's new location during a ceremony on 31 January 2020. The new location allows an expansion of services and capabilities to Service Members, Retirees, Family members, and DOD Civilians with a focus on performance improvement and injury prevention. Since its launch in 2013, Fort Meade's AWC has helped approximately 7,000 Service Members and more than 3,000 Family members and DOD Civilians. (U.S. Army photo by Michelle Gonzalez)*

Tobacco Product Use

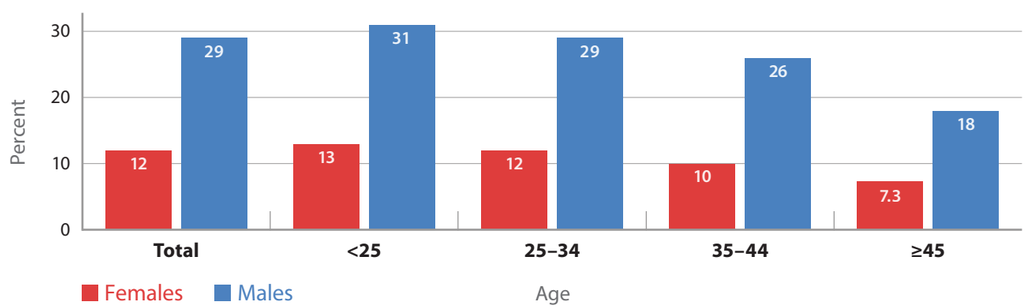
Using tobacco products negatively impacts Soldier readiness by impairing physical fitness and by increasing illness and absenteeism (DA, 2015). In *Health of the Force*, the prevalence of tobacco product use is estimated using Periodic Health Assessment (PHA) data (DOD, 2016a). The PHA asks Soldiers which tobacco products they have used on at least one day in the prior 30 days. In 2018, the PHA began systematically collecting data on vaping and electronic cigarette (e-cigarette) use, and other alternative methods of consuming nicotine. For this report, smoking products are defined as cigarettes, cigars, cigarillos, bidis, pipes, and hookah/waterpipes; smokeless products are defined as chewing tobacco, snuff, dip, snus, and dissolvable tobacco products; e-cigarettes are defined as electronic cigarettes or vape pens. Soldiers complete the PHA as part of a regular physical exam which determines an individual's ability to deploy. Soldiers may not choose to report, or may underreport, their tobacco usage to avoid potential negative attention.

Excluding e-cigarette use, 26% of Soldiers reported using tobacco products.

Prevalence ranged from 12% to 32% across Army installations.

Prevalence of Tobacco Use by Sex and Age, AC Soldiers, 2018

Regardless of sex, the majority of tobacco product users are 34 years of age or younger. **Across the age groups, the prevalence of tobacco use among male Soldiers was more than double that of female Soldiers.**



Between the publication of the 2018 and the current 2019 *Health of the Force* reports, the DOD adopted a new version of the PHA with fundamental changes to data collection for several medical metrics, to include tobacco product use. Due to data collection changes in both content and temporality, the above presented data are not comparable to previous *Health of the Force* reports. For a more in-depth explanation of the changes to the PHA affecting the tobacco product use metric, please see page 146 of this report.

Prevalence of Nicotine Product Use, AC Soldiers, 2018

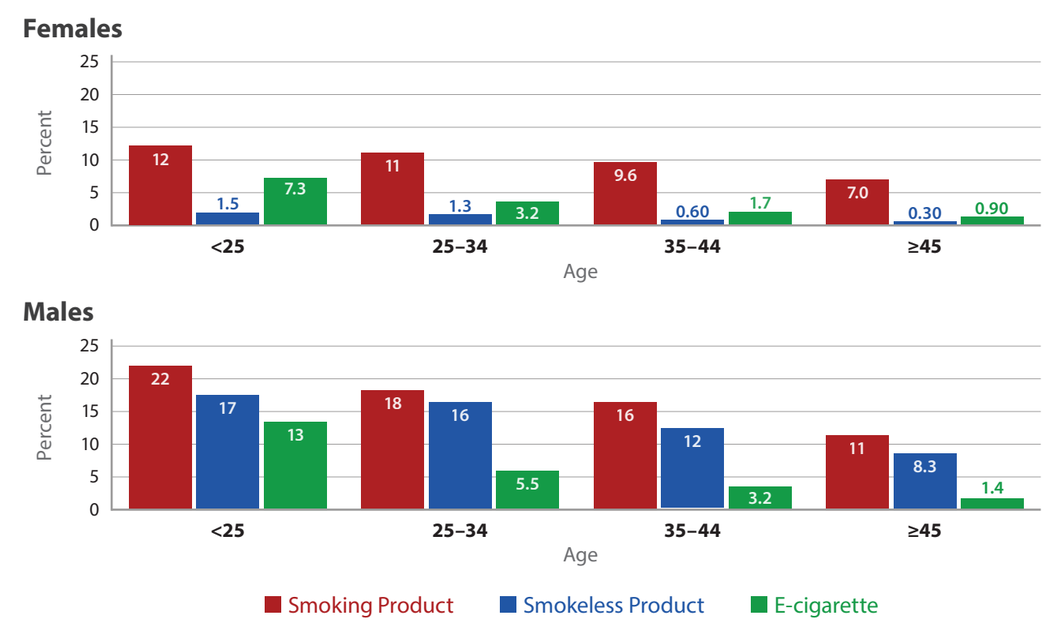
Among the tobacco product use categories assessed, the largest number of Soldiers reported smoking (n= 58,029; 17%), followed by the number of Soldiers who reported smokeless tobacco use (chewing or dipping) (n= 43,282; 13%). In 2018, 7.2% (n= 25,056) of Soldiers who completed the PHA self-reported the use of e-cigarettes.

The general U.S. population prevalence of tobacco product use (22%) is lower than the Army prevalence (26%). In contrast, the adjusted U.S. and Army smoking product use is identical at 17%. The difference in tobacco use is driven by use of smokeless tobacco product use where the Army prevalence (13%) is almost three times higher than the national estimate (4.7%) (BRFSS, 2018).

U.S. population tobacco use is estimated using BRFSS data, which were adjusted to the AC Soldier age and sex distribution for employed individuals. Tobacco use is defined differently in the BRFSS than in the PHA. While the PHA considers any use for at least one day in the past 30 days, BRFSS has a more stringent requirement (more than 100 cigarettes in their lifetime and currently smoking some days or every day).

Prevalence of Tobacco Product Use by Type, Sex, and Age, AC Soldiers, 2018

For both sexes, smoking tobacco products were the primary type of tobacco used across age groups. Males most frequently reported using smoke products followed by smokeless and e-cigarette products, across age groups. Females most frequently reported using smoke products followed by e-cigarette products and smokeless products, across age groups. Regardless of sex, the majority of e-cigarette users are 34 years of age or younger.



LOCAL ACTION

Fort Lee Tobacco-Free Living Campaign Helps Soldiers Kick the Habit

In 2018, the Fort Lee CR2C Physical Resiliency Work Group (PRWG) implemented a Tobacco-Free Living Campaign. The CR2C PRWG collected survey data across all units and tenant organizations impacted by vaping and tobacco usage. Using the survey results, the PRWG then focused the campaign on Advanced Individual Training units and the Army Learning University.

The Tobacco-Free Living Campaign includes several multipronged approaches to tobacco and vaping cessation through a comprehensive media campaign. Soldiers interested in quitting tobacco or vaping are encouraged to make appointments with 1) a physician's assistant for prescribed medications, and 2) an Army Public Health Nurse (APHN), who uses health-coaching techniques to develop Soldiers' individual smoking cessation plans. APHNs also share available smoking cessation resources at monthly Unit Health Promotion Council meetings. The purpose of these meetings is to provide the Commander, 59th Ordnance Brigade with situational awareness of all trends, challenges, and best practices implemented across the Brigade to improve the morale, spiritual, emotional, and physical growth of its Soldiers and Families. Virtual cessation counseling became available in fall 2019 to assist Soldiers who are deployed or otherwise unable to obtain smoking cessation assistance.

To increase community awareness of tobacco and vaping dangers, the Annual Kick Butts Campaign at Fort Lee included a World No Tobacco Day basketball tournament with the Kenner Army Health Clinic's Soldiers and Fort Lee's Youth Services, a library program reading of "Smoking Stinks" to elementary-aged children, and frequent tobacco-free living in-processing briefings. Future goals include creation of Tobacco-Free Living Campuses on Fort Lee and work towards a completely tobacco-free installation.

SPOTLIGHT

PUBLIC HEALTH ALERT: ELECTRONIC CIGARETTES AND VAPING

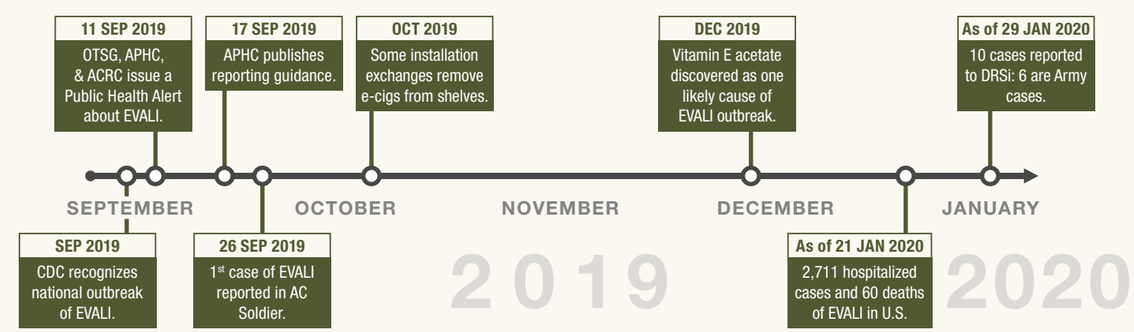
THE U.S. ARMY'S MISSION TO STRENGTHEN resilience, readiness, and combat effectiveness through stamina advocacy programs (OTSG, 2013) is challenged by the popularity and availability of "non-cigarette tobacco products" (DHHS, 2014; CPHSS, 2014), including electronic nicotine delivery systems, electronic cigarettes (e-cigarettes), and vape products.

Current evidence indicates that e-cigarettes contain and release many known toxic chemicals. As e-cigarette products are largely unregulated, the concentrations and characteristics of potentially toxic chemicals present in the vaped aerosol, including nicotine, are highly variable and depend on the device type, selected vaped e-liquid, and user customization of the device and e-liquid (APHC, 2016b). Additionally, e-cigarette devices can explode, causing severe burns and bodily injury (Katz & Russell, 2019). Intentional or accidental exposure to some vaping liquids can induce seizures, brain injury, vomiting, and lactic acidosis (Kelner & Bailey, 1985). Deliberate or unintentional ingestion of the e-liquid can be fatal (APHC, 2016b). Studies show that chemicals in e-cigarette aerosols may cause DNA damage and mutagenesis—hallmarks of cancer development—and that e-cigarette aerosols damage oral health and cause inflammation (Anderson et al., 2016).

In September 2019, the CDC recognized a national outbreak of e-cigarette, or vaping, product use-associated lung injury (EVALI). In December 2019, it was discovered that several confirmed EVALI cases had supplemented their vaping products with vitamin E acetate, a highly viscous and oily substance now thought to be one of the major causes of lung injury among these cases.

On 11 September 2019, on behalf of OTSG, the APHC and U.S. Army Combat Readiness Center (ACRC) issued a Public Health Alert on the vaping issue. The APHC then published a statement discouraging e-cigarette use, and the DHA instructed MTFs to report EVALI cases to the Disease Reporting System, internet (DRSi).

As of 21 January 2020, 2,711 EVALI cases (including 60 deaths) were reported to the CDC, including 10 confirmed or probable cases reported to DRSi (6 from Army MTFs). Although reported cases have persistently declined since peaking in September 2019, continued awareness and prevention efforts are critical. Further study is needed to guide e-cigarette prevention and regulatory efforts.



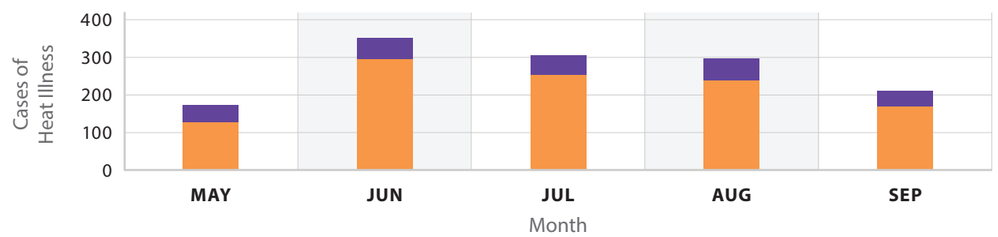
Heat Illness

Heat illness refers to a group of conditions that occur when the body is unable to compensate for increased body temperatures due to hot and humid environmental conditions and/or exertion during exercise or training. These illnesses exist along a continuum of symptoms and, in the most severe cases, can be life threatening. The heat illnesses assessed in *Health of the Force* include heat exhaustion and heat stroke. These are reportable medical events that should be reported through the DRSi.

Heat illness was determined using specific diagnostic codes from inpatient and outpatient medical encounter records in the MDR, in addition to cases of heat exhaustion and heat stroke reported through DRSi. Soldiers who experienced more than one heat illness event in the calendar year were only counted once.

Incident Cases of Heat Illness by Month*, AC Soldiers, 2018

In 2018, 1,499 incident cases of heat illness occurred. Of the incident cases, the majority (80%) were heat exhaustion, and the remaining 20% were heat stroke. Although heat exhaustion and heat stroke were diagnosed and reported year-round, the number of incident cases of heat illness was highest during the warmer months (May through September).

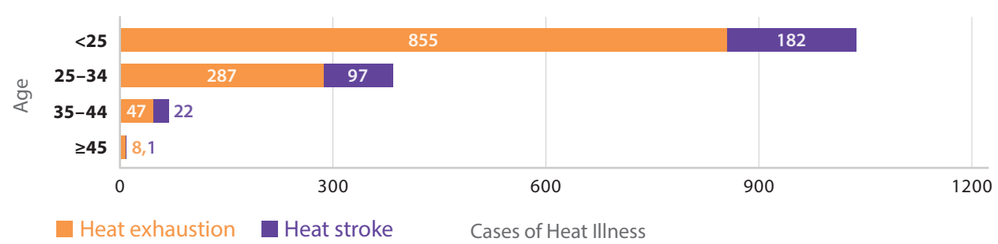


	MAY	JUN	JUL	AUG	SEP
Heat stroke	45	55	52	57	42
Heat exhaustion	127	295	254	239	170

**Months not shown had <20 cases for heat exhaustion and/or heat stroke.*

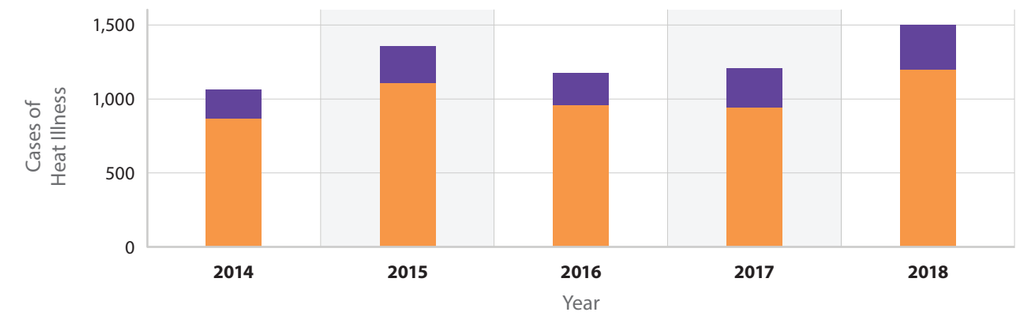
Incident Cases of Heat Illness by Age, AC Soldiers, 2018

In 2018, **71% of heat exhaustion cases and 60% of heat stroke cases occurred in AC Soldiers younger than 25 years old.**



Incident Cases of Heat Illness, AC Soldiers, 2014–2018

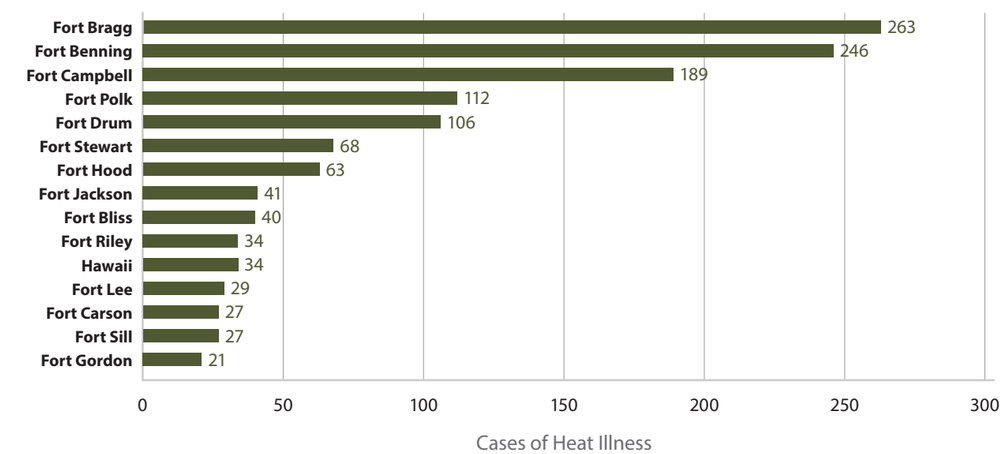
The total number of diagnosed heat illness cases has increased over the past 5 years. This increase is largely driven by the number of heat exhaustion cases being diagnosed and reported. The Army has recently emphasized recognition and reporting of heat illness cases, which could account for some of the increased incidence over time.



	2014	2015	2016	2017	2018
Heat stroke	197	246	214	262	302
Heat exhaustion	870	1,109	961	944	1,197

Heat Illness Totals by Installation*, AC Soldiers, 2018

At the installation level, geographic location, weather patterns, and Soldier population (i.e., large training populations) are factors that can affect heat illness incidence. Several of the installations with the highest number of heat illness cases are located in the Southeastern U.S.



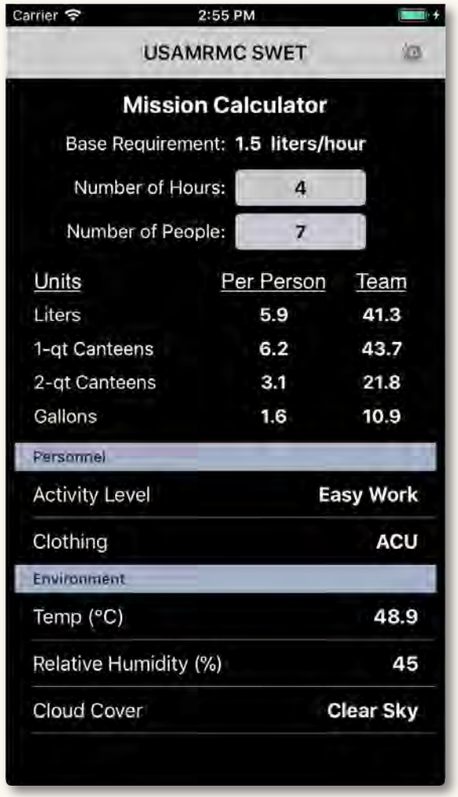
**Installations not shown in the graph had fewer than 20 heat illness cases (heat exhaustion and heat stroke combined).*

U.S. Army Photo, APHC

SPOTLIGHT

INNOVATIVE MOBILE APPLICATION KEEPS SOLDIERS HYDRATED

PROVIDING AN ADEQUATE SUPPLY OF DRINKING water to Soldiers in field training or contingency operations can require tremendous manpower, vehicle space, and fuel consumption. These factors make water transport one of the largest military logistical supply burdens. The U.S. Army Research Institute of Environmental Medicine (USARIEM), in collaboration with MIT-Lincoln Laboratory and the U.S. Army Medical Materiel Development Activity, developed the Soldier Water Estimation Tool (SWET), a mobile application that provides Army leadership with a simple and flexible way to predict the water needs of groups of Soldiers. Decades of USARIEM research led to the development and validation of an equation that accurately predicts sweat losses (i.e., water needs) over a range of environments, activities, and clothing characteristics. The SWET integrates this equation into a mobile application with simple, multiple-choice user inputs for activity level, clothing, and cloud cover; and manual entry of exact values for temperature and relative humidity. The SWET "Mission Planner" tool estimates the total drinking water needs for a unit based on mission duration and number of personnel. The SWET App is currently available on the TRADOC App Gateway and the Nett Warrior system.

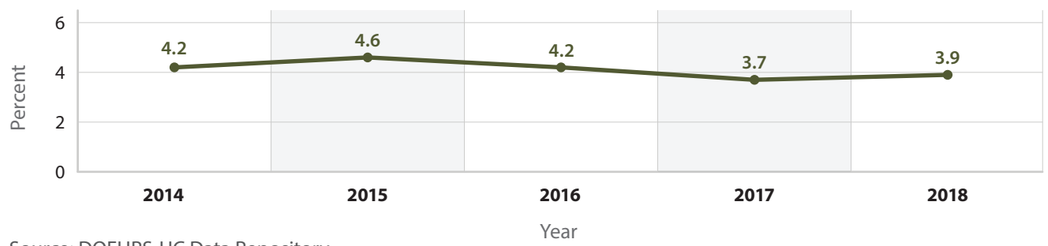


Hearing

Good hearing preserves situational awareness for critical communication abilities (e.g., acoustic stealth, detection, localization, and identification), and improves communication responses that are crucial to success on the battlefield. Hearing readiness is an essential component of medical readiness and is monitored via the Medical Protection System (MEDPROS) using Defense Occupational and Environmental Health Readiness System – Hearing Conservation (DOEHRS-HC) hearing test data. Hearing metrics are utilized by the Army Hearing Program (AHP) to monitor hearing injuries and hearing readiness among AC Soldiers.

Percent New Significant Threshold Shifts, AC Soldiers, 2014–2018

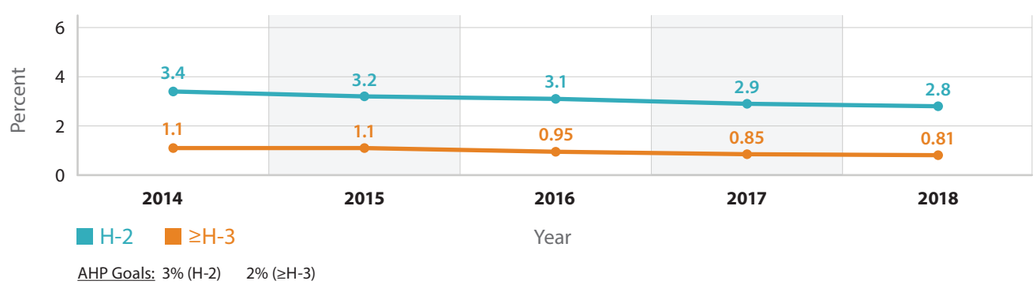
Hearing injuries decreased slightly from 2014 to 2018. In 2018, 3.9% of AC Soldiers experienced a significant threshold shift (STS), or decreased hearing, in one or both ears when compared to their baseline hearing test. This is a slight increase from 2017, and above the AHP hearing injury goal of less than 3% of Soldiers.



Source: DOEHRS-HC Data Repository

Prevalence of Hearing Profiles, AC Soldiers, 2014–2018

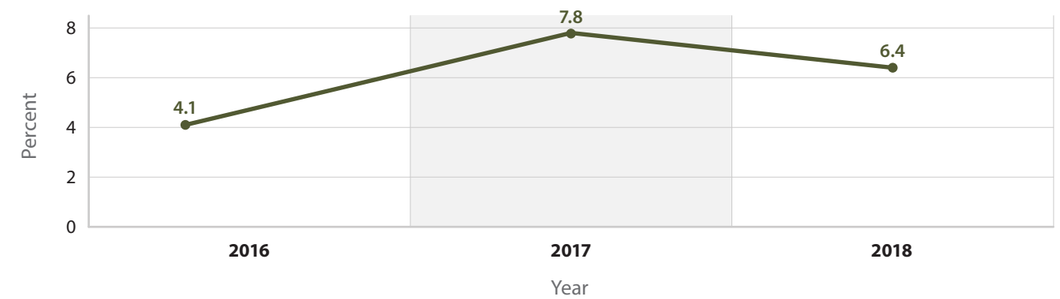
The prevalence of hearing profiles among AC Soldiers continues to decline. AC Soldiers with a projected H-2 hearing profile (clinically significant hearing loss) decreased from 3.4% in 2014 to 2.8% in 2018. AC Soldiers with a projected ≥H-3 hearing profile (indicative of moderate hearing loss and requiring a fitness-for-duty hearing readiness evaluation) decreased from 1.1% in 2014 to 0.81% in 2018.



Source: DOEHRS-HC Data Repository

Percent Not Hearing Ready (HRC 4), AC Soldiers, 2016–2018

In 2018, 6.4% of AC Soldiers were not "hearing ready" due to being assigned a Hearing Readiness Classification 4 (HRC 4). This is a decrease from 2017 and just above the AHP goal of 6%. AC Soldiers who are not "hearing ready" are either overdue for their annual hearing test, require follow-up hearing testing to identify their true hearing ability, or missed the follow-up test window.



Source: MEDPROS

Hearing is a requirement for Soldier performance, affecting both survivability and lethality. Soldiers are susceptible to noise-induced hearing loss (NIHL), in part, because such injuries are typically painless, progressive, permanent, and lacking the immediacy of an open wound, a pulled muscle, or an eye injury. That said, NIHL is preventable! **Prevention occurs with the use of noise control engineering, monitoring audiometry, appropriate hearing protection, hearing health education, and AHP command enforcement.** Hearing injuries impact mission performance during garrison activities, deployments, active training, and combat.

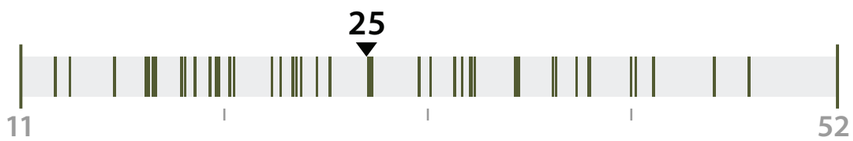
Contact your unit Hearing Program Officer, installation AHP manager, Regional Health Command Audiology Consultant, or the APHC's AHP for assistance. What you hear—or don't hear—matters!

Sexually Transmitted Infections

Chlamydia is the most commonly reported sexually transmitted infection (STI) in the U.S. Left untreated, chlamydia can lead to reproductive health complications such as pelvic inflammatory disease, ectopic pregnancy (i.e., pregnancy outside the uterus), chronic pelvic pain, and infertility that can compromise military medical readiness and Soldier well-being. **Because most chlamydia infections do not cause symptoms, people are often unaware that they have an infection.** Therefore, screening is essential.

The U.S. Preventive Services Task Force (USPSTF) recommends that sexually active females under 25 years of age, and those at increased risk (e.g., individuals with multiple partners), be screened annually. Rates of reported chlamydia infection are not necessarily reflective of the true burden of disease. Higher rates of reported chlamydia infection may reflect enhanced screening or reporting, both of which are positive attributes of a health system.

For the Army AC population, chlamydia cases reported by military MTFs were identified using the DRSi. Incidence rates reflect all new infections; therefore, Soldiers may have more than one chlamydia infection per calendar year.

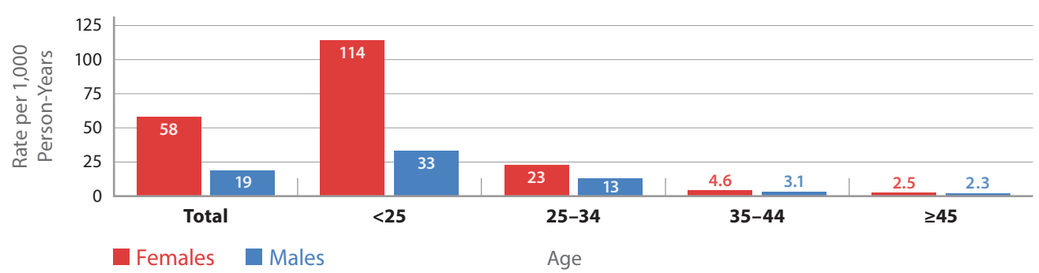


Overall, 25 new chlamydia infections were reported per 1,000 person-years.

Incidence ranged from 11 to 52 per 1,000 person-years across Army installations.

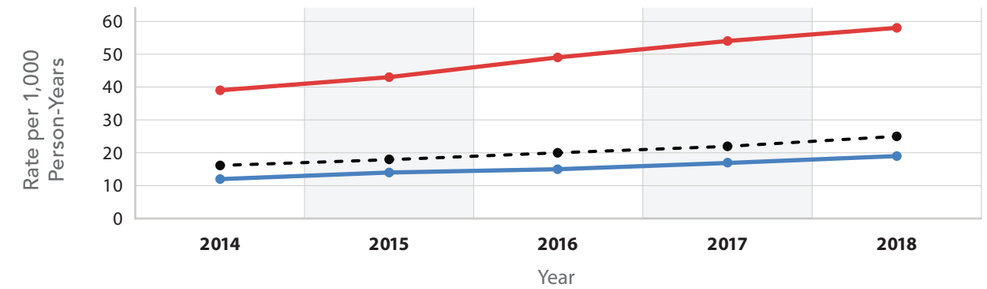
Incidence of Reported Chlamydia Infection by Sex and Age, AC Soldiers, 2018

The rate of reported chlamydia infections among female Soldiers was roughly three times the rate among male Soldiers. Rates were highest among female Soldiers under 25 years of age (a group targeted for annual screening), with 114 reported infections per 1,000 person-years.



Incidence of Reported Chlamydia Infection by Sex and Age, AC Soldiers, 2014–2018

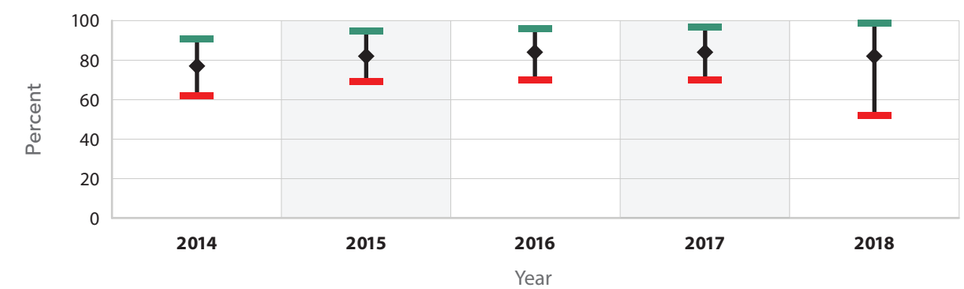
A steady rise in reported chlamydia infections has occurred over the past 5 years, consistent with rising national rates. **Rates reported for 2018 were 58% higher than in 2014.** Greater increases were observed among male Soldiers over this period (a 61% increase compared to a 47% increase in female Soldiers).



	2014	2015	2016	2017	2018
Army Total	16	18	20	22	25
Females	39	43	49	54	58
Males	12	14	15	17	19

Percent of AC Female Soldiers under 25 Years Old Screened for Chlamydia, 2014–2018

On average, 82% of female Soldiers under 25 years old were screened for chlamydia in 2018 in accordance with USPSTF guidelines. Screening compliance has improved from the 77% observed in 2014; however, there is considerable variability by installation, with compliance ranging from 52% to 99%. A higher degree of variation was observed in 2018 relative to previous years. Overall, Army screening compliance was markedly higher than that observed nationally, where 2018 screening compliance ranged from 48% to 58%, depending on the insurance provider.



	2014	2015	2016	2017	2018
Installation maximum	91	95	96	97	99
Army average	77	82	84	84	82
Installation minimum	62	69	70	70	52

Data sources:
Army: MHS Population Health Portal
National: National Committee for Quality Assurance (NCQA), 2018

Chronic Disease

Chronic diseases hinder military medical readiness by decreasing Soldiers' ability to fulfill physically demanding mission requirements or to deploy to remote locations where healthcare resources are limited. Many chronic diseases can be prevented and managed in part by adopting healthy lifestyle choices such as maintaining a healthy diet, exercising regularly, and avoiding tobacco use. The chronic diseases assessed in *Health of the Force* include cardiovascular disease, hypertension, cancer, asthma, arthritis, chronic obstructive pulmonary disease (COPD), and diabetes.

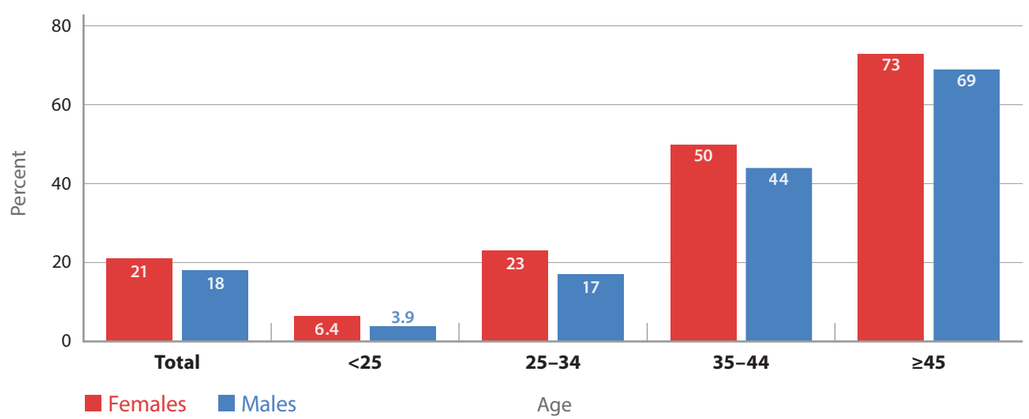
The prevalence of chronic diseases was determined using specific diagnostic codes from inpatient and outpatient medical encounter records in the MDR. Soldiers may have more than one chronic disease; however, the overall prevalence of chronic disease represents the proportion of AC Soldiers who have at least one of the chronic diseases assessed.

Overall, 19% of AC Soldiers had a diagnosed chronic disease.

Prevalence ranged from 13% to 37% across Army installations.

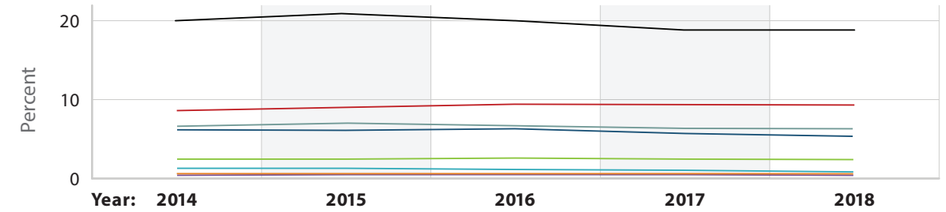
Prevalence of Chronic Disease by Sex and Age, AC Soldiers, 2018

The **prevalence of chronic disease increases with age.** Female Soldiers had a higher prevalence of chronic disease compared to male Soldiers across all age groups. Among AC Soldiers in 2018, 21% of females and 18% of males had at least one chronic disease.



Prevalence of Chronic Diseases by Disease Category, AC Soldiers, 2014–2018

In 2018, 19% of AC Soldiers had a chronic disease. The prevalence of Soldiers with any chronic disease has been decreasing since 2015. In 2018, the **most prevalent chronic disease was arthritis (9.3%), followed by cardiovascular disease (6.0%).**



	2014	2015	2016	2017	2018
Any (%)	20	21	20	19	19
Arthritis (%)	8.6	9.1	9.5	9.4	9.3
Cardiovascular (%)	6.4	6.8	6.5	6.1	6.0
Hypertension (%)	6.5	6.4	6.2	5.8	5.6
Asthma (%)	2.6	2.6	2.7	2.6	2.5
COPD (%)	1.4	1.4	1.3	1.1	1.0
Diabetes (%)	0.5	0.5	0.5	0.3	0.3
Cancer (%)	0.3	0.4	0.4	0.4	0.4

The sum of disease categories is greater than the any chronic disease prevalence, as Soldiers may have more than one condition.

SPOTLIGHT

CANCER CLUSTERS IN THE SOLDIER COMMUNITY

THE NATIONAL INSTITUTES OF HEALTH defines a cancer cluster as "the occurrence of a greater than expected number of cancer cases among a group of people in a defined geographic area over a specific period" (NIH, 2018). A cancer cluster may be due to a shared exposure, clustering of susceptible individuals, or simply due to chance. Only in extremely rare instances is a clear cause of a cancer cluster revealed (Goodman et al., 2012). The response to a potential cancer cluster is often politically and emotionally sensitive and can also be resource intensive (Sharkey & Hauschild, 2013).

A cancer diagnosis can often lead to fear and a sense of crisis (NCCS, 2019). It is also common for those diagnosed with a cancer to reflect on their past exposures and wonder whether they were exposed to something which may have caused their cancer. Concern regarding environmental exposures may be compounded when an unusually large number of cancers are diagnosed among a defined group, such as a military unit (VA, 2019).

During their military service, Soldiers may be exposed to environmental hazards that increase their risk of developing cancers (NRC, 2013). Soldiers' environmental carcinogen exposures, along with genetic, demographic, and behavioral factors and other exposures, may increase their risk of developing cancer (ATSDR, 2011). Examples of exposures containing known or possible carcinogens that may affect Soldiers' cancer risk include burn pit emissions, fumes from fires, exhaust fumes from vehicles or machinery, solvents, intense sun, weapons and munitions, pesticides, asbestos, and ionizing radiation.

Are Service Members More Likely to Develop Cancer?

Each of the more than 100 different types of cancers has specific risk factors and causes (ACS, 2019). Nearly 40 percent of Americans are diagnosed with a cancer at some point in their lives (ACS, 2019). Compared to the U.S. population, Service members are estimated to have lower incidence of overall cancer, colorectal cancer, lung cancer, and cervical cancer (Zhu et al., 2009). However, military personnel are estimated to have higher rates of prostate cancer, breast cancer, testicular cancer, melanoma, and thyroid cancer (Zhu et al., 2009; Levine et al., 2005; Lea et al., 2014). Based on the literature, Service members can be said to have a mixed risk profile for developing cancer compared to the overall U.S. population.

SPOTLIGHT

MEASLES VACCINATIONS SUPPORT TOTAL ARMY HEALTH

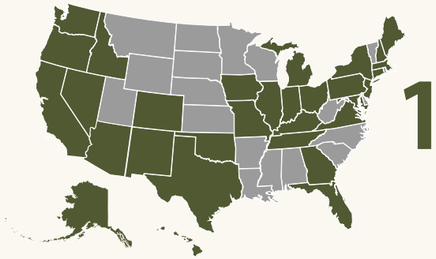
MEASLES IS A HIGHLY CONTAGIOUS VIRAL illness spread to others through coughing or sneezing. Measles can remain in the air or on surfaces for as long as 2 hours, and an infected person can potentially infect 12 to 18 other people in a susceptible population (CDC, 2015 and 2019c; Guerra et al., 2017). Vaccination is necessary to maintain herd immunity, which offers protection from disease for those who cannot be vaccinated due to age limitations or medical contraindications. Given the U.S. Army's compliance with current immunization policies, Soldiers are at minimal risk of contracting measles. However, Army beneficiaries and DOD Civilians who are not fully vaccinated may be susceptible to the measles virus due to an ongoing outbreak of the disease.

Per the CDC, from 1 January to 31 December 2019, there were 1,282 individual measles cases confirmed in 31 states. This represents the largest measles outbreak in the U.S. since 1992 and since measles was declared to be eliminated in 2000 (CDC, 2019c). More than 75% of the cases in 2019 were linked to outbreaks in New York.

Symptoms of measles vary widely but may include high fever and rash, as well as cough, runny nose, and red, watery eyes. Measles-related complications may include ear infections, diarrhea, pneumonia, brain swelling, and seizures. In the most severe cases, measles can be fatal (CDC, 2015).

The CDC recommends children receive two doses of the live measles-mumps-rubella (MMR) vaccine unless they have allergies or other prohibitive medical conditions. The first dose is administered between ages 12 and 15 months. The second dose is administered between ages 4 and 6 years. The majority of persons who receive two doses of live MMR vaccine are protected for life from becoming infected with the measles virus (CDC, 2015, 2019d).

The most vulnerable beneficiaries are children too young to be immunized (aged <12 months), those not immunized completely (aged <4 years), and beneficiaries with medical conditions which preclude their receiving the MMR vaccine. Additionally, Family members, such as foreign-born spouses who were not subject to the U.S. immunization schedule as children, are considered vulnerable to measles. Some adults who received early versions of the vaccine between 1963 and 1968 did not receive the live vaccine that is administered today. Prior to 1989, only one dose of the live vaccine was recommended. According to the CDC, early versions of the vaccine are not as effective as the current vaccine, and many U.S. adults did not receive a second dose (CDC, 2019d). Adult beneficiaries who previously received insufficient or incomplete vaccinations, particularly Army Family members and DOD Civilians who are planning to travel internationally, may benefit from discussing re-vaccination with their healthcare provider.



1,282 cases | **31** states

SPOTLIGHT

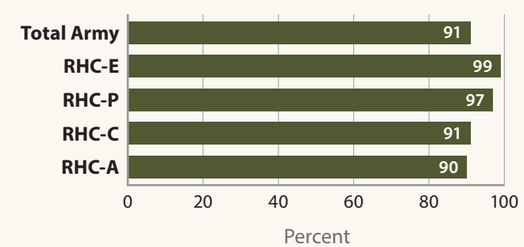
MEDICAL SURVEILLANCE EXAMS:
KEEPING THE WORKFORCE ON THE JOB

OCCUPATIONAL HEALTH (OH) IS AN INTEgrated discipline dedicated to the well-being and safety of employees in the workplace. For the Army, the OH focus is on clinical and public health programs and services aimed at protecting the health of the Total Army Workforce. The Army Occupational Health Program (AOHP) influences global force readiness by assessing workers' health to ensure physical and psychological fitness sufficient to perform essential job functions. AOHP clinicians routinely assess workers for detectable pre-clinical disease that may arise from exposure to potentially hazardous chemical, biological, and radiological sources, and from other workplace hazards. The Army's generating and operational forces comprise populations at greatest risk to health from workplace and environmental factors.

The Occupational Safety and Health Administration (OSHA) mandates and enforces safety and health standards (including noise and respiratory protection measures) for workplace hazards and requires medical surveillance examinations for exposures to specified hazards such as various chemicals and heavy metals. The purpose of the AOHP medical surveillance examination is to detect any occupational illnesses or diseases caused by OSHA-regulated hazards in the workplace.

Medical Surveillance Exam Compliance, Total Army Workforce, 2018

Each Regional Health Command (RHC) met or exceeded the compliance target of 90% for OSHA-mandated medical surveillance examinations.



The system of record for workplace hazard exposure data is the Defense Occupational and Environmental Health Readiness System-Industrial Hygiene (DOEHRS-IH). For 2018, DOEHRS-IH was queried to identify workers exposed to the following OSHA-regulated hazards across all Army installations:

- 1,2-Dibromo-3-Chloropropane (DBCP)
- Acrylonitrile (Vinyl Cyanide)
- Chromic Acid/Chromium (VI)
- Antineoplastic Drugs
- Arsenic
- Asbestos Current Worker
- Audiometric Testing (Civilians Only)
- Hazardous Waste Workers and Emergency Responders
- 1,3-Butadiene
- Cadmium (Current Exposure)
- Benzene
- Ethylene Oxide
- Formaldehyde
- Lead (Inorganic)
- Methylene Chloride (Dichloromethane)
- Respirator User
- Silica (Crystalline)

The DOEHRS-IH query identified 13,439 OSHA-regulated hazards to which workers are exposed. To reduce or eliminate exposure, medical surveillance exams are recommended for workers exposed to OSHA-regulated hazards. These recommendations are based on quantitative and/or qualitative sampling of each workplace by industrial hygienists at the installation; both the sampling and the recommendations are reported in the DOEHRS-IH.

Army OH clinics reported that 91% of workers Army-wide received the recommended medical surveillance exams. Although the compliance for completing medical surveillance met the green target of >90% across the enterprise, the AOHP goal remains to further increase medical surveillance and compliance reporting by all installations. To optimize worker safety and well-being, supervisors should work directly with OH, safety, and IH departments to ensure 100% compliance.

Environmental Health Indicators

- AIR QUALITY
- DRINKING WATER QUALITY
- WATER FLUORIDATION
- SOLID WASTE DIVERSION
- MOSQUITO-BORNE DISEASE
- TICK-BORNE DISEASE
- HEAT RISK

U.S. Army photo

Air Quality

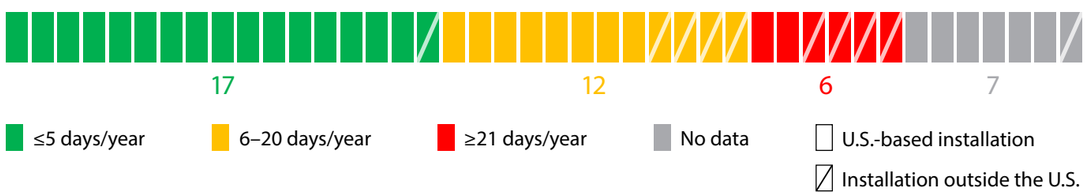
The air quality environmental health indicator (EHI) shows the frequency of outdoor air pollution in proximity to Army installations. It is quantified as the annual number of days when outdoor air pollution levels near the installation were deemed unhealthy for some or all of the general public (i.e., days when the U.S. Environmental Protection Agency (EPA) Air Quality Index (AQI) was greater than 100).

Poor air quality can contribute to both acute and chronic health effects for personnel who train, work, exercise, or reside in an affected area. **A growing body of evidence implicates air pollution in a range of health conditions including cardiovascular and respiratory disease, cancer, type 2 diabetes, adult cognitive decline, childhood obesity, and adverse birth outcomes** (Bowe et al., 2018; Chen et al., 2017; Alderete et al., 2017; Sapoka et al., 2010). The air pollutants responsible for the majority of poor air quality days are ground-level ozone and fine particulate matter known as $PM_{2.5}$.

Outdoor air pollution levels are measured at monitoring stations operated by State and Federal environmental authorities. Using these data, the EPA publishes a daily AQI for over 1,000 counties in the U.S. The EPA AQI was used to determine the number of poor air quality days for Army installations located within the U.S. For installations outside the U.S., proximal air quality data were obtained from host nation environmental authorities and converted to the EPA AQI to determine the number of poor air quality days per year.

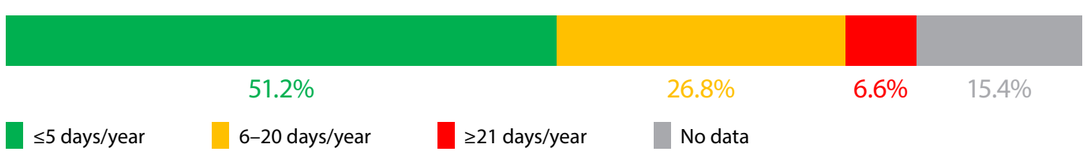
Distribution of Army Installations by Air Quality Status, 2018

The chart shows the number of poor air quality days at selected Army installations in 2018. Annual poor air quality days ranged from 0 to 130 days/year, with the greatest number of days occurring at installations in South Korea.



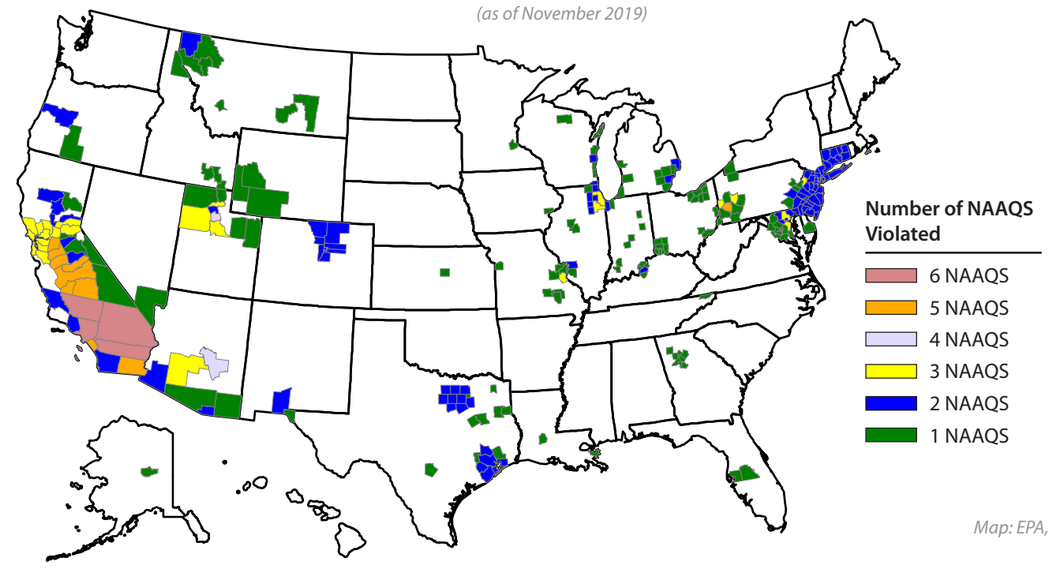
Distribution of Army Population by Air Quality Status, 2018

The chart shows the distribution of the AC Soldier population by the number of poor air quality days experienced at selected installations in 2018.



Counties Designated "Nonattainment" for Clean Air Act's National Ambient Air Quality Standards (NAAQS)

(as of November 2019)



Map: EPA, 2019a

What's Happening at Army Installations?

As in prior years, most poor air quality days at U.S. installations were due to ground level ozone, which is elevated seasonally between May and September. Exceptions occurred at Joint Base Lewis-McChord (JBLM) and Fort Wainwright, both of which experienced high levels of $PM_{2.5}$. High $PM_{2.5}$ at JBLM was due to drifting smoke from regional wildfires. At Fort Wainwright, $PM_{2.5}$ levels were high in winter months due to wood-burning stoves and fireplaces. The map shows U.S. areas that persistently fail to meet one or more Federal health-based air quality standards.

In Germany and Japan, most poor air quality days were due to ground level ozone. In contrast, the majority of poor air quality days in Italy and South Korea were due to $PM_{2.5}$. Although 2018 monitoring data were unavailable for USAG Vicenza, air quality conditions there are unlikely to have improved from the 2014–2017 average of 110 poor air quality days/year. Seasonal influx of naturally occurring fine particles, as well as industrial and vehicular activity, are responsible for air quality conditions in South Korea. Between 2015 and 2018, South Korea installations experienced a range of 51 to 179 poor air quality days/year.

Where to Find Air Quality Information?

The EPA's AirNow website provides real-time air pollution levels in the U.S., along with health precautions based on the pollutant level and affected population (https://www.airnow.gov). Air pollution data for locations outside the U.S. are available at the World Air Quality Index website (http://aqicn.org/). This website aggregates real-time air pollution data published by international environmental authorities and converts it to the EPA AQI. Users can obtain an AQI value for a location of interest and match it to the associated health precautions at the AirNow website.

Drinking Water Quality

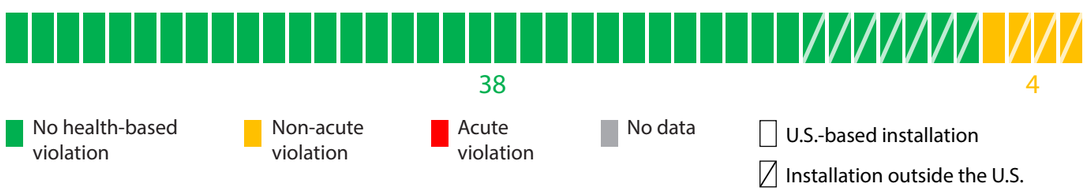
The drinking water quality EHI reflects whether community water systems (CWS) serving Army installations comply with health-based standards promulgated in the National Primary Drinking Water Regulations (NPDWR). These standards protect against acute and non-acute health effects. Acute health effects are those that present shortly after exposure to a contaminant (e.g., hemorrhagic diarrhea caused by *E. coli*). Non-acute health effects result from repeated exposure to a contaminant over a longer period of time (e.g., kidney disease caused by inorganic mercury).

Drinking water has a direct and critical impact on human health and Soldier readiness. Exposure to a contaminated water supply through drinking, bathing, or recreation can lead to acute and chronic illness. Secondary effects can include loss of confidence in the water supply and increased waste from bottled water (often provided as an alternate water supply during a water emergency).

Water systems are required to monitor for multiple contaminants to ensure a healthy water supply and compliance with the NPDWR. Monitoring frequency depends on the contaminant, and results are reported to the local environmental authority. NPDWR compliance data for CWS serving Army garrisons come from an annual environmental data survey conducted by the Deputy Chief of Staff, G-9, Environmental Division, as well as information from the EPA Safe Drinking Water Information System (SDWIS) and Consumer Confidence Reports (CCRs) prepared by local water purveyors.

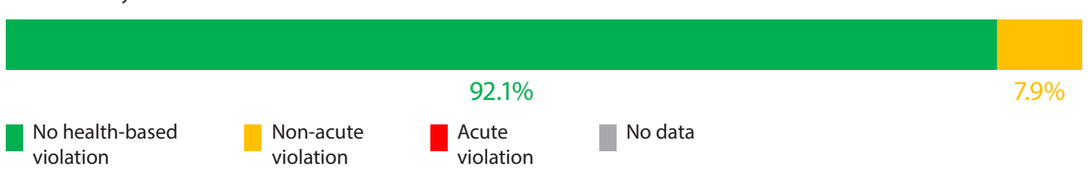
Distribution of Army Installations by Drinking Water Quality Status, FY18

The chart shows occurrence of health-based water quality violations at selected Army installations in FY18. Standards violated in FY18 included the Surface Water Treatment Rule (SWTR), Lead and Copper Rule, and the Stage 2 Disinfectants/Disinfection Byproduct Rule (D/DBPR).



Distribution of Army Population by Water Quality Status, FY18

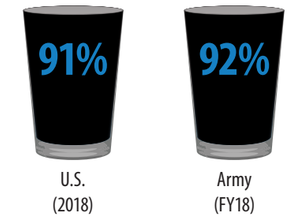
The chart shows the distribution of the Soldier population by occurrence of health-based water quality violations at selected Army installations in FY18.



What's Happening at Army Installations?

When compared to CWS across the U.S., the Army has performed favorably since FY16. In FY18, 92.1% of the AC Soldier population at installations tracked in *Health of the Force* were served by CWS with no health-based violations, compared to the national value of 91.1% (EPA, 2019b). Health-based violations were reported at four Army installations in FY18. All were violations of non-acute health effects standards. The copper action level was exceeded at USAGs Humphreys and Wiesbaden. This was a repeat violation for USAG Wiesbaden at Clay Kaserne. The water at USAG Bavaria–Garmisch was not properly chlorinated, which constituted a violation of the SWTR. Fort Riley reported elevated trihalomethanes, which violated the Stage 2 D/DBPR. Trihalomethanes can occur when disinfectant chlorine reacts with naturally occurring organic matter in water.

Population Served by CWS with No Reported Health-Based Violations



Consumers can learn more about their water quality in the annual Consumer Confidence Report for their CWS, or at the EPA SDWIS (https://www.epa.gov/enviro/sdwis-overview).

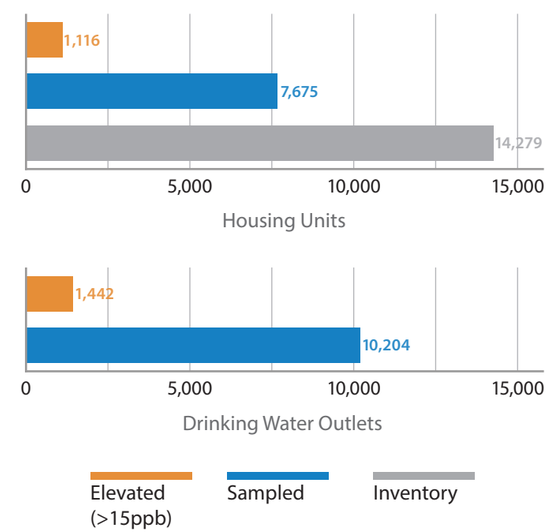
SPOTLIGHT

ARMY CAMPAIGN TO PREVENT LEAD IN DRINKING WATER

IN 2013, THE U.S. ARMY INSTALLATION MANAGEment Command (IMCOM) began a campaign to protect the health of Army communities by monitoring and eliminating lead in drinking water systems (IMCOM, 2013). This initial effort has been converted to an enduring surveillance mission to evaluate drinking water at all Army high risk facilities (e.g., child development centers, youth centers, schools) and government owned/leased Army Family Housing (AFH) units on a 5-year cycle, with a goal of sampling 20% of inventory every year (IMCOM, 2018). Interim results from the current cycle are shown for AFH units.

Between 2016–2019, 15% of sampled AFH units had at least one water outlet that exceeded the EPA lead action level of 15 parts per billion (ppb) (CFR, 2019). Lead concentrations greater than 15 ppb were present in 14% of the samples collected from drinking water outlets (i.e., kitchen or bathroom faucets). Outlets where water exceeded the EPA action level were removed from service or remediated. Replacement water supplies were provided when necessary to ensure safe water for consumers.

Government Owned/Leased Army Family Housing Units and Outlets Sampled for Lead in Drinking Water, 2016–2019



Water Fluoridation

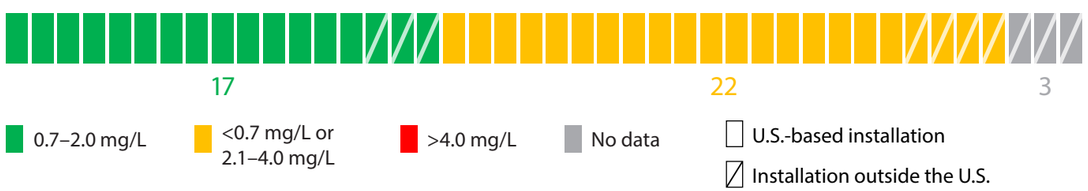
The water fluoridation EHI reports the annual average fluoride concentration in the drinking water at Army installations. Scientific evidence supports the benefits of fluoride in drinking water to help prevent dental decay in people of all ages, including adults. Poor dental health can lead to medically non-ready Soldiers.

Army community water systems (CWS) are subject to fluoridation standards set by military, public health, and environmental authorities. Current Army regulations require drinking water supplies to be "optimally fluoridated." Optimal fluoridation refers to the CDC- and U.S. Public Health Service (PHS)-recommended fluoride level of 0.7 milligrams/liter (mg/L). Although fluoride can occur naturally in the environment, most CWS must be supplemented to achieve optimal fluoridation. The maximum fluoride level permitted by the Safe Drinking Water Act (SDWA) is 4.0 mg/L.

To ensure optimally fluoridated water and compliance with the SDWA, water suppliers monitor fluoride levels throughout the year and report to the local environmental authority. Data on fluoride levels in Army CWS come from an annual environmental data survey conducted by the Deputy Chief of Staff, G-9, Environmental Division, and SDWA-mandated CCRs.

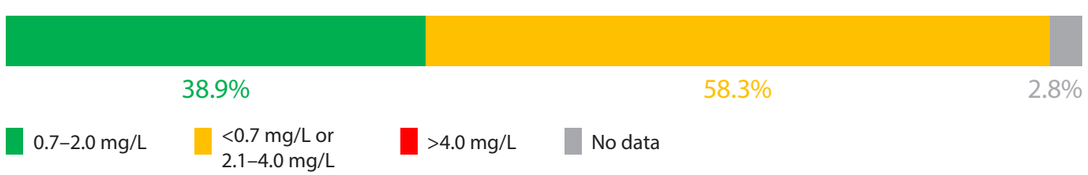
Distribution of Army Installations by Water Fluoridation Status, FY18

The chart shows average fluoride concentration in drinking water at selected Army installations in FY18. Fluoride concentrations ranged from 0–1.5 mg/L. The number of installations providing optimally fluoridated drinking water decreased from 21 in FY17 to 17 in FY18.



Distribution of Army Population by Water Fluoridation Status, FY18

The chart shows the distribution of the Soldier population by average fluoride concentration in drinking water at selected Army installations in FY18.



How Does the Army Compare?

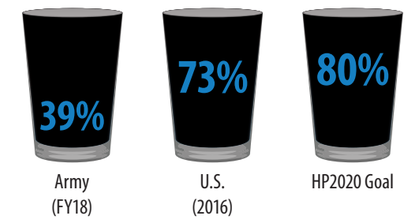
The CDC uses the Water Fluoridation Reporting System to monitor nationwide water fluoridation for oral health objectives in Healthy People 2020 (HP2020). The current objective is for 79.6% of the U.S. population served by CWS to receive optimally fluoridated water by 2020. **In 2016, 72.8% of the U.S. population served by CWS received optimally fluoridated water. Based on data available at the time of this report, 38.9% of the surveyed AC Soldier population received optimally fluoridated water.** The proportion of the Army population receiving optimally fluoridated water in FY18 is slightly lower than FY17 (46%) and continues to lag behind the U.S. population.

Most of the water suppliers for the Army CWS examined in this report are privatized (50%) or Army-owned/Army-operated (26%). The chart to the right shows the distribution of Army water suppliers for surveyed installations, and whether those suppliers provided optimally fluoridated drinking water for their garrisons in FY18. Data were not available on fluoride levels for three Army installations located outside the U.S.

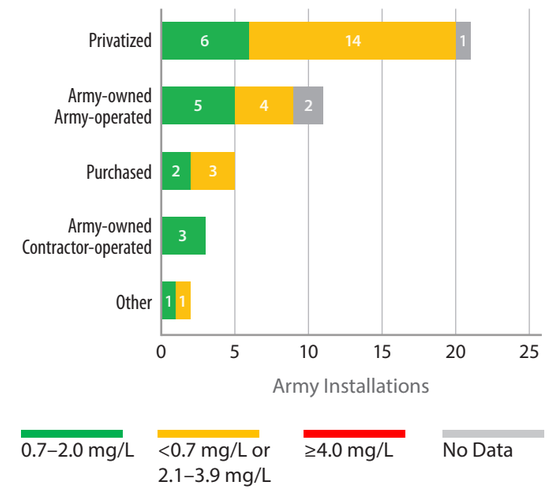
Further Information

- The CDC's "My Water's Fluoride" (https://nccd.cdc.gov/DOH_MWF/Default/Default.aspx) provides access to a community's drinking water fluoridation status, the number of people served by the system, and the water source.
- Army Community Resource Guides have weblinks to the CCRs for each garrison. The CCR is an annual report card on drinking water factors, including fluoride levels and SDWA compliance. Go to: https://crg.amedd.army.mil

Population Receiving Optimally Fluoridated Water



Installation Fluoridation Status by Water Supplier, FY18



New! CDC Proposes Control Range for Optimal Fluoridation

In 2018, the CDC proposed an operational control range of 0.6–1.0 mg/L for water systems that adjust the fluoride level in drinking water. This range provides flexibility by preserving the benefits of water fluoridation at the lower level while mitigating the potential for dental fluorosis at the higher level. Allowing for an operational control range (rather than a singular target) should improve water systems' ability to demonstrate compliance, and facilitate the public health goal of preventing dental caries. A final decision on the proposed range had not been issued as of December 2019.

Solid Waste Diversion

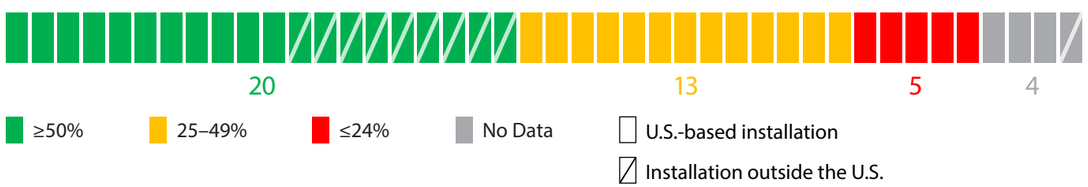
The solid waste diversion EHI measures the extent to which Army installations reduce the amount of waste disposed in landfills and incinerators, thereby reducing health risks from waste contaminants released into air, surface water, and drinking water sources. Diversion, which is the recovery and beneficial use of would-be wastes, can take the form of recycling, composting, or donating. The solid waste diversion rate is calculated as the mass of diverted waste divided by the mass of the total waste stream (diverted plus disposed), and is expressed as a percentage.

Contaminants resulting from waste disposal can become health hazards via surface runoff, landfill leachate, and air emissions that can contain dioxins, chlorinated organics, heavy metals, and endocrine-disrupting chemicals, among others. Improperly managed waste can exacerbate the rise of illnesses such as diarrhea and acute respiratory infections (Simmons, 2016). When present in drinking water sources at concentrations exceeding regulatory levels, waste-derived contaminants have been linked to health effects such as anemia; immune deficiencies; reproductive difficulties; liver, kidney, or nervous system damage; bone disease; and increased cancer risk (EPA, 2019c).

Solid waste diversion data are obtained from the Solid Waste Annual Reporting for the Web (SWARWeb) database. Operated by the Deputy Chief of Staff, G-9, Energy and Facilities Engineering, SWARWeb is the Army system of record for waste generation data. Installations generating more than 1 ton of non-hazardous solid waste per day report facility tonnage for waste, recycling, and other diversion efforts on a semiannual basis. These and other SWARWeb data are used to compute metrics for the DOD's Integrated Solid Waste Management Measures of Merit, reported by fiscal year.

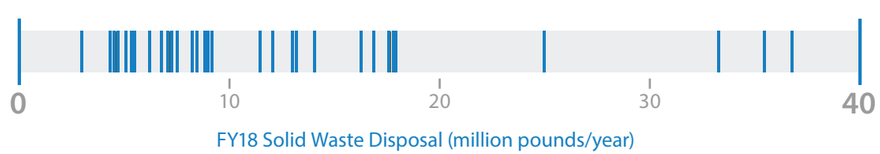
Distribution of Army Installations by Solid Waste Diversion Rate, FY18

The chart shows the solid waste diversion rate at selected Army installations in FY18. Waste diversion includes recycling, composting, and donating discarded materials. Green status indicates that an installation met or exceeded the DOD solid waste diversion goal of 50%. Waste diversion rates ranged from 0–100%.



Distribution of Army Installations by Solid Waste Disposal, FY18

The chart shows solid waste disposal rate at selected Army installations during FY18. Overall, Army installations discarded over 700 million pounds of solid waste in FY18, an increase of more than 23 million pounds from the previous year. Approximately 1 in every 500 tons of waste entering U.S. landfills and incinerators was generated by the Army.

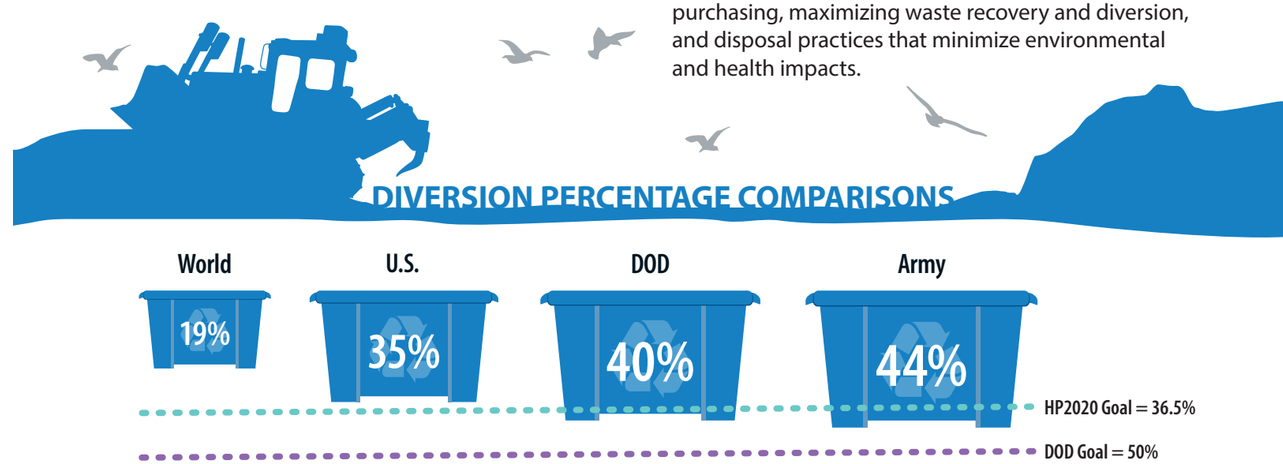


How Do We Stack Up?

The FY18 Army average solid waste diversion rate was 44%, a decrease from FY17's rate of 46%. This decline is likely due to weakening worldwide recycling markets and a lack of monetary incentives for recycling programs. **Overall, the DOD struggled to meet its diversion goal of 50%, achieving 40% diversion in FY18. For perspective, the U.S. EPA's most recent estimate of the U.S. solid waste diversion rate is 35.2% (EPA, 2019d). The average diversion rate worldwide is only 19%** (Kaza et al., 2018).

The Global Burden of Waste

Waste has far-reaching effects on human and environmental health. Waste-related contamination contributes to global pollutant levels, and diseases caused by pollution were responsible for 9 million premature deaths in 2015, representing 16% of total global mortality (Landrigan et al., 2018). Beyond the direct health impacts, the management (and mismanagement) of waste impacts food and drinking water sources, economic growth, and the well-being of vulnerable populations. The solution lies in a sustainable life cycle approach to material management that includes smart purchasing, maximizing waste recovery and diversion, and disposal practices that minimize environmental and health impacts.



> **At the local and regional levels, inadequate waste collection, improper disposal, and inappropriate siting of facilities can have negative impacts on environmental and public health. At a global scale, solid waste contributes to climate change and is one of the largest sources of pollution in oceans.**
>
> —*What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*
> World Bank Group

Tick-borne Disease

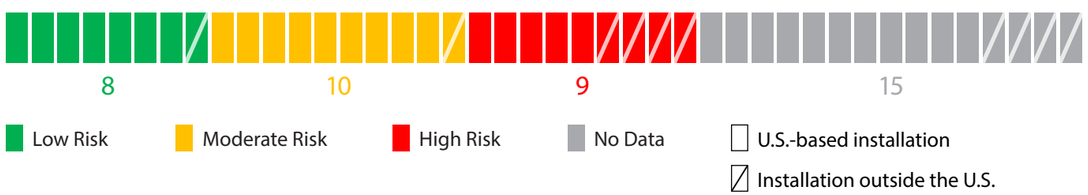
The tick-borne disease EHI reflects Lyme disease risk at Army installations. Lyme disease risk is defined as low, moderate, or high risk of coming into contact with a Lyme vector tick that is infected with the agent of Lyme disease. These ticks can be found on and around Army installations, and Soldiers can be bitten while working or recreating on-post, or when spending time outside in tick habitat off-post.

Lyme disease is the most common vector-borne disease in the U.S., with over 300,000 new cases estimated each year. Bites from blacklegged ticks (also called "deer ticks") cause the majority of Lyme disease cases in the U.S. Ticks capable of transmitting Lyme disease are found worldwide, so the risk is present abroad as well as at home. Lyme and many other tick-borne diseases have similar symptoms, such as fever, headache, rash, and fatigue, which can make them difficult to diagnose. **If left untreated, Lyme disease can cause joint inflammation, memory problems, and even heart failure.**

The DOD Human Tick Test Kit Program (HTTKP) is a free tick identification and testing service available to DOD-affiliated personnel; approximately 3,000 ticks are submitted each year. Lyme disease risk data come from the HTTKP and from environmental tick surveillance conducted by the Army Regional Public Health Commands. Installations with "No Data" did not participate in the HTTKP in 2018, and no Army environmental surveillance data were available for that year. Additional data were obtained from the CDC and scientific literature (Eisen et al., 2016; Li et al., 2019; Im et al., 2019).

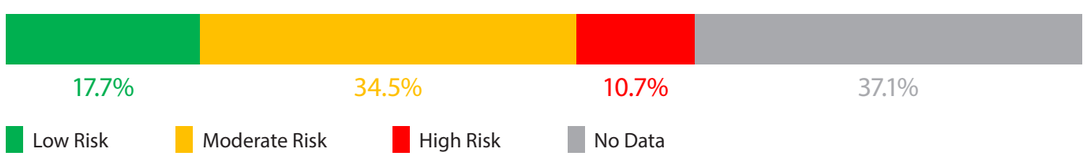
Distribution of Army Installations by Lyme Disease Risk, 2018

The chart shows the risk of Lyme disease at selected Army installations in 2018. Many installations with a low Lyme disease risk have elevated risks of other tick-borne diseases such as ehrlichiosis and a red meat allergy that have been associated with the bite of the lone star tick, which is common in the southeast U.S.



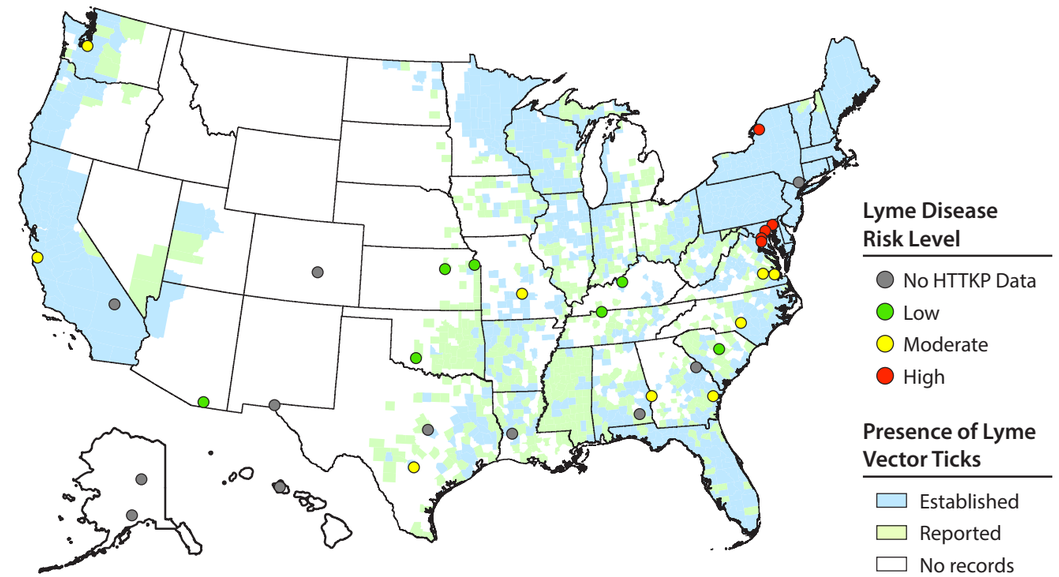
Distribution of Army Population by Lyme Disease Risk, 2018

The chart shows the distribution of the AC Soldier population by risk of Lyme disease at selected Army installations in 2018. **The absence of HTTKP and Army tick surveillance data in 2018 has resulted in a failure to characterize 37% of the Soldier population for risk of exposure to Lyme disease.**



Presence of Lyme Disease Vector Ticks and Risk of Lyme Disease at Selected U.S. Army Installations

The risk of coming into contact with a Lyme vector tick that is infected with the agent of Lyme disease varies tremendously based on climate, habitat, and wildlife communities present at an Army installation. **In the U.S., Soldiers at installations in the northeast and mid-Atlantic are at greatest risk of contracting Lyme disease.**



SPOTLIGHT

ASIAN LONGHORNED TICK:
A NEW ARRIVAL AND POTENTIAL THREAT

IT'S CREEPY, IT'S HERE TO STAY, AND A SINGLE female can lay thousands of eggs—without ever mating with a male. The Asian longhorned tick is native to East Asia, where it is a major livestock pest and has been found to transmit pathogens that can make humans and animals sick (USDA, 2019a). It was first documented in the U.S. in 2017 and has now been identified in 11 states across the eastern U.S. (USDA, 2019b). It's not known if these ticks can transmit the agent of Lyme disease or other pathogens found in the U.S., as the speed and extent of their spread are still being discovered. Ticks found biting Army personnel should be submitted to the HTTKP for identification and testing. Access the HTTKP at https://tiny.army.mil/r/nn5LK/HTTKP.

Asian longhorned tick adult female. Without specialized training, it is difficult to discern these small, brown, nondescript ticks from native tick species.

Mosquito-borne Disease

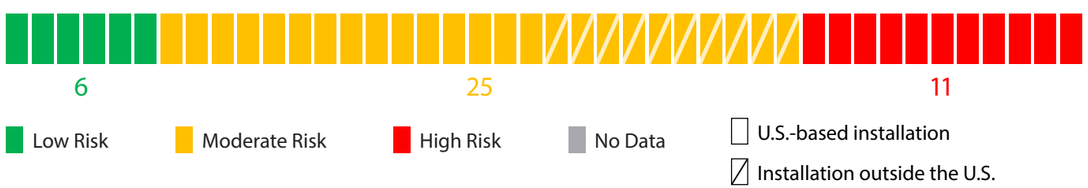
The mosquito-borne disease EHI reflects the risk of being infected with dengue, chikungunya, and Zika viruses carried by day-biting *Aedes* mosquitoes at Army installations. The warming global climate is increasing the range where mosquitoes can live and thrive, as well as the portion of the year when they are active and able to transmit disease (Reinhold et al., 2018; Kamal et al., 2018). This metric combines parameters characterizing the window of vector activity and disease transmission, local presence of vectors, and human case confirmation (local and travel-related) into a site-specific risk index.

Health impacts from *Aedes* mosquitoes range from debilitating infection and birth defects to allergic reaction and dermatitis. Mosquito-borne pathogens often circulate in mosquito populations long before human cases occur. Because of this, robust vector surveillance at the installation level is necessary to create an early warning system for mosquito-borne disease threats. **Since the majority of mosquito-borne diseases have no vaccines, bite avoidance is the most important method of prevention.**

Data used to derive the parameters summarized into the mosquito-borne disease EHI came from a variety of sources. These sources included state-of-the-art models on mosquito species behavior, community surveillance reports on mosquito populations, human case confirmation, and local daily weather reports provided by the U.S. Air Force 14th Weather Squadron.

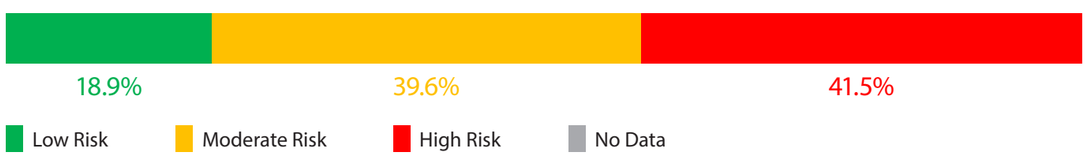
Distribution of Army Installations by Mosquito-borne Disease Risk, 2018

The chart shows the risk of *Aedes* mosquito-borne disease at selected Army installations in 2018. While the *Ae. albopictus* mosquito is more likely to be found in cooler climates than its vector counterpart, *Ae. aegypti*, the presence of both species in an area greatly increases the risk of disease transmission.



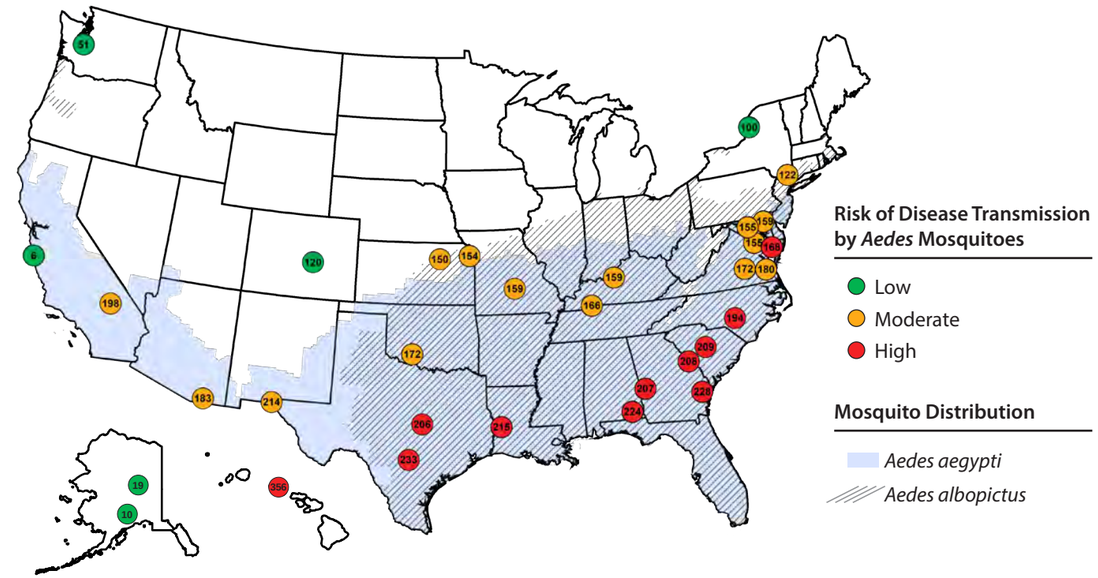
Distribution of Army Population by Mosquito-borne Disease Risk, 2018

The chart shows the distribution of the AC Soldier population by risk of *Aedes* mosquito-borne disease at selected Army installations in 2018. Although a majority of installations are at moderate risk, a preponderance of the Soldier population is at high risk for disease transmission from day-biting mosquitoes.



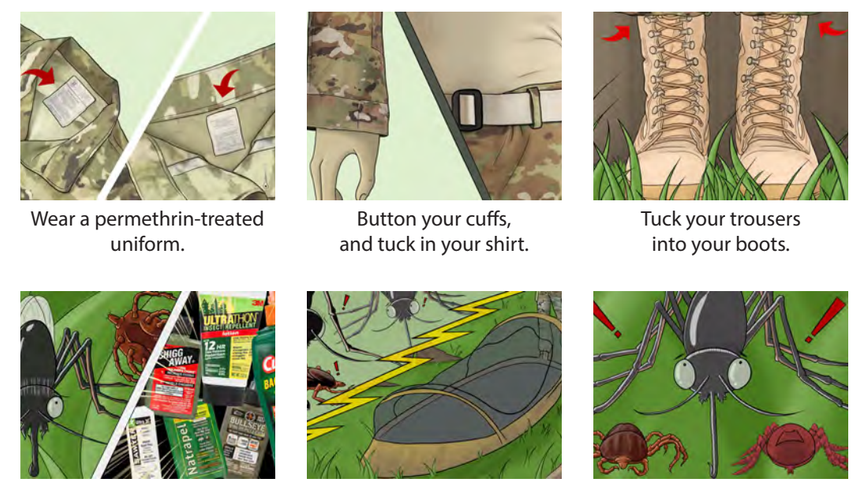
Mosquito-borne Disease Risk and Transmission Days

The icons on the risk map indicate an installation's risk of disease (Zika, chikungunya, or dengue) transmission by day-biting *Aedes* mosquitoes. The number in the icon represents the number of days per year that day-biting mosquitoes are likely to be active and able to transmit a disease-causing pathogen. The portion of the year when mosquitoes are active corresponds to when heightened surveillance and prevention efforts should occur.



THE DOD INSECT REPELLENT SYSTEM

New graphics are part of the transformation of health information for digital platforms. In 2020, the DOD Insect Repellent System will be available as a short animation on social media to reach wider audiences and offer guidance in formats that reach today's Soldier.



Wear a permethrin-treated uniform.

Button your cuffs, and tuck in your shirt.

Tuck your trousers into your boots.

Use DOD-approved insect repellent.

Sleep in a bed net.

Make those bugs sad!

Illustrations by: Rachel Sterschic, Knowesis

Heat Risk

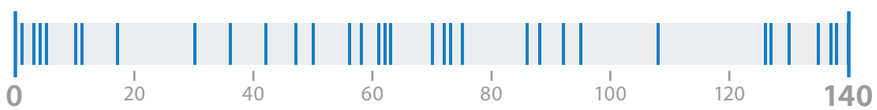
The heat risk EHI reflects the portion of the year when outdoor conditions heighten the risk of heat-related health impacts. A heat risk day occurs when the National Weather Service (NWS) heat index is greater than 90 degrees Fahrenheit (°F) for one or more hours during a day. Heat index reflects outdoor temperature and relative humidity, which are well-established as the principal environmental agents of heat illness (Mora et al., 2017). The EHI reports the number of heat risk days per year in proximity to an Army installation, and whether the year of interest is consistent with the prior decade.

In the U.S., 4 of the 5 hottest years on record have occurred since 2012, and annual average temperatures are projected to increase by at least 2.5°F over the next 3 decades (USGCRP, 2017). The frequency, persistence, and magnitude of temperature rise has made heat the leading cause of weather-related fatalities in the U.S. over the last 30 years (NWS, 2018). Further, **annual rates of heat illness across all military services have risen every year from 2014–2018, including a 39% rise for the AC Army during this interval** (AFHSB, 2019). Additional health consequences anticipated due to rising temperatures include increases in outdoor air pollution, seasonal allergens, and weather-related mental health stress (USGCRP, 2016).

Outdoor temperature, relative humidity, and the associated heat index used to characterize the area-wide heat risk to an installation were acquired from weather stations in closest proximity to the population center of the installation. Weather data were provided by the U.S. Air Force 14th Weather Squadron. Historic heat index at the county level was obtained from scientific literature (Dahl, 2019).

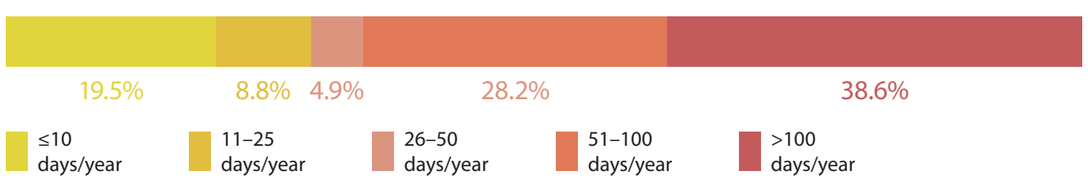
Distribution of Army Installations by Heat Risk Days, 2018

Of the selected Army installations tracked in this report, 10 experienced more than 100 heat risk days in 2018, mostly concentrated in the south and southeast U.S. Heat risk days ranged from 0–140 days/year in 2018.



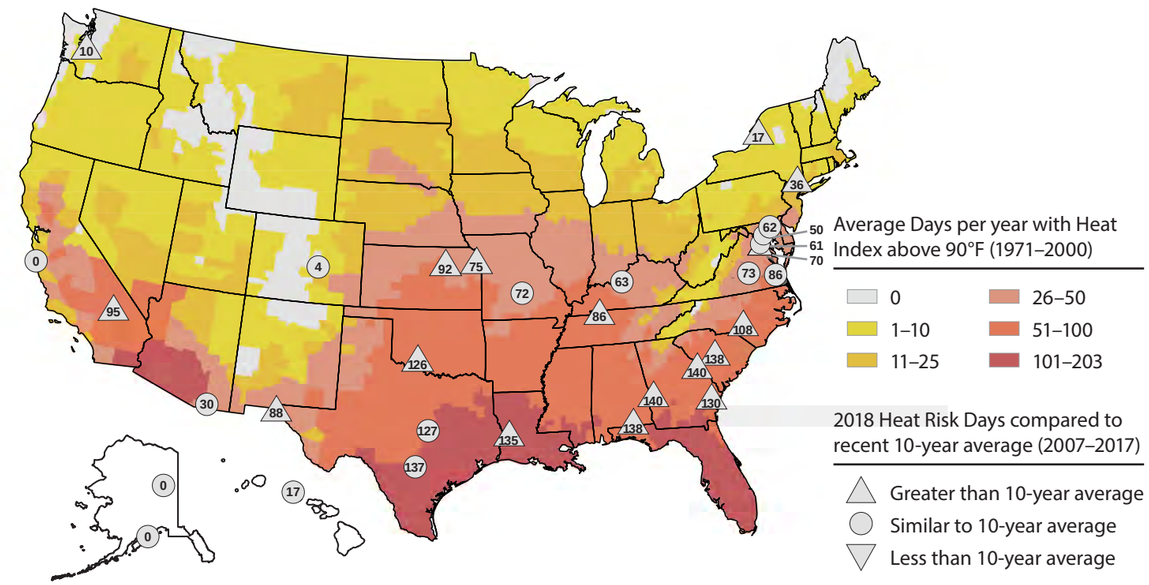
Distribution of Army Population by Heat Risk Days, 2018

The chart shows the distribution of the Soldier population by number of heat risk days at selected Army installations in 2018. Although most installations experienced less than 100 heat risk days per year, **nearly 40% of Soldiers were stationed at an installation with more than 100 heat risk days in 2018.**



2018 Heat Risk Days at Army Installations

Annual days with one or more hours when Heat Index is above 90°F.



Managing Operational Heat Risk

Many factors influence the amount of heat a person experiences and how the body copes. Some of these include weather conditions such as temperature, humidity, wind speed, and cloud cover. Heat risk is further influenced by clothing burden and activity level. Army doctrine for managing operational heat risk can be found in Technical Bulletin, Medical (TB MED) 507, *Heat Stress Control and Heat Casualty Management* (DA, 2003), which provides guidance to gauge and manage heat risk during training and operational activities. Site-specific heat risk can be evaluated with the wet bulb globe temperature (WBGT) index kit. Knowing the WBGT index and task workload, leaders can manage heat risk by directing appropriate work/rest cycles and fluid intakes according to TB MED 507 guidelines.

Fluid Replacement and Work/Rest Guidelines for Training in Warm and Hot Environments

Heat Category	WBGT Index (°F)	Easy Work (250 W)		Moderate Work (425 W)		Heavy Work (600 W)		Very Heavy Work (800 W)	
		Work/Rest (mins)	Water Intake (qt/hr)	Work/Rest (mins)	Water Intake (qt/hr)	Work/Rest (mins)	Water Intake (qt/hr)	Work/Rest (mins)	Water Intake (qt/hr)
1	78–81.9	NL	½	NL	¾	40/20	¾	20/40	1
2	82–84.9	NL	½	NL	¾	30/30	1	15/45	1
3	85–87.9	NL	¾	NL	¾	30/30	1	10/50	1
4	88–89.9	NL	¾	50/10	¾	20/40	1	10/50	1
5	>90	NL	1	20/40	1	15/45	1	10/50	1

NL = no limit to work per hour (up to 4 continuous hours).

SPOTLIGHT

OUR THIRST FOR CONVENIENCE

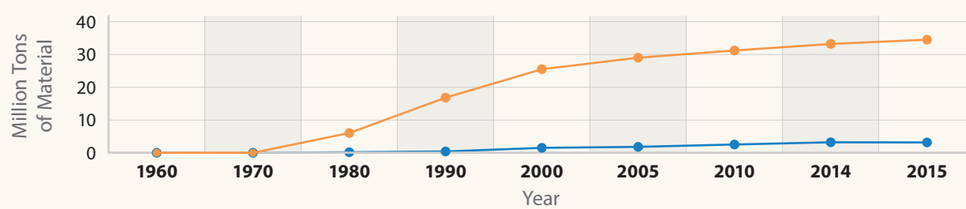
EACH YEAR, AMERICANS BUY AND CONSUME more containerized beverages, particularly water, in disposable plastic bottles. In 2016, U.S. bottled water consumption surpassed that of carbonated drinks for the first time, reaching 12.8 billion gallons (IBWA, 2019). Of great concern is what happens after the beverage is consumed. **Nearly two out of every three single-use beverage containers sold in the U.S. are discarded as trash or litter, including 2 million tons of plastic bottles per year** (Gitlitz, 2013). Concerns like these prompted the House Armed Services Committee to request DOD studies on expenditures and wastes related to single-use plastic water bottles in an early version of the 2020 National Defense Authorization Act (NDAA). The request was not included in the final version of the law, but indicates that Congress is concerned about implications for DOD.

Global production of plastics exceeds 320 million tons per year, 40% of which is single-use packaging. An estimated 86% of plastic packaging waste evades recycling streams and is eventually released to the environment (Villano, 2019). Compounding this issue is a globally weakened market for plastic recycling. For almost three decades, China accepted 45% of the world's plastic, but in 2018 imposed stricter contamination standards that all but ended the U.S.'s ability to recycle its plastic discards. Prior to those restrictions, the U.S. sent 693 million metric tons of plastic waste to China per year (Halder, 2019). This will likely lead to greater amounts of plastic recyclables being littered or disposed in landfills.

The disposal of plastics is a public health and environmental concern, due to plastics littering waterways, accumulating in all levels of the ocean, and making their way into the food chain—including the seafood that we consume in our diet (Sharma & Chatterjee, 2017). It is estimated that by 2025, about 250 million tons of accumulated plastic waste will find their way to aquatic and marine environments (FAOUN, 2017).

Consumers are beginning to choose environmentally-conscious solutions such as reusable beverage containers. For its part, the Army provides bulk water supplies and personal hydration systems when feasible. However, a new health hazard may be emerging: bacterial contamination from reusable water bottles. Microbes that originate in saliva can grow in unwashed bottles. A recent study examined 90 reusable bottles and found coliform bacteria, including *E. coli*, which can cause stomach illnesses (Sun et al., 2017). The solution? Just as dishes and utensils are washed after each use, water bottles should also be washed with soap and hot water after each use, or at least daily.

U.S. Plastics Generation and Recycling Rates, 1960–2015



	1960	1970	1980	1990	2000	2005	2010	2014	2015
Plastics Generated (tons)	<5,000	<5,000	6,666,667	16,818,182	25,517,241	29,180,328	31,250,000	33,229,167	34,505,495
Plastics Recycled (tons)	<5,000	<5,000	20,000	370,000	1,480,000	1,780,000	2,500,000	3,190,000	3,140,000

Source: EPA, 2018

SPOTLIGHT

EFFECTS OF THE CHANGING CLIMATE ON MILITARY READINESS

ACCORDING TO THE LATEST NATIONAL CLImate Assessment, Earth's climate is now changing faster than at any point in history. The impacts of climate change are already being felt in the U.S. and are projected to intensify in the future (Jay et al., 2018). Early evidence of these impacts is manifested in rising sea levels and temperatures, and the increasing frequency, severity, and duration of extreme weather events. Climate change has direct implications for national security in the form of threats to critical infrastructure; instability in the availability of water, food, and energy; and the emboldening of adversaries in affected geostrategic environments. In recognition of these implications, the 2018 NDAA directed the DOD to evaluate vulnerabilities to military infrastructure and operations resulting from climate change (Public Law, 2017).

The DOD has begun to characterize climate-induced vulnerabilities at priority military bases for five specific impacts: flooding, drought, desertification, wildfire, and thawing permafrost (see table). **Initial screenings indicate that two-thirds of the bases studied are vulnerable to recurrent flooding, and more than half are vulnerable to drought** (DOD, 2019b).

Beyond the infrastructure and resource consequences associated with climate change, human health threats are also anticipated. The U.S. Global Change Research Program (USGCRP) has identified the following as examples of climate impacts on human health (Crimmins et al., 2016):

- Extreme heat.
- Worsened air quality.
- Contaminated water supplies.
- Expansion of habitat and transmission conditions for vector-borne diseases.
- Increases in food-related infections.
- Mental health stress due to climate-related traumatic events.

As climate effects intensify, medical surveillance systems such as the DRSi will be critical to the preservation of military health readiness. MTFs should ensure their public health personnel are trained on proper utilization of reportable medical events and submit timely reports through the DRSi.

Climate Vulnerabilities Currently Experienced by Military Installations

Service	Installations Evaluated	Number of Installations that Experience a Climate Vulnerability				
		Recurrent Flooding	Drought	Desertification	Wildfire	Thawing Permafrost
Air Force	36	20	20	4	32	-
Army	21	15	5	2	4	1
Navy	18	16	18	-	-	-

"I would say the effects of climate change are things we have to consider at the strategic, operational, and tactical level and all of our military operations in the future."

—General Mark A. Milley

in testimony to the House Armed Services Committee, 2 April 2019

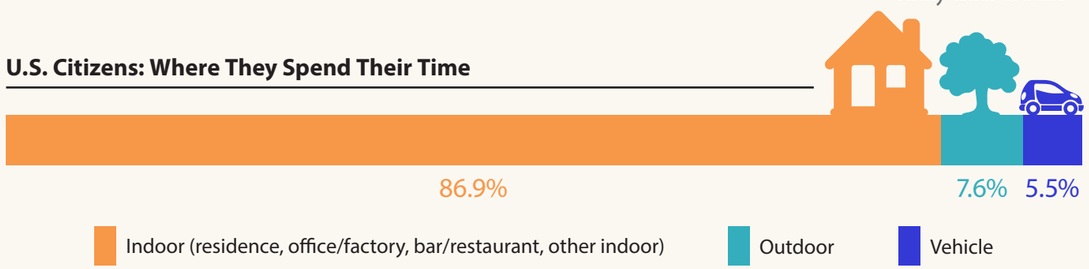
SPOTLIGHT

GOOD HEALTH INCLUDES HEALTHY HOMES

THE ESSENTIAL ELEMENTS OF PERSONAL health go beyond medical intervention and choices regarding sleep, physical activity, and nutrition. Health status also depends on the quality of the environments where we work, live, play, and raise our families. According to a nationwide survey commissioned by the EPA, Americans spend as much as 87% of their lives indoors, including about 69% in their residence (Klepeis et al., 2001).

> **"The Army expects a lot from their Soldiers and Families and really to maximize the readiness of our Soldiers, they must know that the Army is caring for their Families."**
>
> **—General James C. McConville**
> Army Chief of Staff

U.S. Citizens: Where They Spend Their Time



The quality of these environments can affect both health and readiness and requires the sustained attention of Army leadership. The health influence of a home depends on factors such as safe drinking water, properly functioning heating and cooling, and reduction of hazards such as mold, lead-based paint, asbestos, radon, and pests. These are some of the key issues raised in the 2019 Department of the Army (DA) Inspector General's report examining the quality of Army housing (DA, 2019d), as well as by Soldiers and Army Families in recent surveys and forums.

In response, MEDCOM created the Housing Environmental Health Response Registry (HEHRR) to address health or safety concerns of current and former residents of Army housing. Army Families were invited to enroll in April 2019. The HEHRR is designed to serve as a 2-way exchange of information: to provide environmental health hazard information to Army Families and to obtain information from Families to assist them in seeking medical care for housing-related health concerns. More information on the HEHRR can be found on the APHC website or by calling the Registry hotline at 1-800-984-8523.

The HEHRR is just one component of the comprehensive Housing Campaign Plan rolled out by IMCOM in September 2019 (IMCOM, 2019). The Plan involves multiple lines of effort, including regular Town Hall meetings with Army housing residents, enhanced housing manager accountability and responsiveness, and additional measures to ensure that Soldiers and their Families enjoy safe and healthy living conditions.

SPOTLIGHT

ARMY CAMPAIGN TO MANAGE LEAD HAZARDS

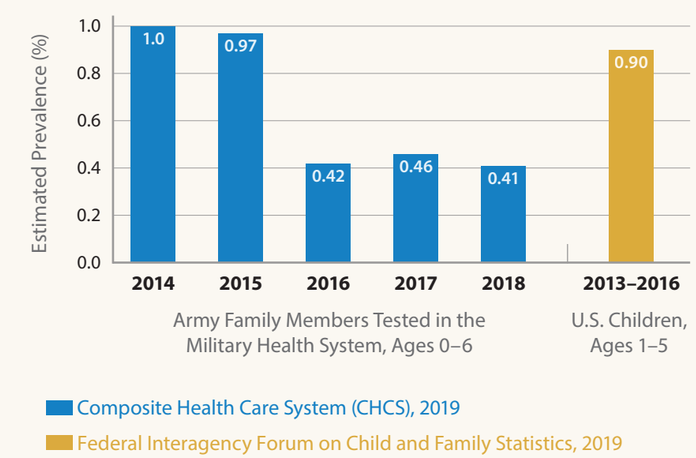
LEAD IS A NATURALLY OCCURRING METAL BUT can present an environmental and health hazard if it contaminates air, water, soil, or dust. Lead exposure can cause behavior changes and learning deficits in children and put adults at risk for high blood pressure, heart disease, kidney disease, and reduced fertility (ATSDR, 2019). Children are at higher risk of lead exposure because of more frequent hand-to-mouth behavior. They are also more susceptible to the harmful effects of lead since the brain is in a period of rapid development during childhood.

The most common exposure to lead results from inhalation or accidental ingestion of contaminated household dust or outdoor soil due to flaking or deteriorated lead-based paint. Other potential sources of lead exposure include contaminated drinking water, occupational settings (e.g., firing ranges, auto and plumbing repair, welding and soldering trades), hobbies that involve the use of leaded materials (e.g., hunting shot, fishing sinkers, pottery dyes or glazes), as well as some foreign-made toys, ceramics, cosmetics, and packaged foods.

In 2018, MEDCOM directed that elevated blood lead level (eBLL) be managed as a **reportable medical event** for children 6 years of age and younger (DA, 2018). Although no safe lead level has been identified for children, the CDC established a reference BLL of 5 micrograms per deciliter (µg/dL) as a threshold to trigger additional medical monitoring (CDC, 2012). Army Medicine tracks cases of pediatric eBLL through the DRSi, and monitors clinical laboratory data systems for additional cases that may not have been reported. Estimates for the prevalence of eBLL in young Army Family members and U.S. children are shown in the graphic.

To further track and control lead hazards at the enterprise level, MEDCOM established the Lead Hazard Management and Control Plan (MEDCOM, 2019) in January 2019. This initiative includes assessment and reporting of medical and environmental surveillance related to potential lead exposures experienced by Army Families.

Elevated Blood Lead Level in Selected Populations (≥5µg/dL)



Performance Triad

SLEEP

ACTIVITY

NUTRITION

U.S. Army photo

Sleep, activity, and nutrition (SAN), also known as the Performance Triad (P3), work together as the pillars of optimal physical, behavioral, and emotional health. Neglect of any single SAN domain can lead to suboptimal performance and, in some cases, injury. The interrelationships between SAN elements is critical for maximizing Soldier performance—Soldiers need to have balanced nutrients to fuel their physical activity and physical activity can impact the amount and quality of sleep. To address SAN deficiencies, leaders and Soldiers need information about the targets on which they fall short.

The Global Assessment Tool (GAT) is a survey designed to assess a number of health domains to include self-reported SAN behaviors. Soldiers are required to complete the GAT annually per AR 350-53, *Comprehensive Soldier and Family Fitness* (DA, 2014). The data presented here represent the proportions of Army Soldier GAT respondents meeting expert-defined targets during calendar year 2018.

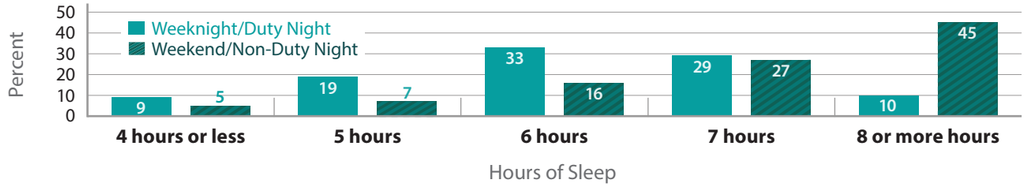
Sleep

Both the CDC (CDC, 2017a) and the National Sleep Foundation (NSF, 2020) recommend adults attain 7 or more hours of sleep per night.

On the GAT, Soldiers report the approximate hours of sleep they get, on average, during weeknights/duty nights and weekends/non-duty nights. Most Soldiers report 6–7 hours of sleep during weeknights/duty nights.

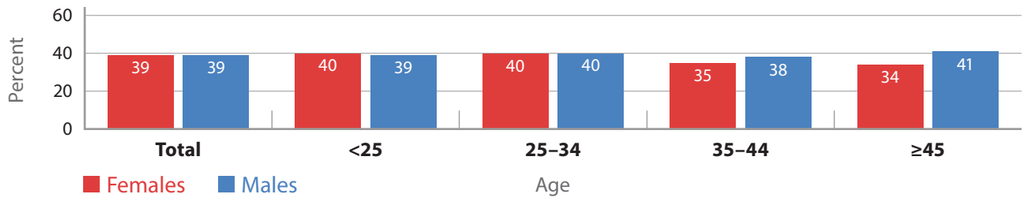
Estimated Hours of Sleep by Duty Status, AC Soldiers, 2018

Most Soldiers reported sleeping 6 to 7 hours per night, regardless of duty status. However, nearly 1 in 3 reported getting less than 6 hours of sleep on weeknights/duty nights. Soldiers also reported getting more sleep on weekend/non-duty nights compared to weeknights/duty nights.



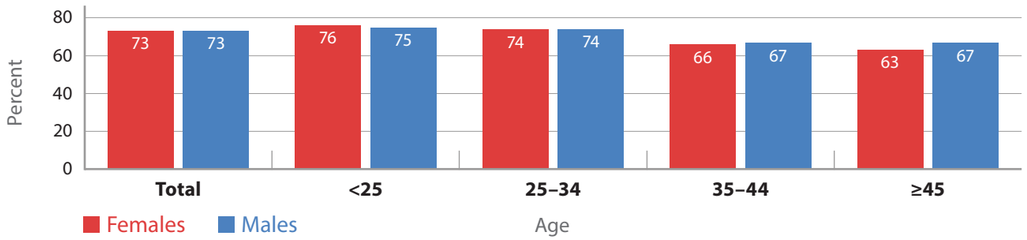
Percent of Soldiers Meeting Weeknight/Duty Night Sleep Target by Sex and Age, AC Soldiers, 2018

On weeknights/duty nights, just over 1 in 3 Army Soldiers are getting the target 7 or more hours of sleep per night; there is no difference in proportions of male and female Soldiers attaining the target.



Percent of Soldiers Meeting Weekend/Non-Duty Night Sleep Target by Sex and Age, AC Soldiers, 2018

During the weekend/non-duty nights, more Soldiers report sufficient sleep. On weekends/non-duty nights, almost 3 out of 4 Army Soldiers are getting the target of 7 or more hours of sleep; rates are similar across sex and age groups.



SPOTLIGHT

BLUE LIGHT: TOO MUCH OF A GOOD THING

JUST LIKE PLANTS, HUMANS NEED LIGHT TO maintain good health. There are a number of physiological processes that require light, such as maintaining circadian rhythms (sleep-wake cycle), Vitamin D production, and healthy bones. Exposure to blue light, however, may be too much of a "good thing." From 2000 to 2009, the diagnosis of insomnia in the AC Soldier population increased 19-fold. This is significant because insomnia is associated with anxiety, depression, PTSD, chronic pain, alcohol abuse, and suicide (AMEDD, 2018).

Sunlight, specifically the blue wavelength component of light, controls part of our circadian rhythm. Photoreceptors in the eye absorb the blue wavelengths. This absorption decreases melatonin release, resulting in an increase in alertness, attention, and mood. However, light emitting diodes (LEDs) contain a higher level of the blue spectrum than the typical incandescent bulb historically used in home and work environments. Therefore, the use of handheld devices or other electronics with LED-based displays before sleeping inhibits an individual's melatonin release. This action may delay sleep onset, degrade sleep quality, and impair next-day alertness. A recent study reported that exposure to LED e-readers at bedtime may negatively affect sleep and circadian rhythm (Chang et al., 2015). Poor sleep can contribute to a decrease in concentration, impaired memory, and decreased physical and mental performance (AMEDD, 2018). Although somewhat controversial, some studies suggest that poor sleep caused by the reduction in melatonin production can contribute to chronic diseases such as depression, diabetes, certain types of cancers, and cardiovascular problems (Rea et al., 2010). Recently, researchers reaffirmed their position that blue light (at very high levels) from LED lighting does cause health effects (Holick, 2016).

Manufacturers of devices using LED-based displays have attempted to ameliorate the issue by allowing the user to attach an external blue light filter to the screen or turn on an internal "blue light filter," either of which will decrease the amount of blue light. Another widely accepted solution is refraining from using LED devices at least 2 hours before going to sleep. A more controversial solution that may prove beneficial is the use of special blue-blocking eyewear or lens coatings. A recent U.S. Marine Corps study found that blue light-blocking glasses provide significant improvements in alertness and mood and may provide improvements in sleep quality (Werner, 2017).

According to Army researchers, when Soldiers get less than 7–8 hours of sleep, their performance degrades; getting only 4–6 hours of sleep has demonstrated a 10–15% decrease in Soldier performance (AMEDD, 2018). Since less than 5% of Soldiers can sustain performance on less than 7–8 hours of sleep per day (AMEDD, 2018), ensuring good sleep habits and minimizing blue light exposure before bedtime are essential for maintaining good performance.

Activity

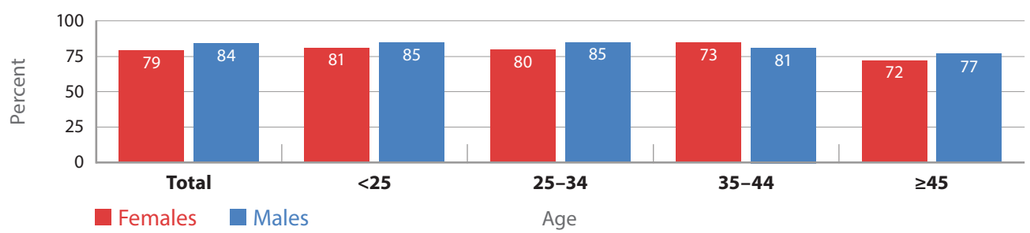
There are two activity recommendations from the CDC (CDC, 2020). The first is attaining 2 or more days per week of resistance training. The second activity recommendation is adequate aerobic activity. The amount of activity can be attained in three ways:

- **150 minutes a week of moderate-intensity aerobic activity, or**
- **75 minutes a week of vigorous-intensity aerobic activity, or**
- **an equivalent combination of moderate- and vigorous-intensity aerobic activity.**

MODERATE-INTENSITY	*VIGOROUS-INTENSITY*
Brisk walking	Running
Recreational swimming	Lap swimming
General yard work / Home repair	Heavy yard work (digging, shoveling)
Bicycling (less than 10mph)	Biking (over 10mph)
Low-impact excercise classes	High-intensity interval training (HIIT)

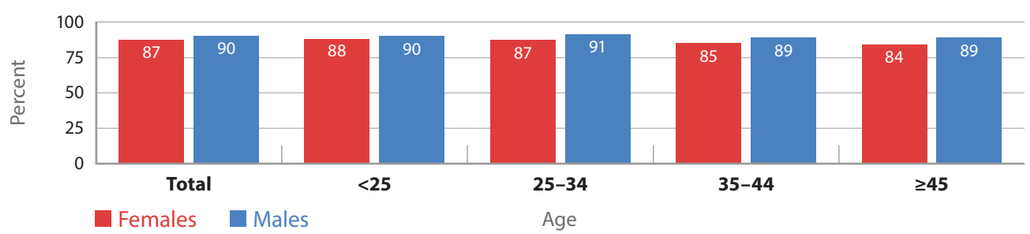
Percent of Soldiers Meeting Resistance Training Target by Sex and Age, AC Soldiers, 2018

More than 4 out of 5 Army Soldiers are engaging in resistance training on 2 or more days of the week. Target attainment varied by sex and age groups: 85% of male Soldiers under age 25 are getting adequate resistance training.



Percent of Soldiers Meeting Aerobic Activity Target by Sex and Age, AC Soldiers, 2018

Approximately nine out of ten Army Soldiers are attaining adequate aerobic activity; overall, female Soldiers are meeting the target less frequently.



SPOTLIGHT

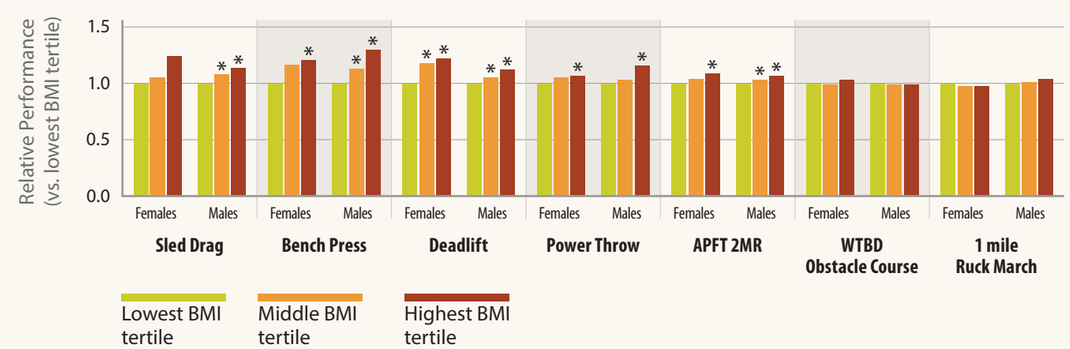
IMPACT OF BMI AND PHYSICAL FITNESS ON WARRIOR TASKS AND BATTLE DRILLS PERFORMANCE

WARRIOR TASKS AND BATTLE DRILLS (WTBD) are tasks that include obstacle navigation, casualty drag/evacuation, and establishing a fighting position. All Soldiers must successfully master WTBD as they are vital for Soldier combat survivability. In addition to performing these core tasks, Soldiers must also meet stringent requirements for body fat composition. Specifically, Soldiers must pass biannual sex- and age-adjusted weight-for-height screening standards based on BMI values (body mass divided by height squared, kg/m^2). Failure to meet these screening standards requires conditional body fat assessments known as Tape Tests, as described in AR 600–9 (DA, 2019e).

Studies show that Soldiers with higher BMIs complete the Army Physical Fitness Test (APFT) 2-mile run more slowly, indicating a lower aerobic capacity. Conversely, Soldiers with higher BMIs perform better on fitness tests of muscular strength (i.e., lift heavier weights) and power (i.e., move external objects farther and/or faster) (Pierce et al., 2017). These components of fitness are critical to performing WTBDs. When Soldiers were divided into three equally sized groupings, or tertiles, from lowest to highest BMI, Soldiers in the two highest BMI tertiles (including overweight (25–30 kg/m^2) and obese (≥30 kg/m^2)) outperformed Soldiers in the lowest BMI tertile (normal weight (18.5–24.9 kg/m2)) on fitness tests relevant to WTBD performance, such as the sled drag, bench press, deadlift, and power throw (Pierce et al., 2017) (see figure). Additionally, Soldiers in the three BMI tertiles had similar completion times for a 1-mile loaded ruck march and an obstacle course that included four WTBDs.

Tradeoffs exist between higher BMI and physical performance. Soldiers may not meet strict body composition standards/guidelines but may still excel on physical fitness components related to the execution of WTBDs. The outstanding question for the Army is "How do you balance body composition and physical fitness standards to optimize readiness and retention of Soldiers?"

Relative Performance on Physical Fitness Tests and WTBDs by Sex, AC Soldiers, 2014



Performance of middle and high BMI tertiles was compared to the lowest BMI tertile; asterisks indicate where there is a significant difference compared to the lowest BMI tertile.

Source: Pierce et al., 2017

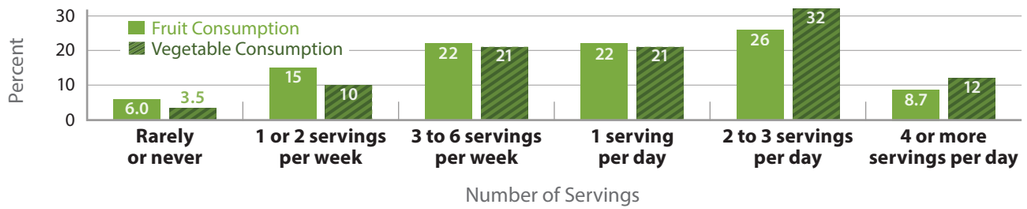
Nutrition

On the GAT, Soldiers report the approximate servings of fruits and vegetables they consume each week. Most Soldiers report fruit consumption ranging from a few servings per week to a few servings per day. Vegetable consumption is a bit higher, with more Soldiers reporting multiple servings per day.

The targets as reported here (USDA, 2019c) are defined as eating two or more servings of fruits and two or more servings of vegetables per day.

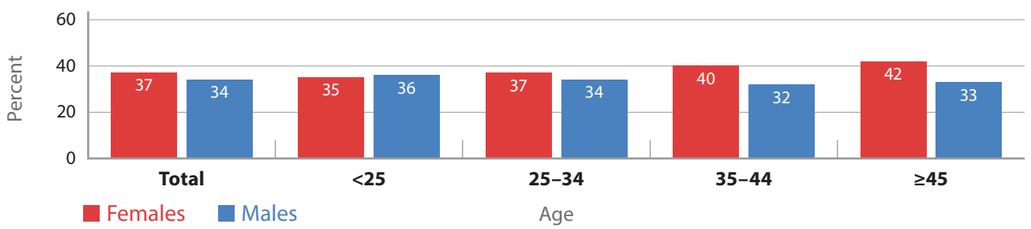
Estimated Fruit and Vegetable Consumption per Week, AC Soldiers, 2018

Most Soldiers reported fruit consumption ranging from 3 to 6 servings per week to 2 to 3 servings per day. Vegetable consumption was higher than fruit consumption; more Soldiers reported consuming 2 to 3 servings per day.



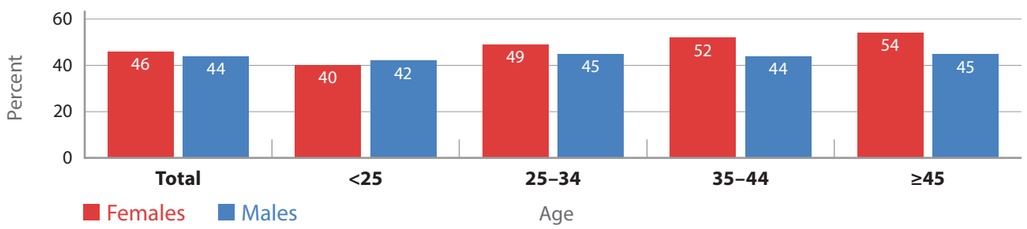
Percent of Soldiers Meeting Fruit Consumption Target by Sex and Age, AC Soldiers, 2018

More than 1 in 3 Soldiers ate two or more servings of fruit per day. A higher proportion of female Soldiers met the fruit target than male Soldiers.



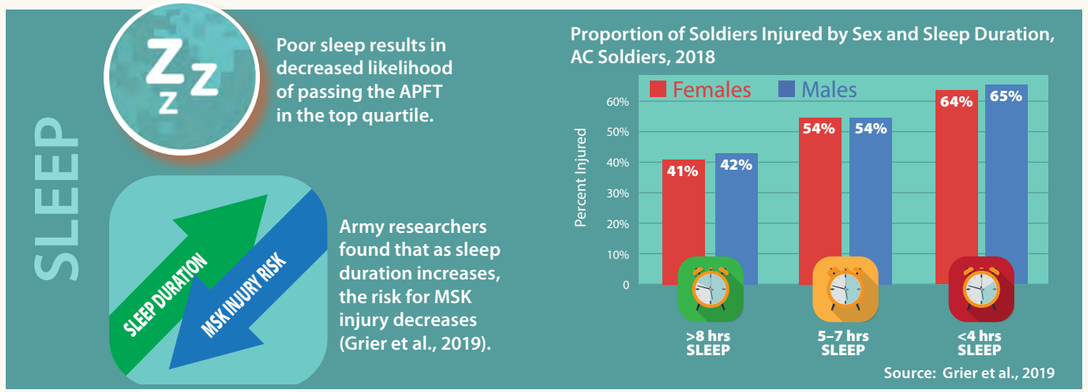
Percent of Soldiers Meeting Vegetable Consumption Target by Sex and Age, AC Soldiers, 2018

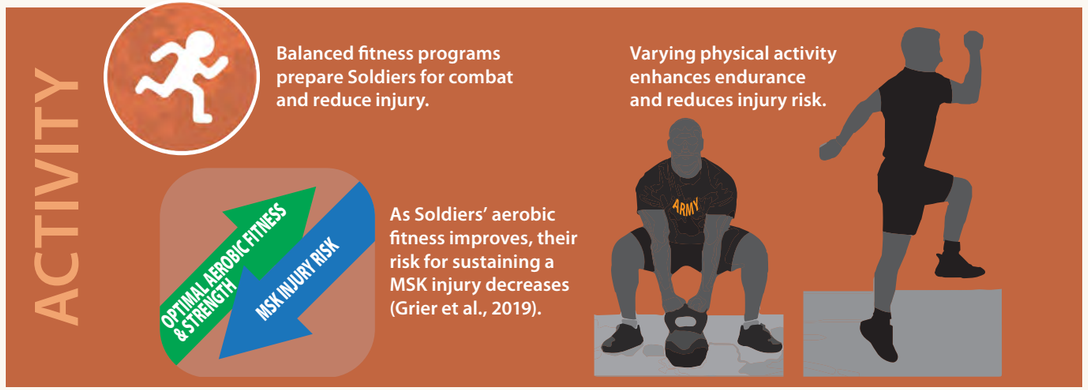
Almost 1 in 2 Soldiers ate two or more servings of vegetables per day. A higher proportion of female Soldiers met the vegetable target than male Soldiers.

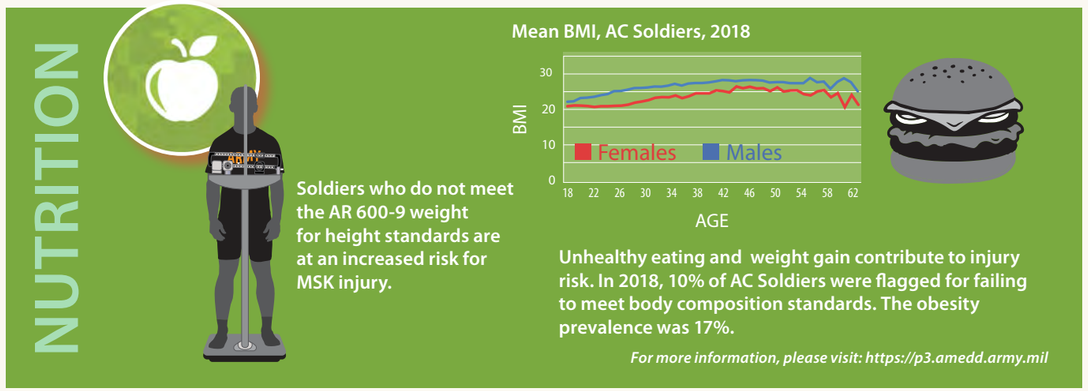


SPOTLIGHT

OPTIMIZE SLEEP, ACTIVITY, AND NUTRITION TO DECREASE INJURY AND IMPROVE PERFORMANCE







Summary

Percent of Soldiers Meeting SAN Targets, AC Soldiers, 2018

attained 7 or more hours of sleep on weeknights/duty nights.

attained 7 or more hours of sleep on weekends/non-duty nights.

engaged in resistance training 2 or more days per week.

achieved adequate moderate and/or vigorous aerobic activity targets.

ate 2 or more servings of fruits per day.

ate 2 or more servings of vegetables per day.

Photo by Pat Molnar

Installation Health Index

The *Health of the Force* presents metrics with the intent of revealing actionable interpretations of health data. The Installation Health Index (IHI) is a composite measure that can be used to gauge the health of installation populations. **The purpose of the IHI is to motivate discussions about successes and challenges that can be leveraged across the Force.**

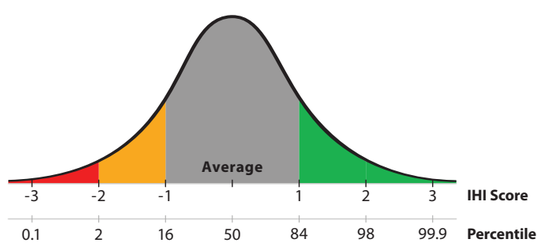
The IHI combines installation-specific metric scores, each calculated by contrasting the installation's metric value to the average value for the installations evaluated (subsequently referred to as Army average). It also incorporates the number of poor air quality days, an environmental health metric. The IHI consists of two components: a score and a percentile.

How should IHI be interpreted?

IHI Score	IHI Percentile
The IHI is a global installation health indicator defined as a weighted average of z-scores corresponding to six installation medical metric values and an installation air quality score. IHI scores are standardized such that a score of zero represents the average across the 40 Army installations included in the 2018 *Health of the Force*; positive scores are above average, and negative scores are below average.	The percentile for a given installation is the probability of having an IHI equal to, or lower than that installation's IHI.
Higher IHI scores reflect comparatively better installation health. IHI scores less than -2 (i.e., more than 2 standard deviations below the average) are color-coded in red. IHI scores between -1 and -2 (i.e. between 1 and 2 standard deviations below the average) are color-coded in yellow; IHI scores ≥ 1 (i.e. ≥1 standard deviation above the average) are color-coded in green.	Higher IHI percentiles reflect more favorable installation health relative to other installations.

The IHI incorporates age- and sex-adjusted values for six medical metrics (injury, sleep disorders, chronic disease, obesity, tobacco product use, STI), and installation air quality. The weights given to each metric for calculation of the IHI are shown here.

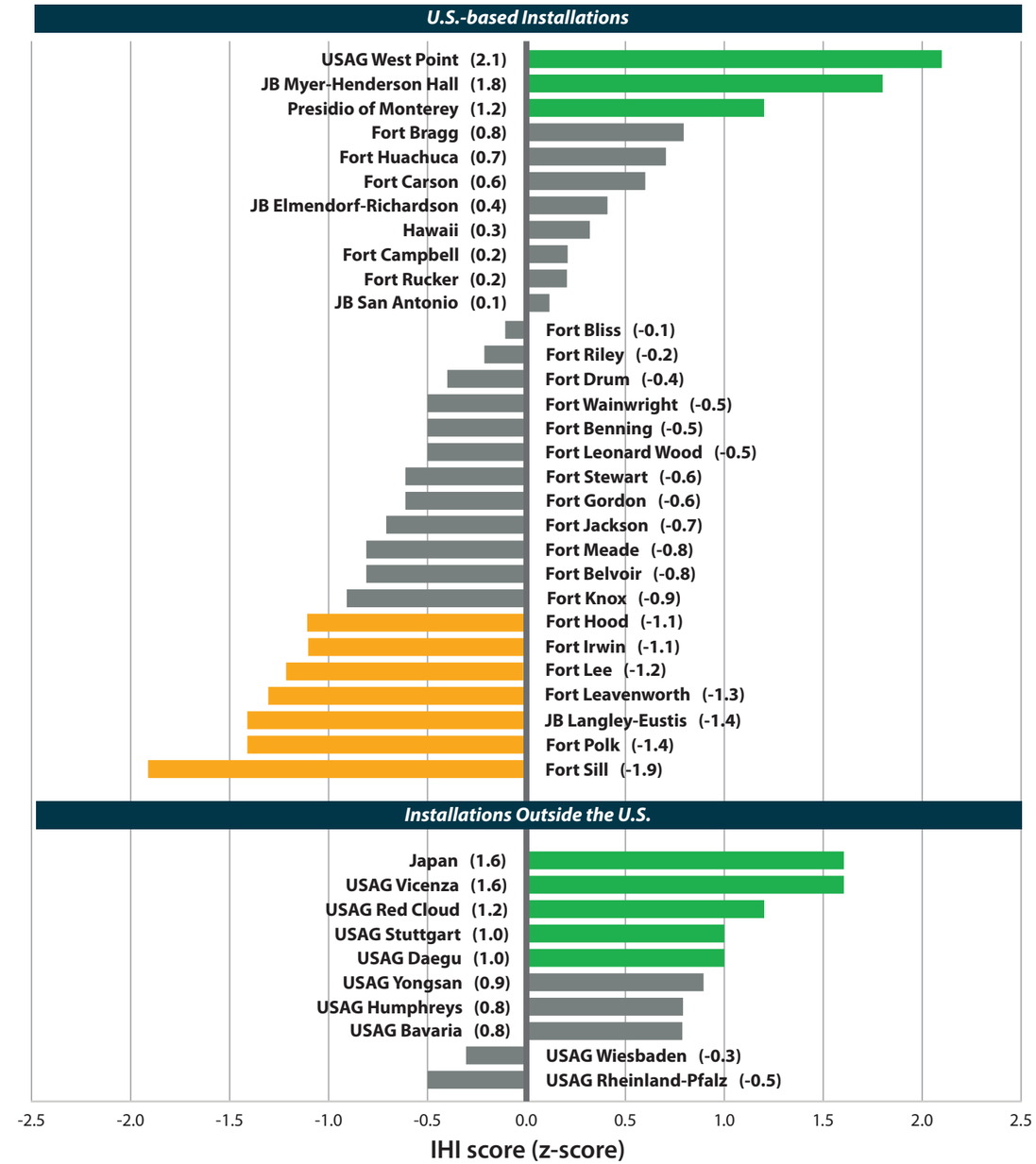
- Injury (30%)
- Obesity (BMI) (15%)
- Sleep disorders (15%)
- Chronic disease (15%)
- Tobacco use (15%)
- Sexually transmitted infections (chlamydia) (5%)
- Air quality (5%)



See the Methods Appendix for more information on the IHI.

IHI should not be compared with prior years due to changes in data sources and methodology (e.g., new weighting, new metric inclusion criteria, new tobacco use definitions, etc).

Ranking by Installation Health Index Score



The ranking order is based on unrounded scores. U.S.-based installations and installations outside the U.S. are ranked separately.

COLOR CODE KEY:

GREEN = Better than the Army average by 1 or more SD

AMBER = Worse than the Army average by 1 or more SD

RED = Worse than the Army average by 2 or more SD

NO COLOR ADDED = About the same as the Army average

Rankings by Medical Metrics

The health data used to rank installations are adjusted by age and sex to allow for a more accurate comparison of health outcomes throughout the Force. Installations outside of the U.S. are ranked separately from U.S.-based installations due to differences which may bias their comparison with U.S.-based installations.

Red, amber, and green color coding symbolizes installation health status compared to the average across *Health of the Force* installations.

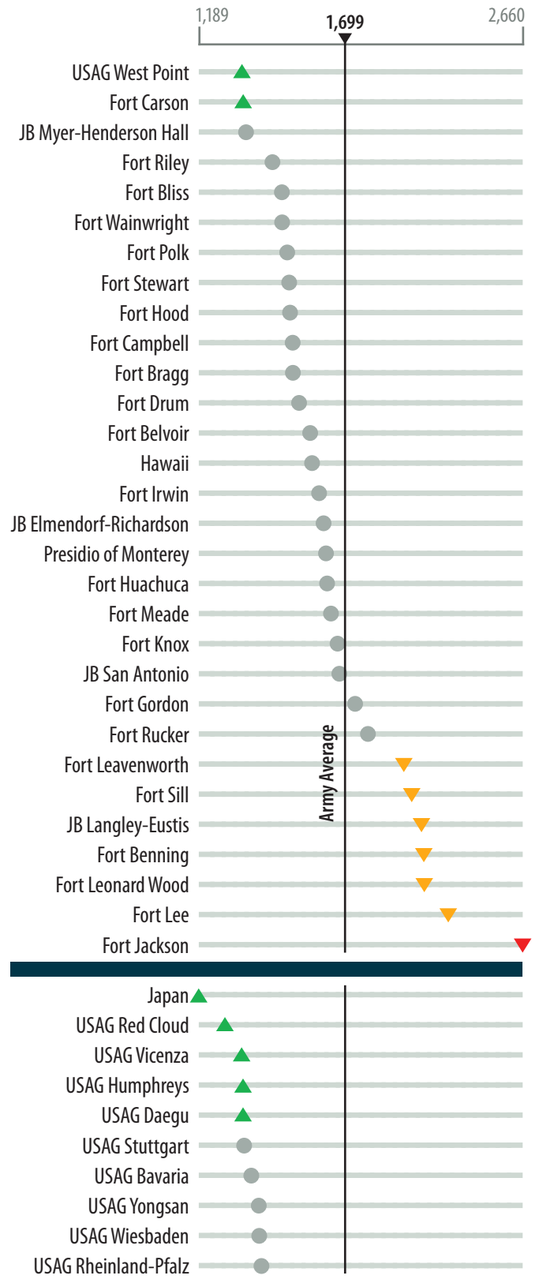
The ranking order is based on adjusted, unrounded rates. U.S.-based installations and installations outside the U.S. are ranked separately.

COLOR CODE KEY:

- **GREEN** — Better than the average of the 40 installations presented by 1 or more SD
- **AMBER** — Worse than the average of the 40 installations presented by 1 or more SD
- **RED** — Worse than the average of the 40 installations presented by 2 or more SD
- **NO COLOR ADDED** — About the same as the Army average

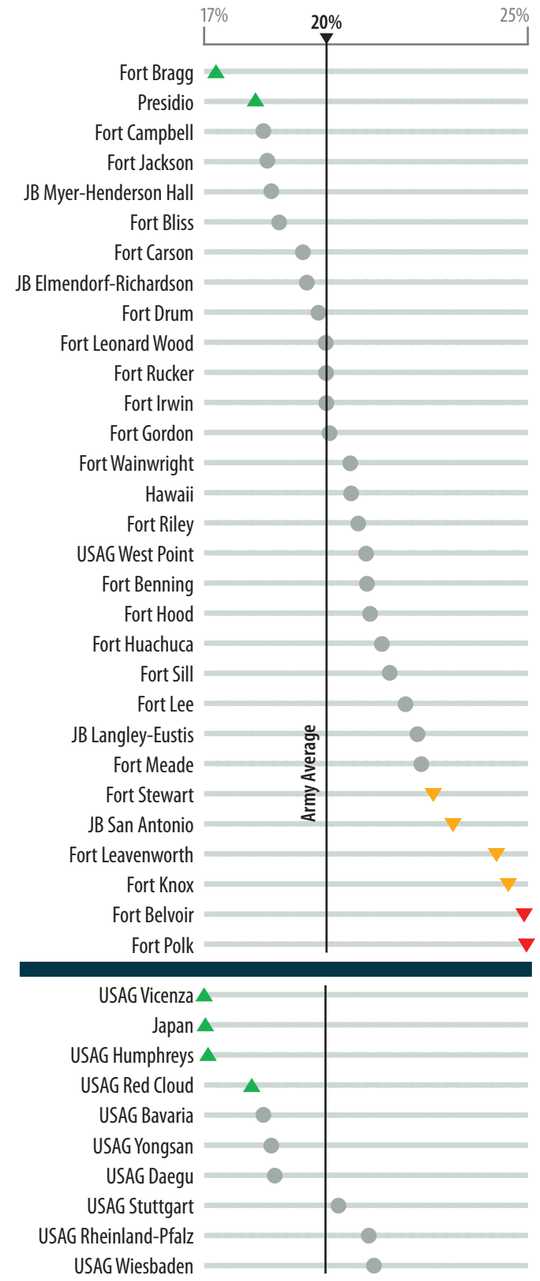
Injury

Incidence of Injuries per 1,000 person-years, adjusted average (and range) for the 40-installations presented, 2018



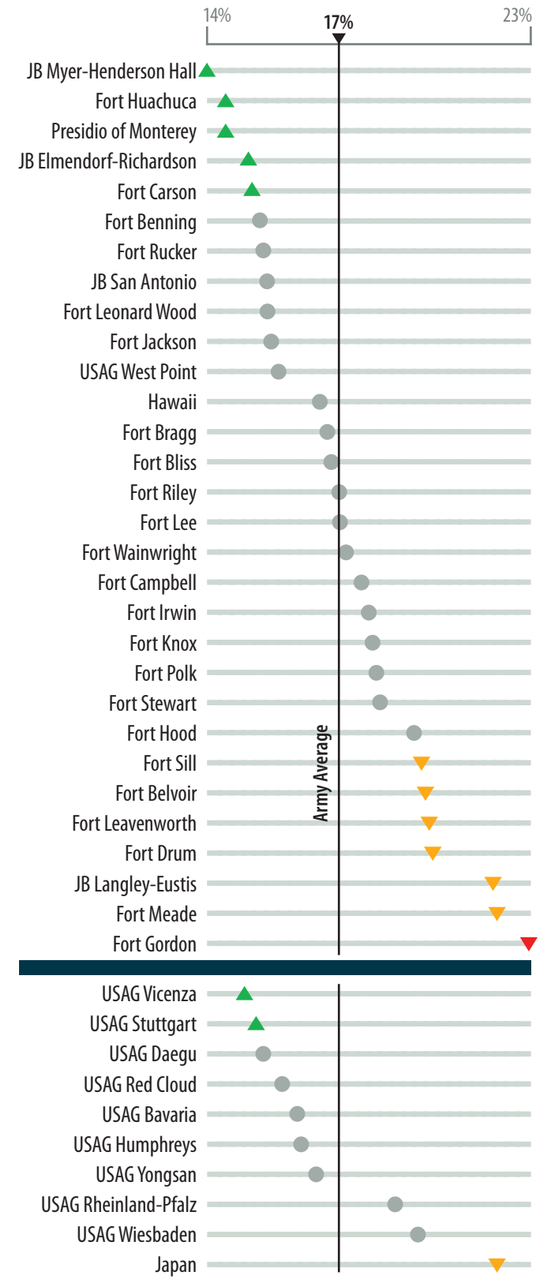
Chronic Disease

Chronic Disease Prevalence, adjusted average (and range) for the 40-installations presented, 2018



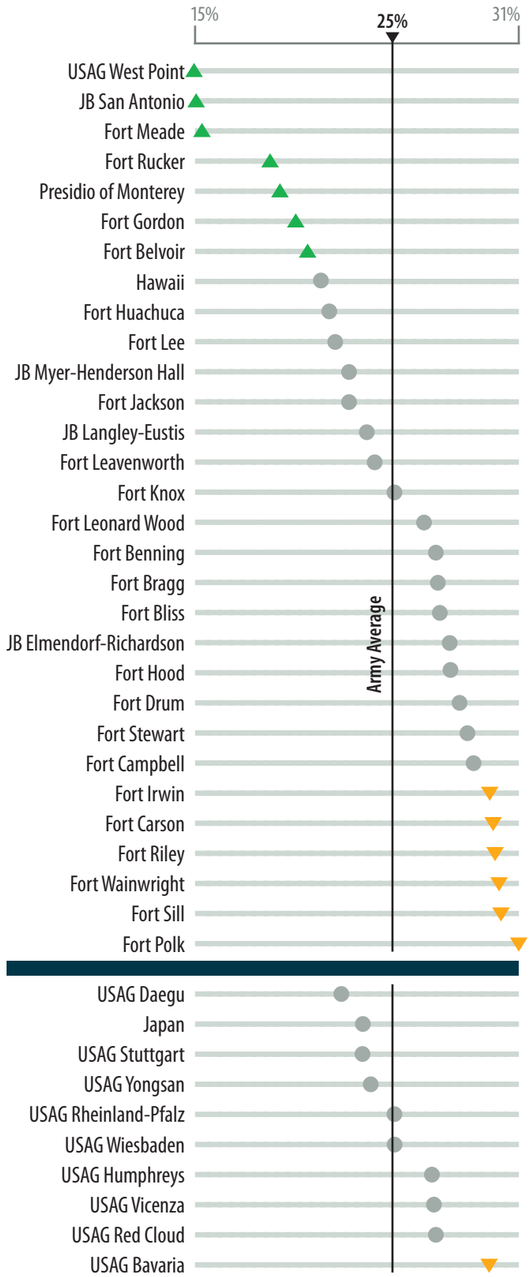
Obesity

Obesity Prevalence, adjusted average (and range) for the 40-installations presented, 2018



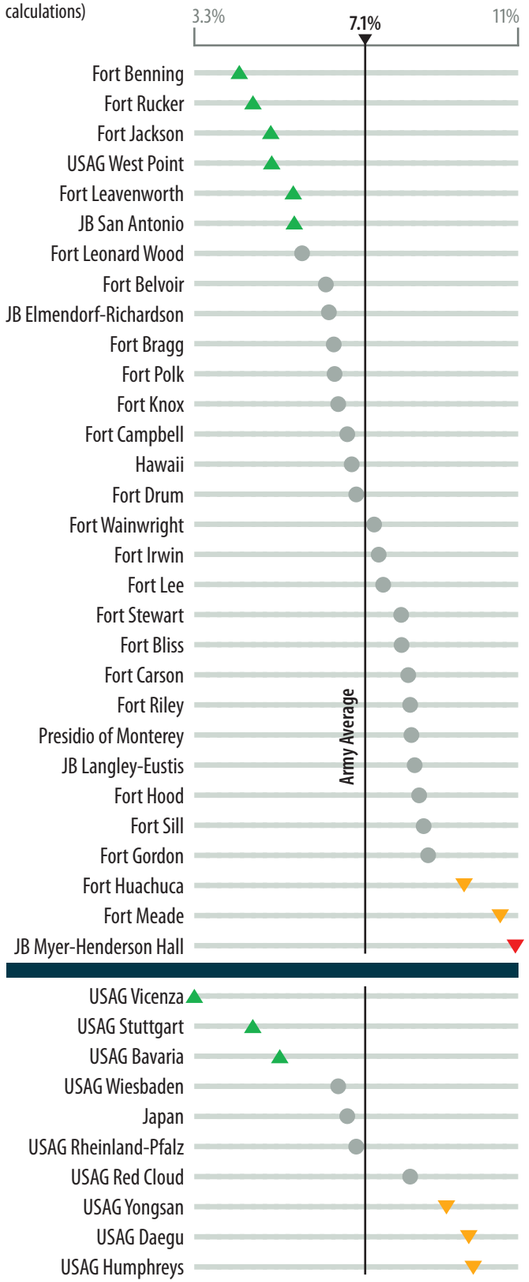
Tobacco Product Use

Tobacco Use, excluding e-cigarettes, adjusted average (and range) for the 40-installations presented, 2018



E-cigarette Use

E-cigarette Use, adjusted average (and range) for the 40-installations presented, 2018 (Note: E-cigarette use is not incorporated into the installation health index calculations)



U.S. Army photo

Installation Profiles

The below footnotes pertain to the installation profiles found on pages 91 through 137.

1. Crude values are not adjusted by age and sex.

2. Adjusted values are weighted averages of crude age- and sex-specific frequencies, where the weights are the proportions of Soldiers in the corresponding age and sex categories of the 2015 Army AC population. By using a common adjustment standard such as this, we are able to make valid comparisons across installations because it controls for age and sex differences in the population which might influence crude rates.

3. The Army values represent crude values for the entire Army, and the ranges represent crude values for the 40 installations included in the report.

4. EHI color coding (green, amber, and red) indicates metric status at the affected installation. Green denotes the desired condition.

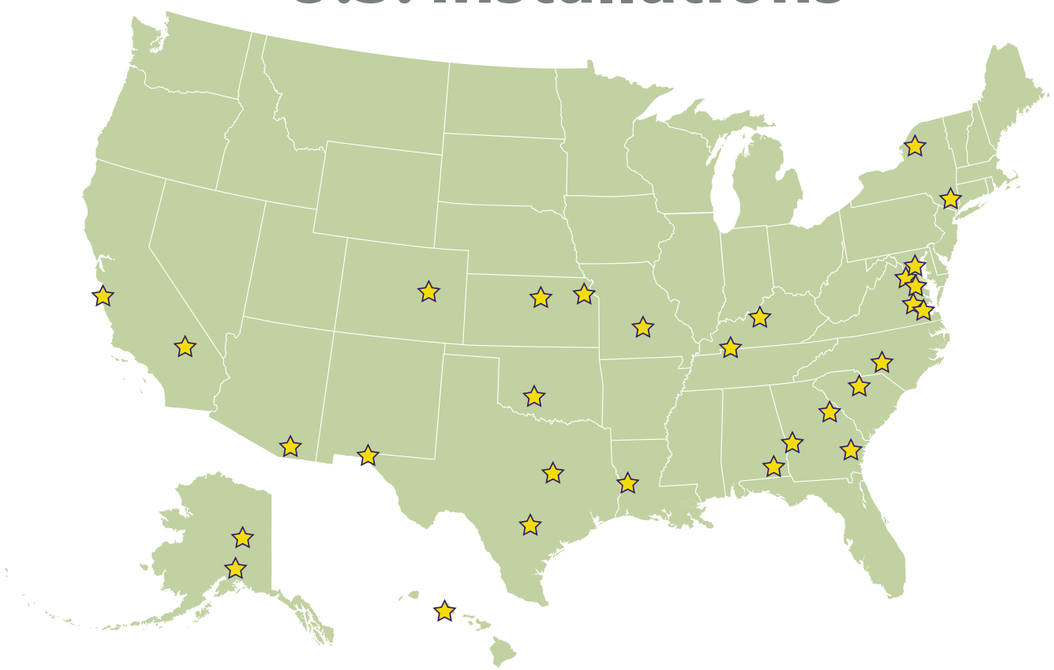
5. The IHI is a standardized weighted average of scores corresponding to six medical metrics and an air quality metric. The percentile reflects the approximate probability of having an IHI equal to or lower than the installation's IHI. Higher percentiles reflect better installation health. Green indicates better than the Army average by 1 or more SD; no color added (i.e., gray) indicates about the same as the Army average (between -0.9 SD and 0.9 SD); amber indicates worse than the Army average by 1 or more SD.

6. Air quality status was imputed from the surrounding Air Quality Control Region.

7. Air quality status was imputed from prior year data.

* Medical metric values were not displayed if <20 cases were reported or when the reporting compliance was estimated to be <50%. However, every installation met the reporting compliance threshold for the reporting year.

U.S. Installations



Fort Belvoir

Demographics: Approximately 3,300 AC Soldiers
48% under 35 years old, 24% female

Main Healthcare Facility: Fort Belvoir Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,896	1,693	1,670	1,195–3,043
Behavioral health (%)	24	21	16	10–24
Substance use disorder (%)	2.7	3.4	3.7	1.7–6.9
Sleep disorder (%)	24	18	14	8.0–24
Obesity (%)	24	20	17	11–25
Tobacco product use (%)	17	21	26	12–32
STIs: Chlamydia infection (rate per 1,000)	15	24	25	11–52
Chronic disease (%)	37	25	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
1 day/year

Poor water quality:
0 days/year

Water fluoridation:
0.70 mg/L

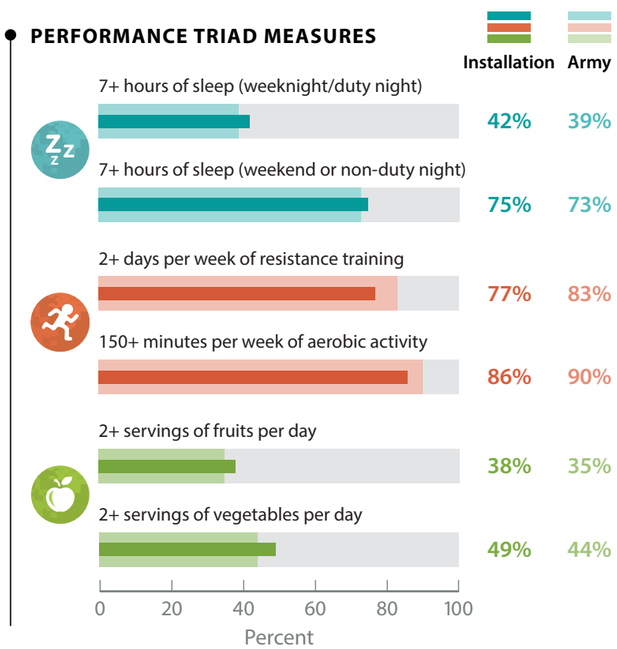
Solid waste diversion rate:
51%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
High

Heat risk:
70 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.8 (<20th percentile)**

Footnotes: See page 89.

Fort Benning

Demographics: Approximately 17,000 AC Soldiers
84% under 35 years old, 7% female

Main Healthcare Facility: Martin Army Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	2,121	2,211	1,670	1,195–3,043
Behavioral health (%)	13	16	16	10–24
Substance use disorder (%)	2.3	2.4	3.7	1.7–6.9
Sleep disorder (%)	9.9	14	14	8.0–24
Obesity (%)	11	15	17	11–25
Tobacco product use (%)	28	27	26	12–32
STIs: Chlamydia infection (rate per 1,000)	12	15	25	11–52
Chronic disease (%)	15	21	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
0 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.61 mg/L

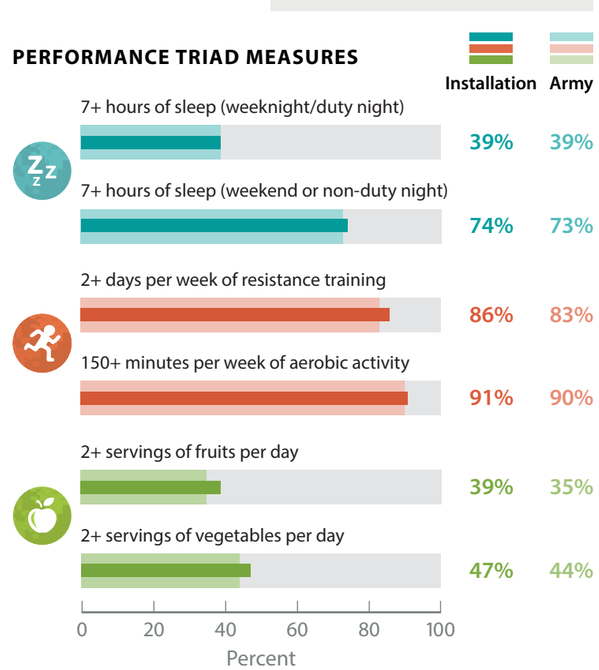
Solid waste diversion rate:
24%

Mosquito-borne disease risk:
High

Lyme disease risk:
Moderate

Heat risk:
140 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.5 (30–39th percentile)**

Footnotes: See page 89.

Fort Bliss

Demographics: Approximately 26,000 AC Soldiers
82% under 35 years old, 14% female

Main Healthcare Facility: William Beaumont Army Medical Center

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,504	1,566	1,670	1,195–3,043
Behavioral health (%)	18	19	16	10–24
Substance use disorder (%)	4.6	4.3	3.7	1.7–6.9
Sleep disorder (%)	14	17	14	8.0–24
Obesity (%)	17	17	17	11–25
Tobacco product use (%)	28	27	26	12–32
STIs: Chlamydia infection (rate per 1,000)	33	29	25	11–52
Chronic disease (%)	15	19	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
17 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.84 mg/L

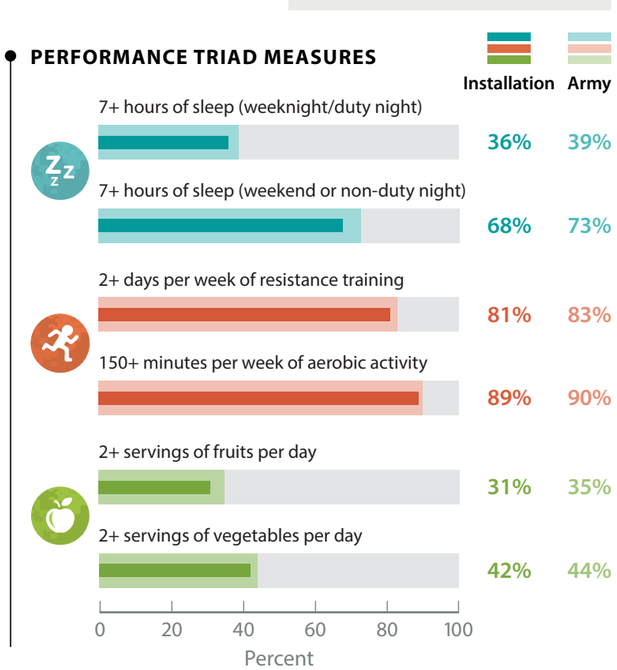
Solid waste diversion rate:
40%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
No Data

Heat risk:
88 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.1 (40–49th percentile)**

Footnotes: See page 89.

Fort Bragg

Demographics: Approximately 45,000 AC Soldiers
80% under 35 years old, 12% female

Main Healthcare Facility: Womack Army Medical Center

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,571	1,616	1,670	1,195–3,043
Behavioral health (%)	12	12	16	10–24
Substance use disorder (%)	4.0	3.9	3.7	1.7–6.9
Sleep disorder (%)	12	13	14	8.0–24
Obesity (%)	17	17	17	11–25
Tobacco product use (%)	28	27	26	12–32
STIs: Chlamydia infection (rate per 1,000)	24	24	25	11–52
Chronic disease (%)	16	17	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
0 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.54 mg/L

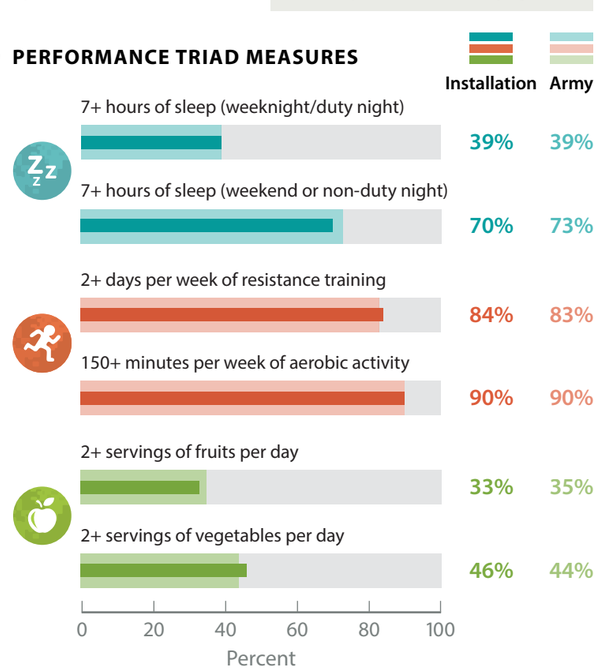
Solid waste diversion rate:
33%

Mosquito-borne disease risk:
High

Lyme disease risk:
Moderate

Heat risk:
108 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **0.8 (70–79th percentile)**

Footnotes: See page 89.

Fort Campbell

Demographics: Approximately 27,000 AC Soldiers
86% under 35 years old, 12% female

Main Healthcare Facility: Blanchfield Army Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,538	1,615	1,670	1,195–3,043
Behavioral health (%)	15	16	16	10–24
Substance use disorder (%)	3.9	3.5	3.7	1.7–6.9
Sleep disorder (%)	12	15	14	8.0–24
Obesity (%)	17	18	17	11–25
Tobacco product use (%)	30	29	26	12–32
STIs: Chlamydia infection (rate per 1,000)	23	20	25	11–52
Chronic disease (%)	14	18	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
0 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.60 mg/L

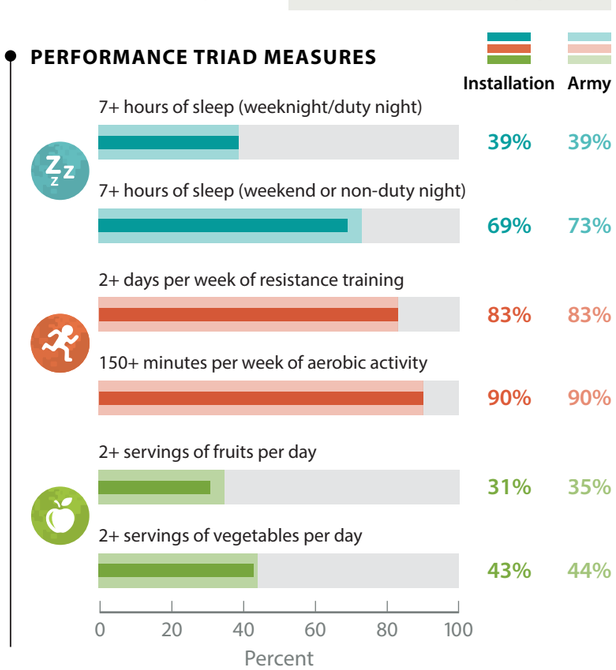
Solid waste diversion rate:
34%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
Low

Heat risk:
86 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **0.2 (50–59th percentile)**

Footnotes: See page 89.

Fort Carson

Demographics: Approximately 25,000 AC Soldiers
85% under 35 years old, 14% female

Main Healthcare Facility: Evans Army Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,312	1,390	1,670	1,195–3,043
Behavioral health (%)	14	14	16	10–24
Substance use disorder (%)	3.9	3.7	3.7	1.7–6.9
Sleep disorder (%)	12	14	14	8.0–24
Obesity (%)	15	15	17	11–25
Tobacco product use (%)	31	30	26	12–32
STIs: Chlamydia infection (rate per 1,000)	25	22	25	11–52
Chronic disease (%)	15	19	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
8 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.41 mg/L

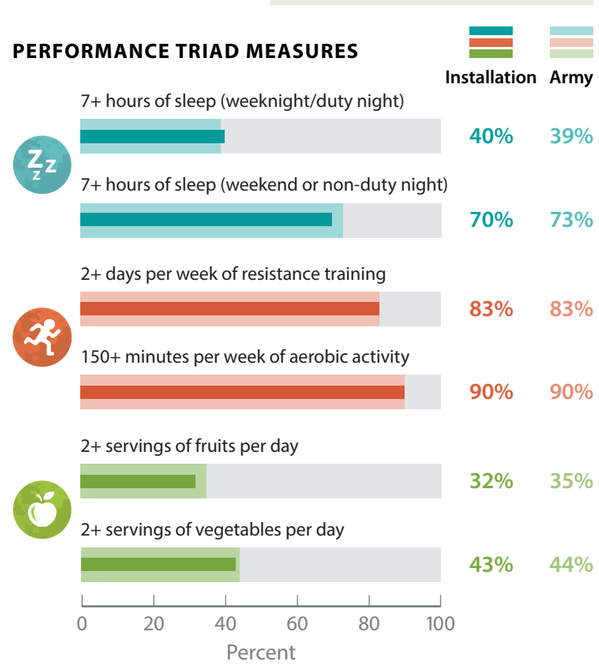
Solid waste diversion rate:
45%

Mosquito-borne disease risk:
Low

Lyme disease risk:
No Data

Heat risk:
4 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **0.6 (70–79th percentile)**

Footnotes: See page 89.

Fort Drum

Demographics: Approximately 15,000 AC Soldiers
86% under 35 years old, 12% female

Main Healthcare Facility: Guthrie Army Health Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,526	1,644	1,670	1,195–3,043
Behavioral health (%)	15	16	16	10–24
Substance use disorder (%)	4.3	3.7	3.7	1.7–6.9
Sleep disorder (%)	12	14	14	8.0–24
Obesity (%)	18	20	17	11–25
Tobacco product use (%)	29	28	26	12–32
STIs: Chlamydia infection (rate per 1,000)	46	39	25	11–52
Chronic disease (%)	14	20	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
2 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.70 mg/L

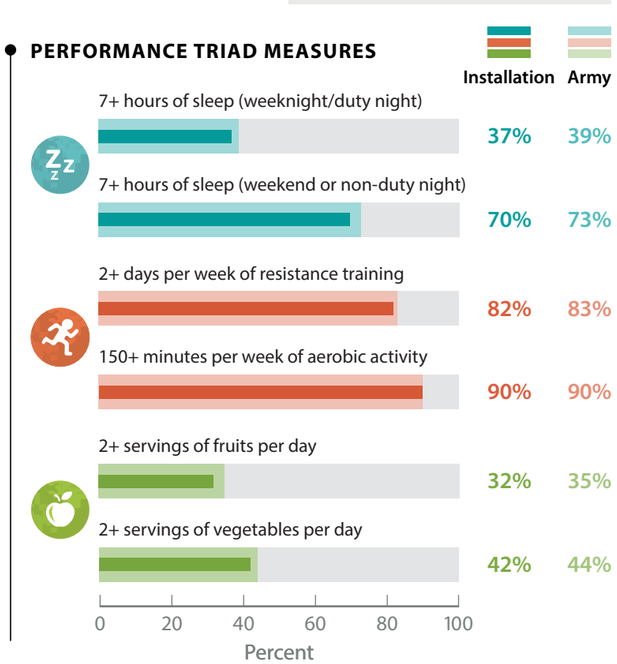
Solid waste diversion rate:
59%

Mosquito-borne disease risk:
Low

Lyme disease risk:
High

Heat risk:
17 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.4 (30–39th percentile)**

Footnotes: See page 89.

Fort Gordon

Demographics: Approximately 9,000 AC Soldiers
76% under 35 years old, 19% female

Main Healthcare Facility: Dwight D. Eisenhower Army Medical Center

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,940	1,897	1,670	1,195–3,043
Behavioral health (%)	17	17	16	10–24
Substance use disorder (%)	3.1	3.1	3.7	1.7–6.9
Sleep disorder (%)	14	14	14	8.0–24
Obesity (%)	22	23	17	11–25
Tobacco product use (%)	19	20	26	12–32
STIs: Chlamydia infection (rate per 1,000)	17	15	25	11–52
Chronic disease (%)	19	20	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
6 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.72 mg/L

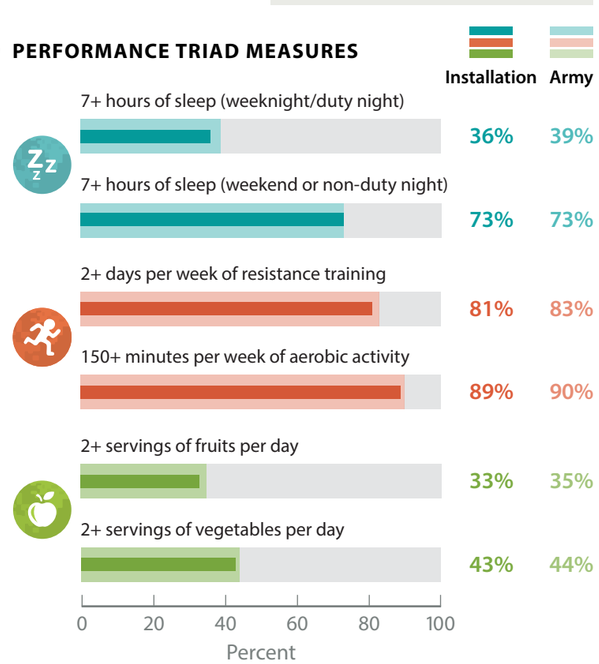
Solid waste diversion rate:
22%

Mosquito-borne disease risk:
High

Lyme disease risk:
No Data

Heat risk:
140 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.6 (20–29th percentile)**

Footnotes: See page 89.

Fort Hood

Demographics: Approximately 36,000 AC Soldiers
83% under 35 years old, 17% female

Main Healthcare Facility: Carl R. Darnall Army Medical Center

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,530	1,603	1,670	1,195–3,043
Behavioral health (%)	19	19	16	10–24
Substance use disorder (%)	5.4	5.0	3.7	1.7–6.9
Sleep disorder (%)	17	19	14	8.0–24
Obesity (%)	18	19	17	11–25
Tobacco product use (%)	28	28	26	12–32
STIs: Chlamydia infection (rate per 1,000)	36	29	25	11–52
Chronic disease (%)	17	21	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
5 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.21 mg/L

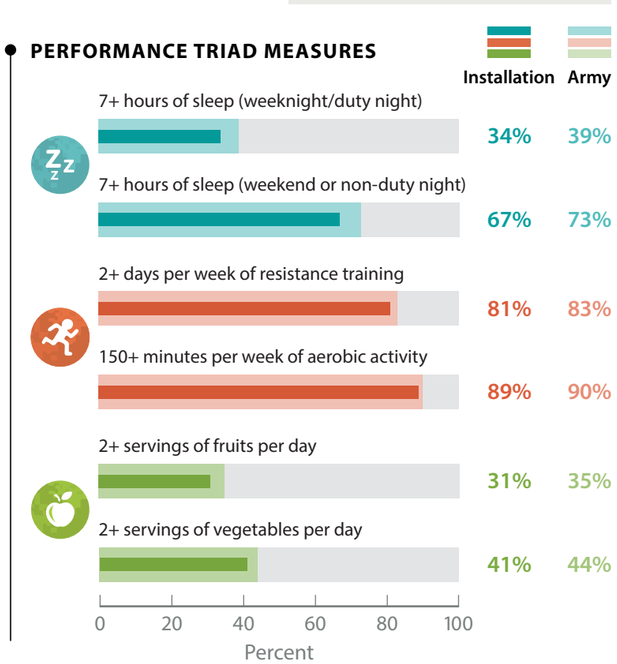
Solid waste diversion rate:
53%

Mosquito-borne disease risk:
High

Lyme disease risk:
No Data

Heat risk:
127 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-1.1 (<20th percentile)**

Footnotes: See page 89.

Fort Huachuca

Demographics: Approximately 4,000 AC Soldiers
78% under 35 years old, 17% female

Main Healthcare Facility: Raymond W. Bliss Army Health Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,785	1,770	1,670	1,195–3,043
Behavioral health (%)	11	11	16	10–24
Substance use disorder (%)	2.4	2.4	3.7	1.7–6.9
Sleep disorder (%)	12	13	14	8.0–24
Obesity (%)	13	14	17	11–25
Tobacco product use (%)	21	22	26	12–32
STIs: Chlamydia infection (rate per 1,000)	17	15	25	11–52
Chronic disease (%)	19	21	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
0 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.70 mg/L

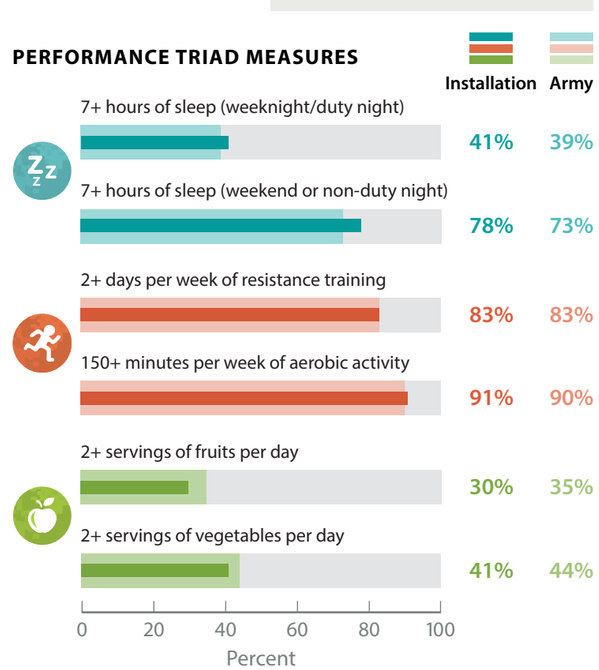
Solid waste diversion rate:
0%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
Low

Heat risk:
30 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **0.7 (70–79th percentile)**

Footnotes: See page 89.

Fort Irwin

Demographics: Approximately 4,200 AC Soldiers
78% under 35 years old, 14% female

Main Healthcare Facility: Weed Army Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,724	1,735	1,670	1,195–3,043
Behavioral health (%)	18	18	16	10–24
Substance use disorder (%)	6.9	6.5	3.7	1.7–6.9
Sleep disorder (%)	17	18	14	8.0–24
Obesity (%)	18	18	17	11–25
Tobacco product use (%)	30	30	26	12–32
STIs: Chlamydia infection (rate per 1,000)	37	34	25	11–52
Chronic disease (%)	18	20	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
55 days/year

Poor water quality:
0 days/year

Water fluoridation:
1.51 mg/L

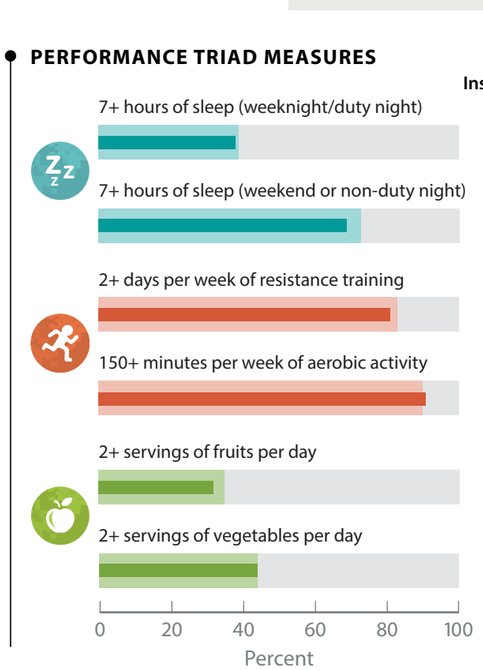
Solid waste diversion rate:
30%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
No Data

Heat risk:
95 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-1.1 (<20th percentile)**

Footnotes: See page 89.

Fort Jackson

Demographics: Approximately 6,700 AC Soldiers
81% under 35 years old, 28% female

Main Healthcare Facility: Moncrief Army Health Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	3,043	2,660	1,670	1,195–3,043
Behavioral health (%)	16	16	16	10–24
Substance use disorder (%)	1.7	2.1	3.7	1.7–6.9
Sleep disorder (%)	8.0	12	14	8.0–24
Obesity (%)	11	16	17	11–25
Tobacco product use (%)	21	23	26	12–32
STIs: Chlamydia infection (rate per 1,000)	36	22	25	11–52
Chronic disease (%)	13	18	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[5]

Poor air quality:
1 day/year

Poor water quality:
0 days/year

Water fluoridation:
0.63 mg/L

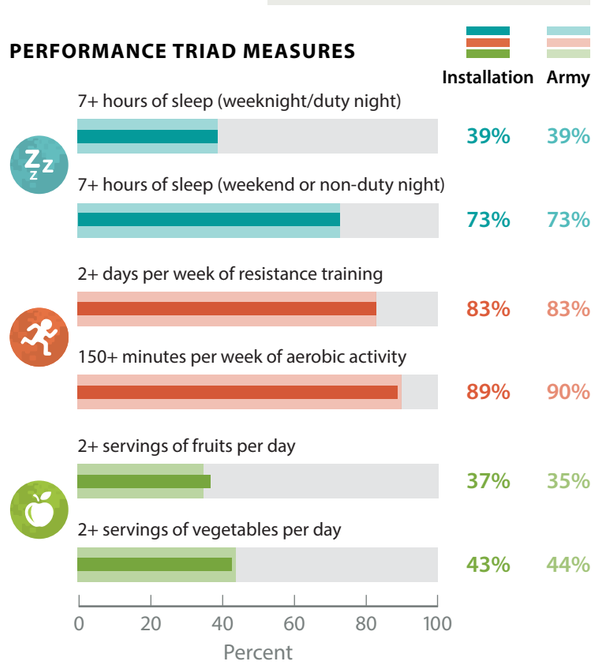
Solid waste diversion rate:
29%

Mosquito-borne disease risk:
High

Lyme disease risk:
Low

Heat risk:
138 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.7 (20–29th percentile)**

Footnotes: See page 89.

Fort Knox

Demographics: Approximately 4,100 AC Soldiers
64% under 35 years old, 22% female

Main Healthcare Facility: Ireland Army Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	2,057	1,819	1,670	1,195–3,043
Behavioral health (%)	19	17	16	10–24
Substance use disorder (%)	2.7	2.8	3.7	1.7–6.9
Sleep disorder (%)	21	17	14	8.0–24
Obesity (%)	23	18	17	11–25
Tobacco product use (%)	23	25	26	12–32
STIs: Chlamydia infection (rate per 1,000)	14	14	25	11–52
Chronic disease (%)	31	24	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[5]

Poor air quality:
0 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.65 mg/L

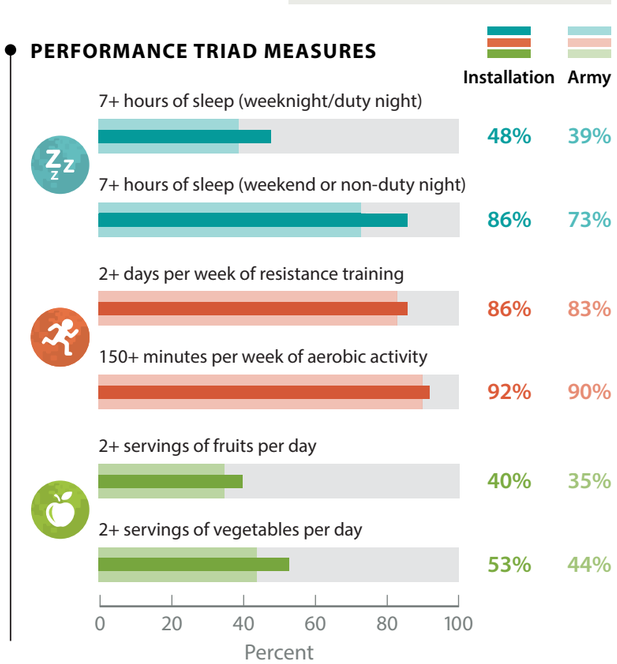
Solid waste diversion rate:
43%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
Low

Heat risk:
63 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.9 (<20th percentile)**

Footnotes: See page 89.

Fort Leavenworth

Demographics: Approximately 3,300 AC Soldiers
54% under 35 years old, 16% female

Main Healthcare Facility: Munson Army Health Center

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	2,264	2,120	1,670	1,195–3,043
Behavioral health (%)	18	18	16	10–24
Substance use disorder (%)	2.6	3.7	3.7	1.7–6.9
Sleep disorder (%)	18	14	14	8.0–24
Obesity (%)	24	20	17	11–25
Tobacco product use (%)	21	24	17	12–32
STIs: Chlamydia infection (rate per 1,000)	16	28	25	11–52
Chronic disease (%)	33	24	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
0 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.57 mg/L

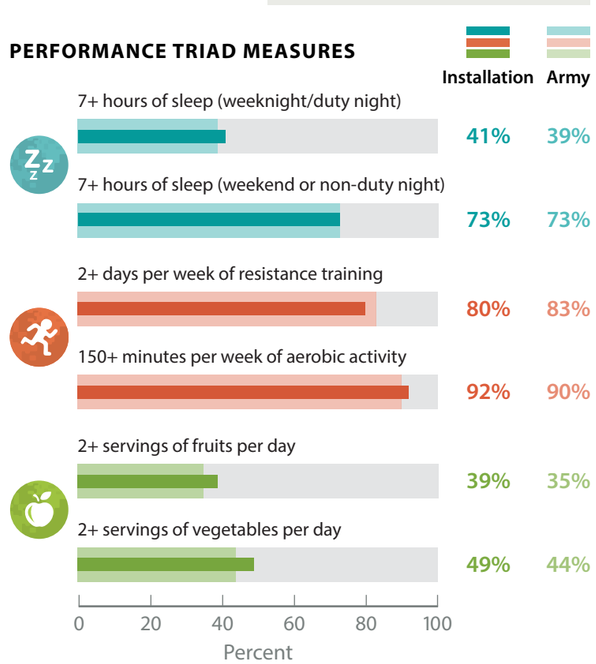
Solid waste diversion rate:
26%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
Low

Heat risk:
75 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-1.3 (<20th percentile)**

Footnotes: See page 89.

Fort Lee

Demographics: Approximately 7,400 AC Soldiers
78% under 35 years old, 23% female

Main Healthcare Facility: Kenner Army Health Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	2,445	2,322	1,670	1,195–3,043
Behavioral health (%)	17	18	16	10–24
Substance use disorder (%)	2.2	2.5	3.7	1.7–6.9
Sleep disorder (%)	14	16	14	8.0–24
Obesity (%)	13	18	17	11–25
Tobacco product use (%)	21	22	17	12–32
STIs: Chlamydia infection (rate per 1,000)	13	9.6	25	11–52
Chronic disease (%)	18	22	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
No Data[6]

Poor water quality:
0 days/year

Water fluoridation:
0.67 mg/L

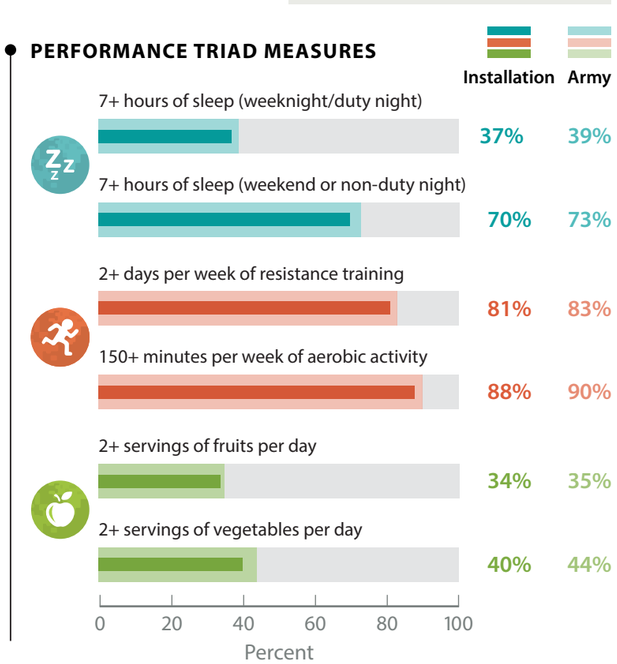
Solid waste diversion rate:
51%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
Moderate

Heat risk:
73 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-1.2 (<20th percentile)**

Footnotes: See page 89.

Fort Leonard Wood

Demographics: Approximately 7,800 AC Soldiers
82% under 35 years old, 18% female

Main Healthcare Facility: General Leonard Wood Army Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	2,273	2,213	1,670	1,195–3,043
Behavioral health (%)	14	16	16	10–24
Substance use disorder (%)	2.4	2.6	3.7	1.7–6.9
Sleep disorder (%)	10	14	14	8.0–24
Obesity (%)	12	16	17	11–25
Tobacco product use (%)	26	27	26	12–32
STIs: Chlamydia infection (rate per 1,000)	13	11	25	11–52
Chronic disease (%)	14	20	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
No Data[6]

Poor water quality:
0 days/year

Water fluoridation:
0.78 mg/L

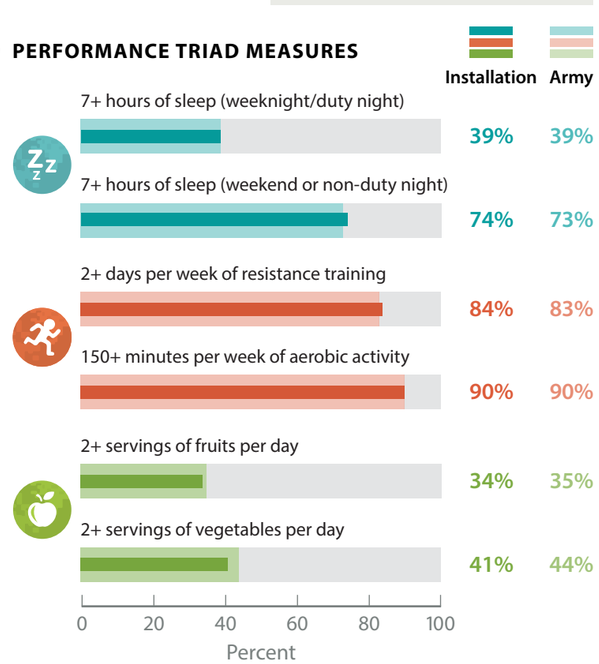
Solid waste diversion rate:
51%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
Moderate

Heat risk:
72 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.5 (20–29th percentile)**

Footnotes: See page 89.

Fort Meade

Demographics: Approximately 4,000 AC Soldiers
63% under 35 years old, 20% female

Main Healthcare Facility: Kimbrough Ambulatory Care Center

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,890	1,789	1,670	1,195–3,043
Behavioral health (%)	19	18	16	10–24
Substance use disorder (%)	2.2	2.7	3.7	1.7–6.9
Sleep disorder (%)	20	17	14	8.0–24
Obesity (%)	25	22	17	11–25
Tobacco product use (%)	17	18	26	12–32
STIs: Chlamydia infection (rate per 1,000)	12	15	25	11–52
Chronic disease (%)	29	22	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
9 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.71 mg/L

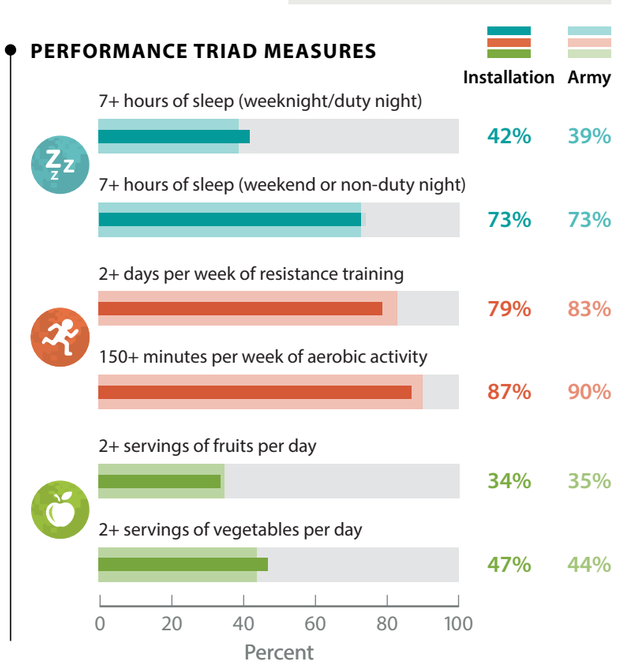
Solid waste diversion rate:
47%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
High

Heat risk:
50 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.8 (20–29th percentile)**

Footnotes: See page 89.

Fort Polk

Demographics: Approximately 7,900 AC Soldiers
83% under 35 years old, 12% female

Main Healthcare Facility: Bayne-Jones Army Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,517	1,590	1,670	1,195–3,043
Behavioral health (%)	18	19	16	10–24
Substance use disorder (%)	5.0	4.6	3.7	1.7–6.9
Sleep disorder (%)	15	14	14	8.0–24
Obesity (%)	17	18	17	11–25
Tobacco product use (%)	32	31	26	12–32
STIs: Chlamydia infection (rate per 1,000)	29	25	25	11–52
Chronic disease (%)	20	25	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
No Data[6]

Poor water quality:
0 days/year

Water fluoridation:
0.90 mg/L

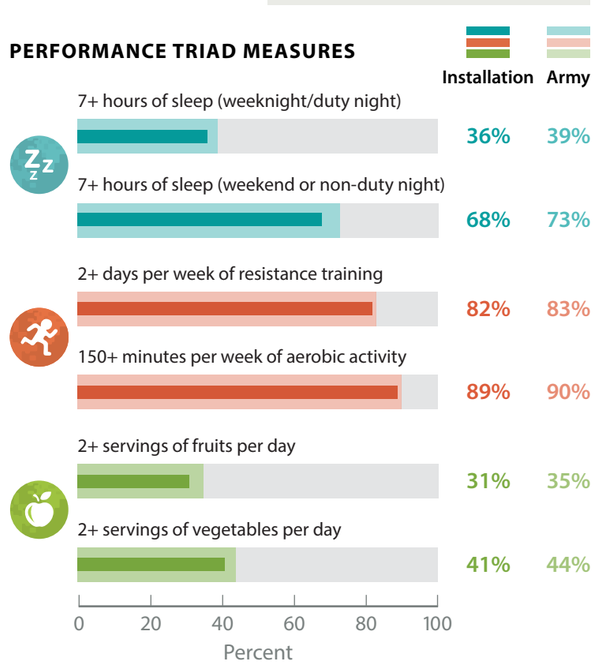
Solid waste diversion rate:
59%

Mosquito-borne disease risk:
High

Lyme disease risk:
No Data

Heat risk:
135 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-1.4 (<20th percentile)**

Footnotes: See page 89.

Fort Riley

Demographics: Approximately 15,000 AC Soldiers
86% under 35 years old, 13% female

Main Healthcare Facility: Irwin Army Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,404	1,523	1,670	1,195–3,043
Behavioral health (%)	16	17	16	10–24
Substance use disorder (%)	5.3	4.8	3.7	1.7–6.9
Sleep disorder (%)	12	15	14	8.0–24
Obesity (%)	16	17	17	11–25
Tobacco product use (%)	30	30	26	12–32
STIs: Chlamydia infection (rate per 1,000)	35	29	25	11–52
Chronic disease (%)	15	21	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
No Data[6]

Poor water quality:
75 days/year

Water fluoridation:
0.56 mg/L

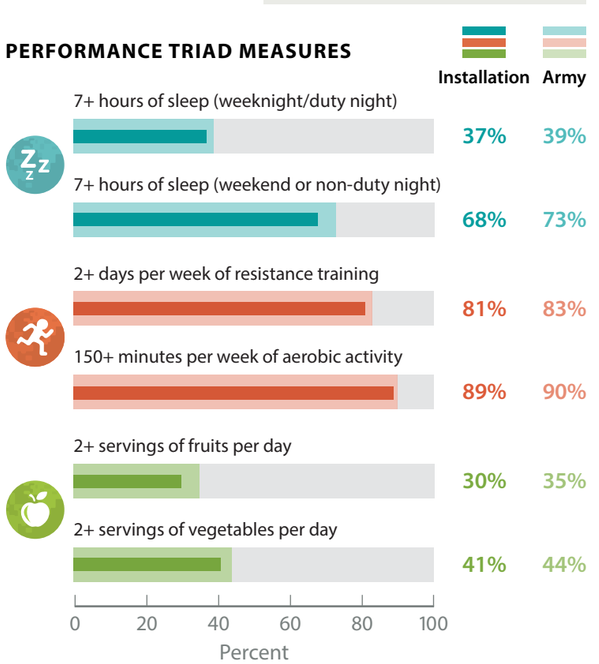
Solid waste diversion rate:
44%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
Low

Heat risk:
92 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.2 (40–49th percentile)**

Footnotes: See page 89.

Fort Rucker

Demographics: Approximately 2,900 AC Soldiers
66% under 35 years old, 14% female

Main Healthcare Facility: Lyster Army Health Center

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	2,114	1,957	1,670	1,195–3,043
Behavioral health (%)	11	10	16	10–24
Substance use disorder (%)	1.7	1.8	3.7	1.7–6.9
Sleep disorder (%)	19	16	14	8.0–24
Obesity (%)	17	15	17	11–25
Tobacco product use (%)	19	19	26	12–32
STIs: Chlamydia infection (rate per 1,000)	13	14	25	11–52
Chronic disease (%)	23	20	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
No Data[6]

Poor water quality:
0 days/year

Water fluoridation:
0.65 mg/L

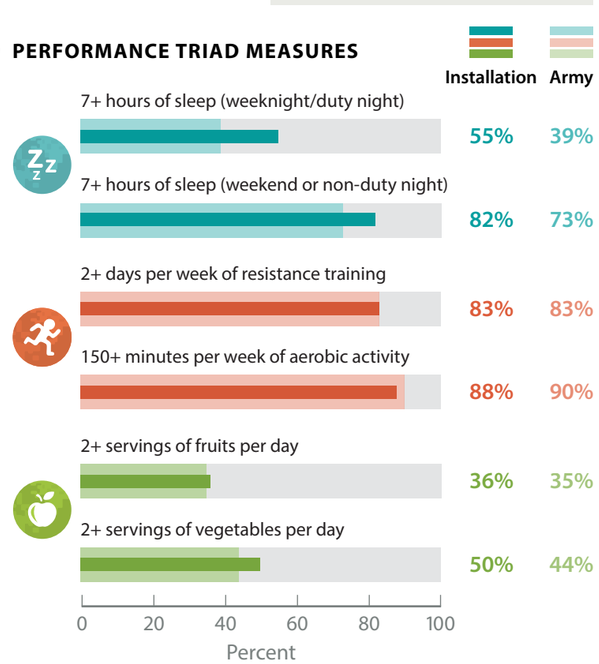
Solid waste diversion rate:
63%

Mosquito-borne disease risk:
High

Lyme disease risk:
No Data

Heat risk:
138 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **0.2 (50–59th percentile)**

Footnotes: See page 89.

Fort Sill

Demographics: Approximately 10,000 AC Soldiers
84% under 35 years old, 15% female

Main Healthcare Facility: Reynolds Army Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	2,106	2,156	1,670	1,195–3,043
Behavioral health (%)	20	21	16	10–24
Substance use disorder (%)	3.7	3.7	3.7	1.7–6.9
Sleep disorder (%)	15	19	14	8.0–24
Obesity (%)	16	20	17	11–25
Tobacco product use (%)	30	30	26	12–32
STIs: Chlamydia infection (rate per 1,000)	19	17	25	11–52
Chronic disease (%)	16	21	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
4 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.58 mg/L

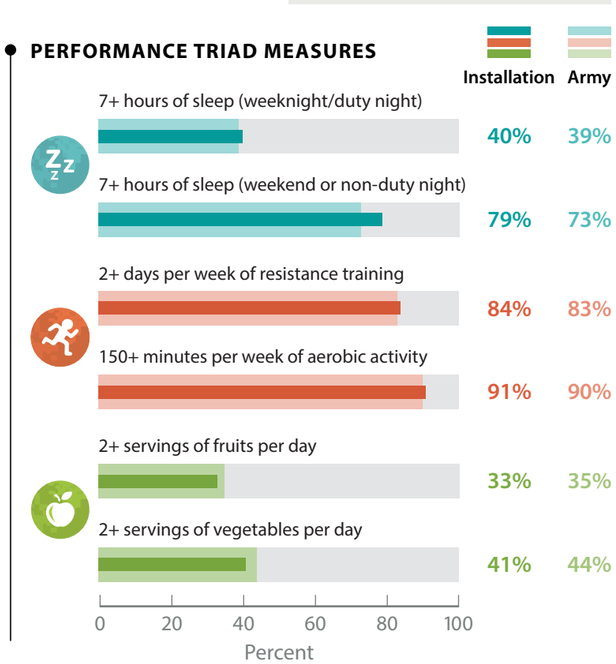
Solid waste diversion rate:
96%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
Low

Heat risk:
126 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-1.9 (<20th percentile)**

Footnotes: See page 89.

Fort Stewart

Demographics: Approximately 20,000 AC Soldiers
84% under 35 years old, 15% female

Main Healthcare Facility: Winn Army Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,520	1,599	1,670	1,195–3,043
Behavioral health (%)	19	20	16	10–24
Substance use disorder (%)	4.5	4.2	3.7	1.7–6.9
Sleep disorder (%)	13	16	14	8.0–24
Obesity (%)	17	18	17	11–25
Tobacco product use (%)	29	29	26	12–32
STIs: Chlamydia infection (rate per 1,000)	23	20	25	11–52
Chronic disease (%)	18	23	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
No Data[6]

Poor water quality:
0 days/year

Water fluoridation:
0.98 mg/L

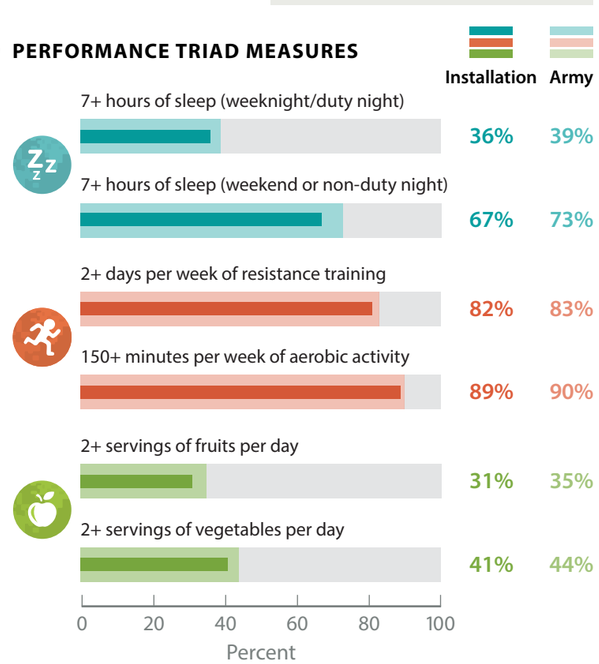
Solid waste diversion rate:
59%

Mosquito-borne disease risk:
High

Lyme disease risk:
Moderate

Heat risk:
130 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.6 (20–29th percentile)**

Footnotes: See page 89.

Fort Wainwright

Demographics: Approximately 7,500 AC Soldiers
88% under 35 years old, 10% female

Main Healthcare Facility: Bassett Army Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,440	1,567	1,670	1,195–3,043
Behavioral health (%)	14	15	16	10–24
Substance use disorder (%)	4.8	4.2	3.7	1.7–6.9
Sleep disorder (%)	12	16	14	8.0–24
Obesity (%)	15	18	17	11–25
Tobacco product use (%)	32	30	26	12–32
STIs: Chlamydia infection (rate per 1,000)	29	24	25	11–52
Chronic disease (%)	13	21	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
30 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.30 mg/L

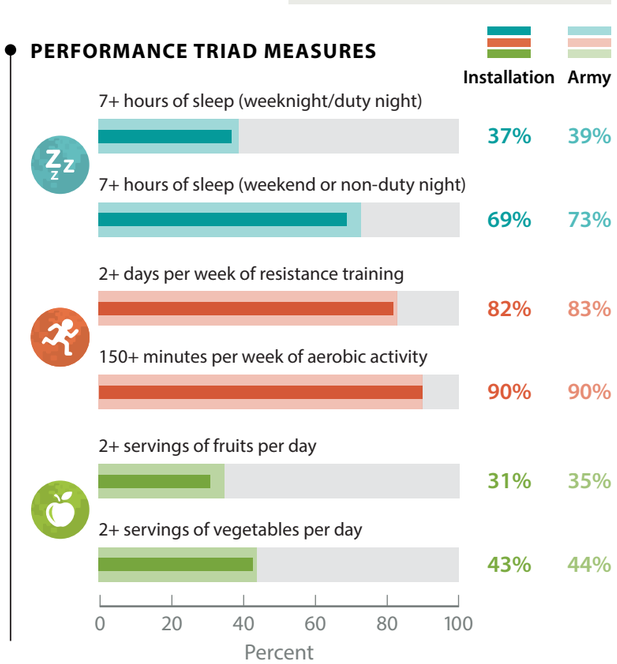
Solid waste diversion rate:
4%

Mosquito-borne disease risk:
Low

Lyme disease risk:
No Data

Heat risk:
0 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.5 (30–39th percentile)**

Footnotes: See page 89.

Hawaii

Demographics: Approximately 21,000 AC Soldiers
78% under 35 years old, 18% female

Main Healthcare Facility: Tripler Army Medical Center and Schofield Barracks Health Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,703	1,701	1,670	1,195–3,043
Behavioral health (%)	16	16	16	10–24
Substance use disorder (%)	3.3	3.3	3.7	1.7–6.9
Sleep disorder (%)	14	15	14	8.0–24
Obesity (%)	17	17	17	11–25
Tobacco product use (%)	21	21	26	12–32
STIs: Chlamydia infection (rate per 1,000)	35	34	25	11–52
Chronic disease (%)	20	21	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
0 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.70 mg/L

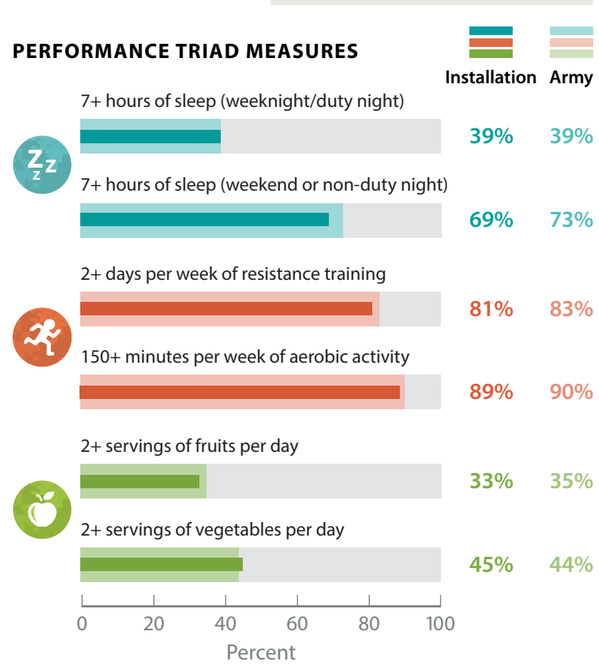
Solid waste diversion rate:
29%

Mosquito-borne disease risk:
High

Lyme disease risk:
No Data

Heat risk:
17 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **0.3 (60–69th percentile)**

Footnotes: See page 89.

JB Elmendorf-Richardson

Demographics: Approximately 4,700 AC Soldiers
88% under 35 years old, 9% female

Main Healthcare Facility: Joint Base Elmendorf-Richardson Health and Wellness Center

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,600	1,754	1,670	1,195–3,043
Behavioral health (%)	9.5	11	16	10–24
Substance use disorder (%)	2.5	2.4	3.7	1.7–6.9
Sleep disorder (%)	11	14	14	8.0–24
Obesity (%)	14	15	17	11–25
Tobacco product use (%)	29	28	26	12–32
STIs: Chlamydia infection (rate per 1,000)	26	22	25	11–52
Chronic disease (%)	13	19	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
0 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.58 mg/L

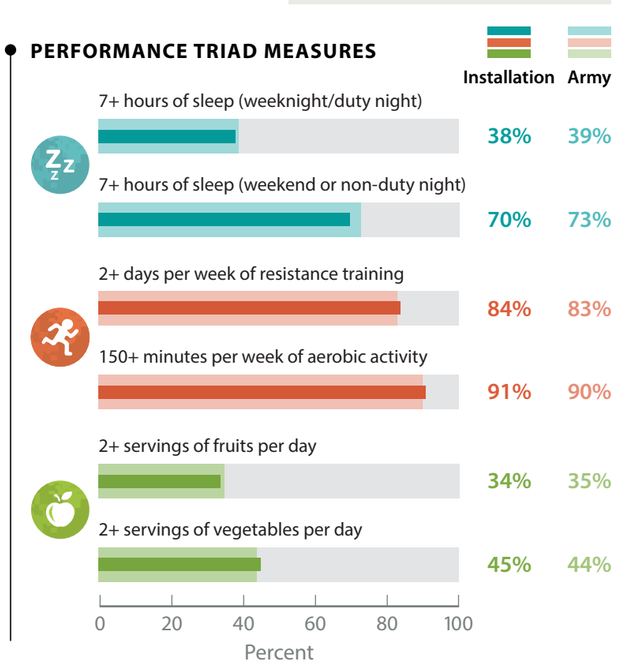
Solid waste diversion rate:
20%

Mosquito-borne disease risk:
Low

Lyme disease risk:
No Data

Heat risk:
0 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **0.4 (60–69th percentile)**

Footnotes: See page 89.

JB Langley-Eustis

Demographics: Approximately 5,300 AC Soldiers
72% under 35 years old, 15% female

Main Healthcare Facility: McDonald Army Health Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	2,235	2,200	1,670	1,195–3,043
Behavioral health (%)	18	18	16	10–24
Substance use disorder (%)	2.9	3.0	3.7	1.7–6.9
Sleep disorder (%)	16	16	14	8.0–24
Obesity (%)	22	21	17	11–25
Tobacco product use (%)	23	24	26	12–32
STIs: Chlamydia infection (rate per 1,000)	17	16	25	11–52
Chronic disease (%)	22	22	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
0 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.84 mg/L

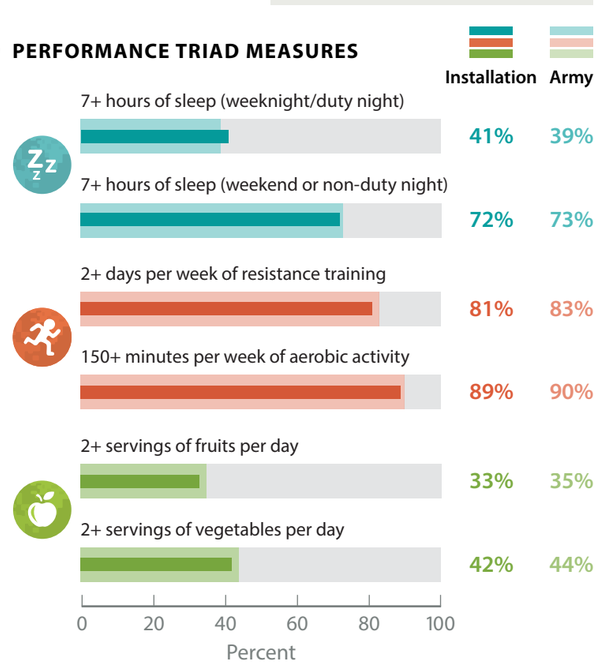
Solid waste diversion rate:
No Data

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
Moderate

Heat risk:
86 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-1.4 (<20th percentile)**

Footnotes: See page 89.

JB Myer-Henderson Hall

Demographics: Approximately 2,000 AC Soldiers
78% under 35 years old, 11% female

Main Healthcare Facility: Andrew Rader Army Health Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,391	1,403	1,670	1,195–3,043
Behavioral health (%)	18	18	16	10–24
Substance use disorder (%)	5.1	4.5	3.7	1.7–6.9
Sleep disorder (%)	11	12	14	8.0–24
Obesity (%)	15	14	17	11–25
Tobacco product use (%)	24	23	26	12–32
STIs: Chlamydia infection (rate per 1,000)	17	18	25	11–52
Chronic disease (%)	16	18	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
1 day/year

Poor water quality:
0 days/year

Water fluoridation:
0.70 mg/L

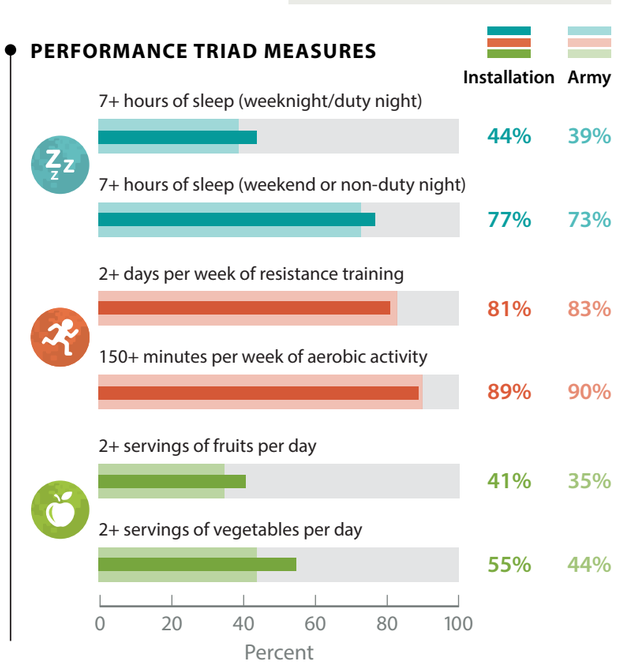
Solid waste diversion rate:
96%

Mosquito-borne disease risk:
High

Lyme disease risk:
High

Heat risk:
61 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **1.8 (≥90th percentile)**

Footnotes: See page 89.

JB San Antonio

Demographics: Approximately 8,500 AC Soldiers
63% under 35 years old, 29% female

Main Healthcare Facility: San Antonio Military Medical Center

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	2,051	1,825	1,670	1,195–3,043
Behavioral health (%)	21	19	16	10–24
Substance use disorder (%)	2.4	2.7	3.7	1.7–6.9
Sleep disorder (%)	20	17	14	8.0–24
Obesity (%)	16	15	17	11–25
Tobacco product use (%)	13	15	26	12–32
STIs: Chlamydia infection (rate per 1,000)	11	12	25	11–52
Chronic disease (%)	29	23	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
11 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.48 mg/L

Solid waste diversion rate:
No Data

Mosquito-borne disease risk:
High

Lyme disease risk:
Moderate

Heat risk:
137 days/year

PERFORMANCE TRIAD MEASURES

Installation Health Index Score[5]: **0.1 (50–59th percentile)**

Footnotes: See page 89.

Presidio of Monterey

Demographics: Approximately 1,000 AC Soldiers
80% under 35 years old, 23% female

Main Healthcare Facility: Presidio of Monterey Army Health Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,781	1,765	1,670	1,195–3,043
Behavioral health (%)	20	20	16	10–24
Substance use disorder (%)	2.7	2.9	3.7	1.7–6.9
Sleep disorder (%)	11	12	14	8.0–24
Obesity (%)	15	14	17	11–25
Tobacco product use (%)	18	19	26	12–32
STIs: Chlamydia infection (rate per 1,000)	Data suppressed*		25	11–52
Chronic disease (%)	17	18	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
7 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.22 mg/L

Solid waste diversion rate:
39%

Mosquito-borne disease risk:
Low

Lyme disease risk:
Moderate

Heat risk:
0 days/year

PERFORMANCE TRIAD MEASURES

Installation Health Index Score[5]: **1.2 (80–89th percentile)**

Footnotes: See page 89.

USAG West Point

Demographics: Approximately 1,600 AC Soldiers
61% under 35 years old, 19% female

Main Healthcare Facility: Keller Army Community Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,485	1,383	1,670	1,195–3,043
Behavioral health (%)	12	11	16	10–24
Substance use disorder (%)	2.0	2.0	3.7	1.7–6.9
Sleep disorder (%)	12	9.3	14	8.0–24
Obesity (%)	17	16	17	11–25
Tobacco product use (%)	12	15	26	12–32
STIs: Chlamydia infection (rate per 1,000)	Data suppressed*		25	11–52
Chronic disease (%)	25	21	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
1 day/year

Poor water quality:
0 days/year

Water fluoridation:
0.40 mg/L

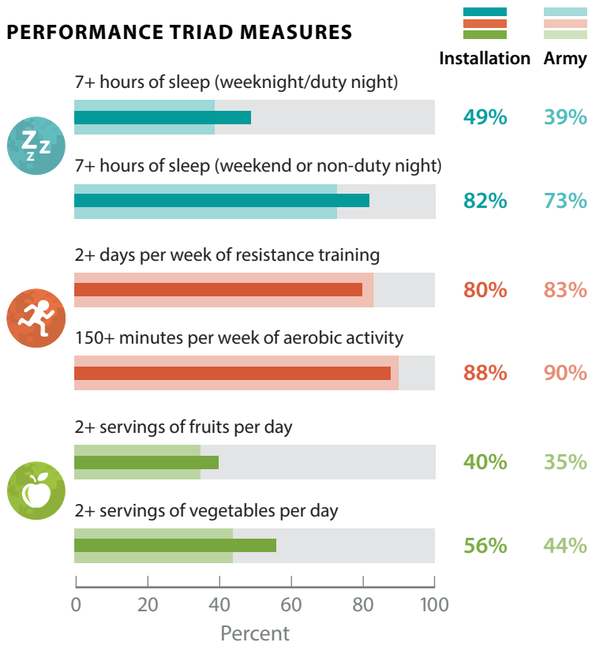
Solid waste diversion rate:
No Data

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
No Data

Heat risk:
47 days/year

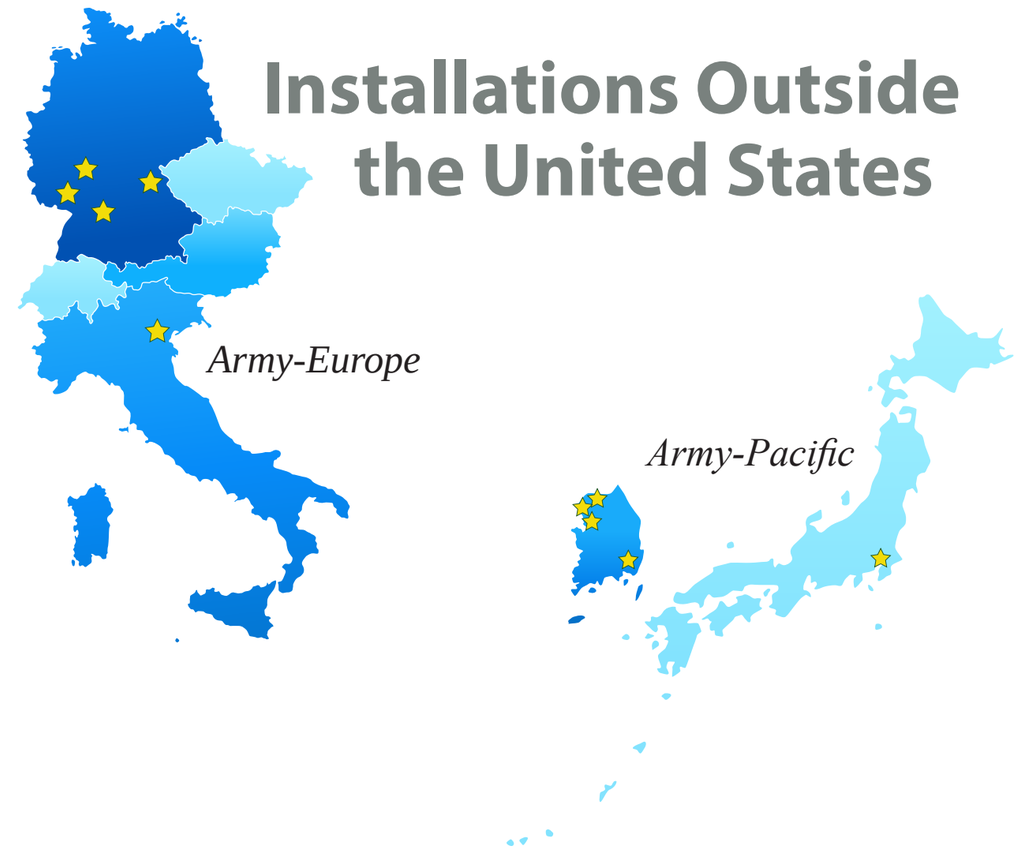
PERFORMANCE TRIAD MEASURES



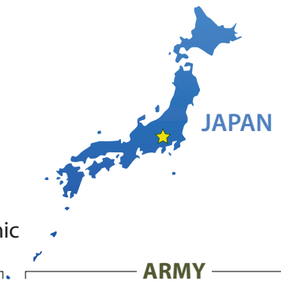
Installation Health Index Score[5]: **2.1 (≥90th percentile)**

Footnotes: See page 89.
Personnel and medical data were not available for cadets; estimates are limited to permanent party AC Soldiers.

Installations Outside the United States



Japan



Demographics: Approximately 2,600 AC Soldiers
74% under 35 years old, 13% female

Main Healthcare Facility: The BG Crawford F. Sams U.S. Army Health Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,195	1,189	1,670	1,195–3,043
Behavioral health (%)	13	13	16	10–24
Substance use disorder (%)	2.4	2.5	3.7	1.7–6.9
Sleep disorder (%)	8.0	7.9	14	8.0–24
Obesity (%)	23	22	17	11–25
Tobacco product use (%)	23	23	26	12–32
STIs: Chlamydia infection (rate per 1,000)	Data suppressed*		25	11–52
Chronic disease (%)	17	17	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
19 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.81 mg/L

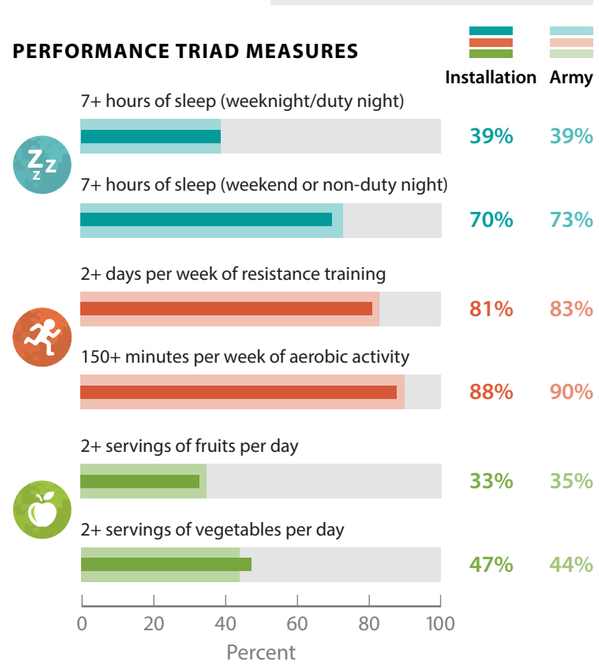
Solid waste diversion rate:
57%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
No Data

Heat risk:
56 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **1.6 (≥90th percentile)**

Footnotes: See page 89.

USAG Bavaria

Demographics: Approximately 9,600 AC Soldiers
85% under 35 years old, 10% female

Main Healthcare Facility: U.S. Army Health Clinic Grafenwoehr

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,350	1,428	1,670	1,195–3,043
Behavioral health (%)	15	15	16	10–24
Substance use disorder (%)	5.1	4.5	3.7	1.7–6.9
Sleep disorder (%)	11	13	14	8.0–24
Obesity (%)	15	16	17	11–25
Tobacco product use (%)	31	30	26	12–32
STIs: Chlamydia infection (rate per 1,000)	29	26	25	11–52
Chronic disease (%)	14	18	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
4 days/year

Poor water quality:
365 days/year

Water fluoridation:
0.69 mg/L

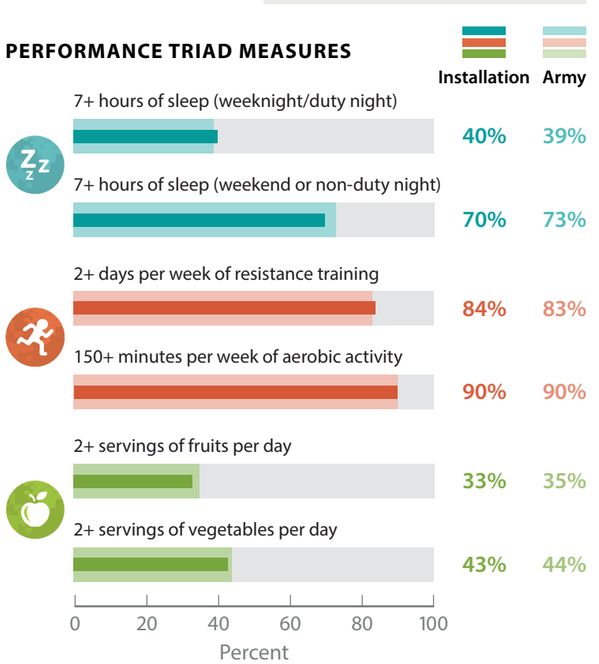
Solid waste diversion rate:
59%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
High

Heat risk:
5 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **0.8 (70–79th percentile)**

Footnotes: See page 89.

USAG Daegu

Demographics: Approximately 2,100 AC Soldiers
72% under 35 years old, 22% female

Main Healthcare Facility: Wood Army Health Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,452	1,389	1,670	1,195–3,043
Behavioral health (%)	14	13	16	10–24
Substance use disorder (%)	2.8	2.8	3.7	1.7–6.9
Sleep disorder (%)	13	12	14	8.0–24
Obesity (%)	15	15	17	11–25
Tobacco product use (%)	21	22	26	12–32
STIs: Chlamydia infection (rate per 1,000)	52	46	25	11–52
Chronic disease (%)	19	19	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
100 days/year

Poor water quality:
0 days/year

Water fluoridation:
No Data

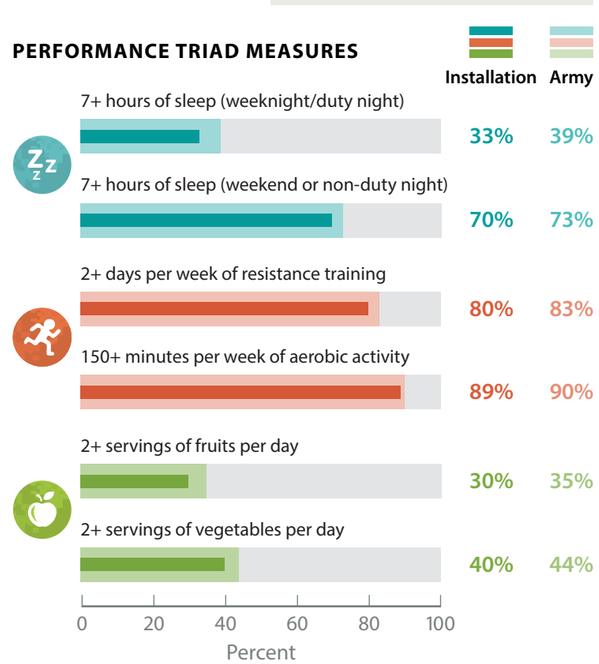
Solid waste diversion rate:
68%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
No Data

Heat risk:
56 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **1.0 (80–89th percentile)**

Footnotes: See page 89.

USAG Humphreys

Demographics: Approximately 6,900 AC Soldiers
80% under 35 years old, 16% female

Main Healthcare Facility: Humphreys Jenkins Medical Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,382	1,388	1,670	1,195–3,043
Behavioral health (%)	13	13	16	10–24
Substance use disorder (%)	3.4	3.2	3.7	1.7–6.9
Sleep disorder (%)	11	12	14	8.0–24
Obesity (%)	16	16	17	11–25
Tobacco product use (%)	27	27	26	12–32
STIs: Chlamydia infection (rate per 1,000)	50	42	25	11–52
Chronic disease (%)	14	17	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
76 days/year

Poor water quality:
3 days/year

Water fluoridation:
0.15 mg/L

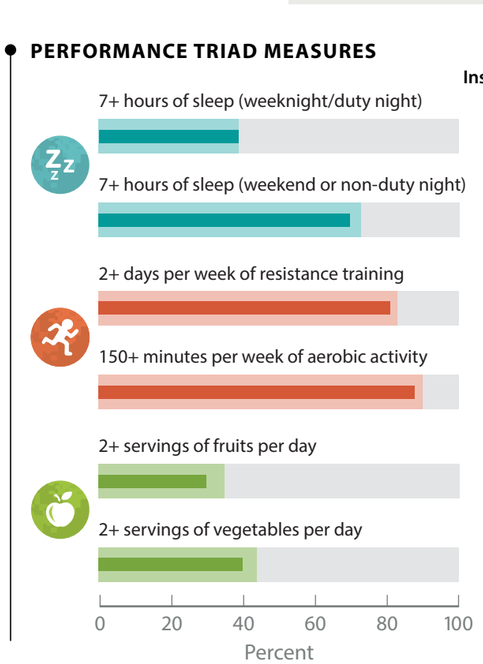
Solid waste diversion rate:
68%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
Moderate

Heat risk:
58 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **0.8 (70–79th percentile)**

Footnotes: See page 89.

USAG Red Cloud

Demographics: Approximately 3,200 AC Soldiers
78% under 35 years old, 15% female

Main Healthcare Facility: Camp Red Cloud Troop Medical Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,301	1,307	1,670	1,195–3,043
Behavioral health (%)	14	14	16	10–24
Substance use disorder (%)	4.5	4.2	3.7	1.7–6.9
Sleep disorder (%)	10	11	14	8.0–24
Obesity (%)	15	16	17	11–25
Tobacco product use (%)	27	27	26	12–32
STIs: Chlamydia infection (rate per 1,000)	27	24	25	11–52
Chronic disease (%)	16	18	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
130 days/year

Poor water quality:
0 days/year

Water fluoridation:
No Data

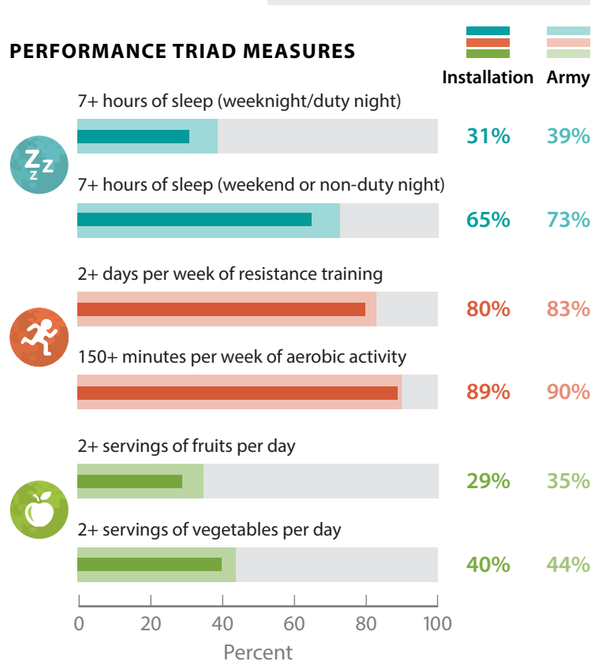
Solid waste diversion rate:
100%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
No Data

Heat risk:
42 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **1.2 (80–89th percentile)**

Footnotes: See page 89.

USAG Rheinland-Pfalz

Demographics: Approximately 6,500 AC Soldiers
74% under 35 years old, 21% female

Main Healthcare Facilities: Kleber Health Clinic (aka U.S. Army Health Clinic Kaiserslautern);
Landstuhl Regional Medical Center

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,513	1,473	1,670	1,195–3,043
Behavioral health (%)	19	18	16	10–24
Substance use disorder (%)	4.6	4.7	3.7	1.7–6.9
Sleep disorder (%)	19	19	14	8.0–24
Obesity (%)	20	19	17	11–25
Tobacco product use (%)	24	25	26	12–32
STIs: Chlamydia infection (rate per 1,000)	30	28	25	11–52
Chronic disease (%)	22	21	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
13 days/year

Poor water quality:
0 days/year

Water fluoridation:
No Data

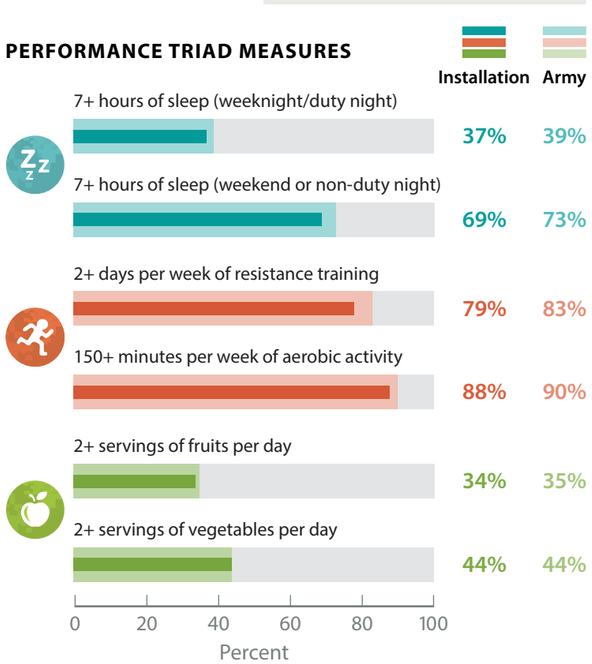
Solid waste diversion rate:
70%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
High

Heat risk:
1 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.5 (30–39th percentile)**

Footnotes: See page 89.

USAG Stuttgart

Demographics: Approximately 1,800 AC Soldiers
58% under 35 years old, 11% female

Main Healthcare Facility: The Stuttgart Army Health Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,482	1,393	1,670	1,195–3,043
Behavioral health (%)	15	15	16	10–24
Substance use disorder (%)	3.5	4.1	3.7	1.7–6.9
Sleep disorder (%)	17	13	14	8.0–24
Obesity (%)	18	15	17	11–25
Tobacco product use (%)	22	23	26	12–32
STIs: Chlamydia infection (rate per 1,000)	14	19	25	11–52
Chronic disease (%)	27	20	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
15 days/year

Poor water quality:
0 days/year

Water fluoridation:
0.80 mg/L

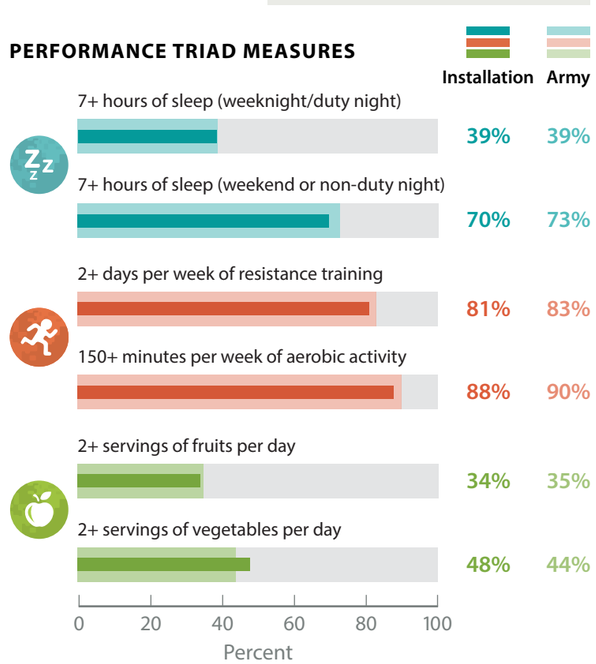
Solid waste diversion rate:
55%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
High

Heat risk:
3 day/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **1.0 (80–89th percentile)**

Footnotes: See page 89.

USAG Vicenza

Demographics: Approximately 3,700 AC Soldiers
81% under 35 years old, 9% female

Main Healthcare Facility: Vicenza Army Health Clinic

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,330	1,383	1,670	1,195–3,043
Behavioral health (%)	15	15	16	10–24
Substance use disorder (%)	5.7	5.2	3.7	1.7–6.9
Sleep disorder (%)	11	12	14	8.0–24
Obesity (%)	15	15	17	11–25
Tobacco product use (%)	28	27	26	12–32
STIs: Chlamydia infection (rate per 1,000)	12	11	25	11–52
Chronic disease (%)	14	17	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality:
No Data[7]

Poor water quality:
0 days/year

Water fluoridation:
0.10 mg/L

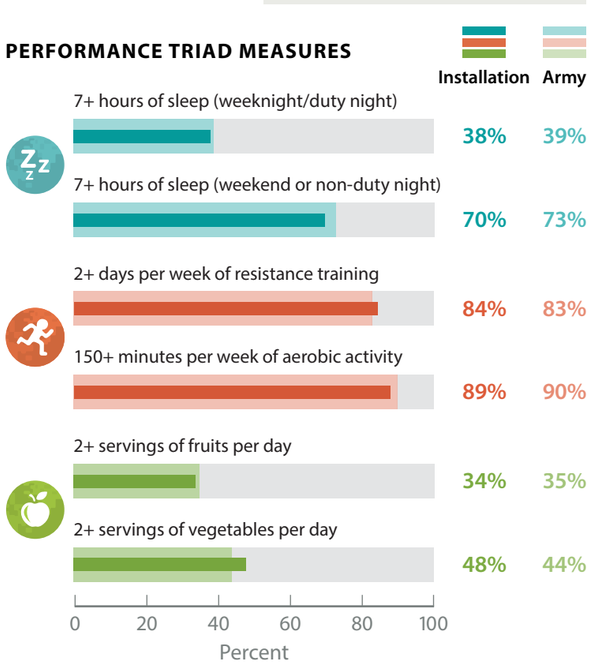
Solid waste diversion rate:
55%

Mosquito-borne disease risk:
Moderate

Lyme disease risk:
Low

Heat risk:
47 days/year

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **1.6 (≥90th percentile)**

Footnotes: See page 89.

USAG Wiesbaden

Demographics: Approximately 1,500 AC Soldiers
72% under 35 years old, 18% female

Main Healthcare Facilities: U.S. Army Health Clinic Wiesbaden; Landstuhl Regional Medical Center

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,491	1,463	1,670	1,195–3,043
Behavioral health (%)	20	19	16	10–24
Substance use disorder (%)	3.1	3.2	3.7	1.7–6.9
Sleep disorder (%)	16	16	14	8.0–24
Obesity (%)	21	20	17	11–25
Tobacco product use (%)	25	25	26	12–32
STIs: Chlamydia infection (rate per 1,000)	21	23	25	11–52
Chronic disease (%)	22	21	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality: **18 days/year**

Poor water quality: **344 days/year**

Water fluoridation: **0.00 mg/L**

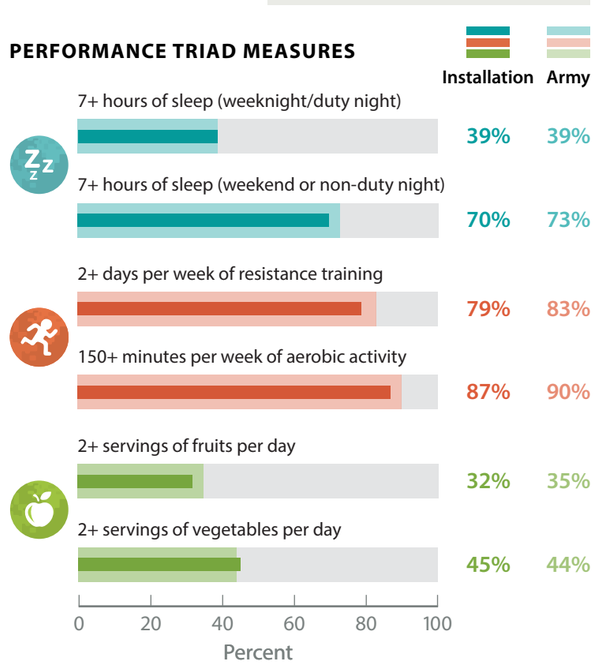
Solid waste diversion rate: **52%**

Mosquito-borne disease risk: **Moderate**

Lyme disease risk: **High**

Heat risk: **11 days/year**

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **-0.3 (40–49th percentile)**

Footnotes: See page 89.

USAG Yongsan

Demographics: Approximately 4,000 AC Soldiers
73% under 35 years old, 17% female

Main Healthcare Facility: USAG Yongsan Hospital

MEDICAL METRICS	INSTALLATION Crude Value[1]	INSTALLATION Adjusted Value[2]	ARMY Value	ARMY Range[3]
Injury (rate per 1,000)	1,493	1,461	1,670	1,195–3,043
Behavioral health (%)	15	14	16	10–24
Substance use disorder (%)	4.0	4.0	3.7	1.7–6.9
Sleep disorder (%)	13	13	14	8.0–24
Obesity (%)	17	17	17	11–25
Tobacco product use (%)	23	24	26	12–32
STIs: Chlamydia infection (rate per 1,000)	14	14	25	11–52
Chronic disease (%)	19	18	19	13–37

ENVIRONMENTAL HEALTH INDICATORS[4]

Poor air quality: **78 days/year**

Poor water quality: **0 days/year**

Water fluoridation: **0.97 mg/L**

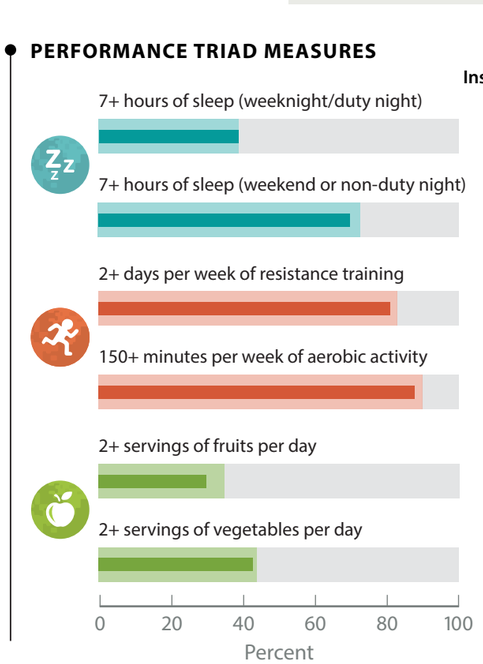
Solid waste diversion rate: **No Data**

Mosquito-borne disease risk: **Moderate**

Lyme disease risk: **No Data**

Heat risk: **42 days/year**

PERFORMANCE TRIAD MEASURES



Installation Health Index Score[5]: **0.9 (80–89th percentile)**

Footnotes: See page 89.

At a glance...

Profiles (2018)

	End-strength	Female population (%)	Under 35 years old (%)
Fort Belvoir	3,300	24	48
Fort Benning	17,000	7.0	84
Fort Bliss	26,000	14	82
Fort Bragg	45,000	12	80
Fort Campbell	27,000	12	86
Fort Carson	25,000	14	85
Fort Drum	15,000	12	86
Fort Gordon	9,000	19	76
Fort Hood	36,000	17	83
Fort Huachuca	4,000	17	78
Fort Irwin	4,200	14	78
Fort Jackson	6,700	27	81
Fort Knox	4,100	16	64
Fort Leavenworth	3,300	16	54
Fort Lee	7,400	23	78
Fort Leonard Wood	7,800	18	82
Fort Meade	4,000	20	63
Fort Polk	7,900	12	83
Fort Riley	15,000	13	86
Fort Rucker	2,900	14	66
Fort Sill	10,000	15	84

Profiles (2018)

	End-strength	Female population (%)	Under 35 years old (%)
Fort Stewart	20,000	15	84
Fort Wainwright	7,500	10	88
Hawaii	21,000	18	78
JB Elmendorf-Richardson	4,700	9.0	88
JB Langley-Eustis	5,300	15	72
JB Myer-Henderson Hall	2,000	11	78
JB San Antonio	8,500	30	63
Presidio of Monterey	1,000	23	80
USAG West Point	1,600	19	61
INSTALLATIONS OUTSIDE THE UNITED STATES			
Japan	2,600	13	74
USAG Bavaria	9,600	10	85
USAG Daegu	2,100	22	72
USAG Humphreys	6,900	16	80
USAG Red Cloud	3,200	15	78
USAG Rheinland-Pfalz	6,500	21	74
USAG Stuttgart	1,800	11	58
USAG Vicenza	3,700	9.0	81
USAG Wiesbaden	1,500	18	72
USAG Yongsan	4,000	17	73

Selected Medical Metrics

Presented values are adjusted for age and sex

	Injury (rate per 1,000)	Substance use disorder (%)	Sleep disorder (%)	Obesity (%)	Tobacco product use (%)	STIs: Chlamydia infection (rate per 1,000)	Chronic disease (%)
Fort Belvoir	1,693	3.4	18	20	21	24	25
Fort Benning	2,211	2.4	14	15	27	15	21
Fort Bliss	1,566	4.3	17	17	27	29	19
Fort Bragg	1,616	3.9	13	17	27	24	17
Fort Campbell	1,615	3.5	15	18	29	20	18
Fort Carson	1,390	3.7	14	15	30	22	19
Fort Drum	1,644	3.7	14	20	28	39	20
Fort Gordon	1,897	3.1	14	23	20	15	20
Fort Hood	1,603	5.0	19	19	28	29	21
Fort Huachuca	1,770	2.4	13	14	22	15	21
Fort Irwin	1,735	6.5	18	18	30	34	20
Fort Jackson	2,660	2.1	12	16	23	22	18
Fort Knox	1,819	2.8	17	18	25	14	24
Fort Leavenworth	2,120	3.7	14	20	24	28	24
Fort Lee	2,322	2.5	16	18	22	10	22
Fort Leonard Wood	2,213	2.6	14	16	27	11	20
Fort Meade	1,789	2.7	17	22	18	15	22
Fort Polk	1,590	4.6	14	18	31	25	25
Fort Riley	1,404	4.8	15	17	30	29	21
Fort Rucker	2,114	1.8	16	15	19	14	20
Fort Sill	2,156	3.7	19	20	30	17	21
Army	**1,699**	**3.5**	**15**	**17**	**25**	**22**	**20**

Footnotes: See page 89.

Selected Medical Metrics

Presented values are adjusted for age and sex

	Injury (rate per 1,000)	Substance use disorder (%)	Sleep disorder (%)	Obesity (%)	Tobacco product use (%)	STIs: Chlamydia infection (rate per 1,000)	Chronic disease (%)
Fort Stewart	1,520	4.2	16	18	29	20	23
Fort Wainwright	1,567	4.2	16	18	30	24	21
Hawaii	1,701	3.3	15	17	21	34	21
JB Elmendorf-Richardson	1,754	2.4	14	15	28	22	19
JB Langley-Eustis	2,200	3.0	16	21	24	16	22
JB Myer-Henderson Hall	1,403	4.5	12	14	23	18	18
JB San Antonio	1,824	2.7	17	15	15	12	23
Presidio of Monterey	1,765	2.9	12	14	19	Data Supressed*	18
USAG West Point	1,383	2.0	9	18	15	Data Supressed*	21
INSTALLATIONS OUTSIDE THE UNITED STATES							
Japan	1,189	2.5	8	22	23	Data Supressed*	17
USAG Bavaria	1,428	4.5	13	16	30	26	18
USAG Daegu	1,389	2.8	12	15	23	47	19
USAG Humphreys	1,388	3.2	12	16	27	42	17
USAG Red Cloud	1,307	4.2	11	16	27	24	18
USAG Rheinland-Pfalz	1,473	4.7	19	19	25	28	21
USAG Stuttgart	1,393	4.1	13	15	23	19	20
USAG Vicenza	1,383	5.2	12	15	27	11	17
USAG Wiesbaden	1,463	3.2	16	20	25	23	21
USAG Yongsan	1,461	4.0	13	17	24	14	18
Army	**1,699**	**3.5**	**15**	**17**	**22**	**22**	**20**

Footnotes: See page 89.

Environmental Health Indicators

	Poor air quality (days per year)	Poor water quality (days per year)	Water fluoridation (mg/L)	Solid waste diversion rate (%)	Mosquito-borne disease risk	Lyme disease risk	Heat risk (days per year)
Fort Belvoir	1	0	0.70	51	Moderate	High	70
Fort Benning	0	0	0.61	24	High	Moderate	140
Fort Bliss	17	0	0.84	40	Moderate	No Data	88
Fort Bragg	0	0	0.54	33	High	Moderate	108
Fort Campbell	0	0	0.60	34	Moderate	Low	86
Fort Carson	8	0	0.41	45	Low	No Data	4
Fort Drum	2	0	0.70	59	Low	High	17
Fort Gordon	6	0	0.72	22	High	No Data	140
Fort Hood	5	0	0.21	53	High	No Data	127
Fort Huachuca	0	0	0.70	0	Moderate	Low	30
Fort Irwin	55	0	1.5	30	Moderate	No Data	95
Fort Jackson	1	0	0.63	29	High	Low	138
Fort Knox	0	0	065	43	Moderate	Low	36
Fort Leavenworth	0	0	0.57	26	Moderate	Low	75
Fort Lee	No Data	0	0.67	51	Moderate	Moderate	73
Fort Leonard Wood	No Data	0	0.78	51	Moderate	Moderate	72
Fort Meade	9	0	0.71	47	Moderate	High	50
Fort Polk	No Data	0	0.90	59	High	No Data	135
Fort Riley	No Data	75	0.56	44	Moderate	Low	92
Fort Rucker	No Data	0	0.65	63	High	No Data	138
Fort Sill	4	0	0.58	96	Moderate	Low	126

Footnotes: See page 89.

Environmental Health Indicators

	Poor air quality (days per year)	Poor water quality (days per year)	Water fluoridation (mg/L)	Solid waste diversion rate (%)	Mosquito-borne disease risk	Lyme disease risk	Heat risk (days per year)
Fort Stewart	No Data	0	0.98	59	High	Moderate	130
Fort Wainwright	30	0	0.30	4	Low	No Data	0
Hawaii	0	0	0.70	29	High	No Data	17
JB Elmendorf-Richardson	0	0	0.58	20	Low	No Data	0
JB Langley-Eustis	0	0	0.84	No Data	Moderate	Moderate	86
JB Myer-Henderson Hall	1	0	0.70	96	High	High	61
JB San Antonio	11	0	0.48	No Data	High	Moderate	137
Presidio of Monterey	7	0	0.22	39	Low	Moderate	0
USAG West Point	1	0	0.40	No Data	Moderate	No Data	36
INSTALLATIONS OUTSIDE THE UNITED STATES							
Japan	19	0	0.81	57	Moderate	No Data	56
USAG Bavaria	4	365	0.69	59	Moderate	High	5
USAG Daegu	100	0	No Data	68	Moderate	No Data	56
USAG Humphreys	76	3	0.15	68	Moderate	Moderate	58
USAG Red Cloud	130	0	No Data	100	Moderate	No Data	42
USAG Rheinland-Pfalz	13	0	No Data	70	Moderate	High	1
USAG Stuttgart	15	0	0.80	55	Moderate	High	3
USAG Vicenza	No Data	0	0.10	55	Moderate	Low	47
USAG Wiesbaden	18	344	0	52	Moderate	High	11
USAG Yongsan	78	0	0.97	No Data	Moderate	No Data	42

Footnotes: See page 89.

Performance Triad

	7+ hours of sleep [weeknights] (%)	7+ hours of sleep [weekends] (%)	2+ days per week of resistance training (%)	150+ minutes per week of aerobic activity* (%)	2+ servings of fruits per day (%)	2+ servings of vegetables per day (%)
Fort Belvoir	42	75	77	86	38	49
Fort Benning	39	74	86	91	39	47
Fort Bliss	36	68	81	89	31	42
Fort Bragg	39	70	84	90	33	46
Fort Campbell	39	69	83	90	31	43
Fort Carson	40	70	83	90	32	43
Fort Drum	37	70	82	90	32	42
Fort Gordon	36	73	81	89	33	43
Fort Hood	34	67	81	89	31	41
Fort Huachuca	41	78	83	91	30	41
Fort Irwin	38	69	81	91	32	44
Fort Jackson	39	73	83	89	37	43
Fort Knox	48	86	86	92	40	53
Fort Leavenworth	41	73	80	92	39	49
Fort Lee	37	70	81	88	34	40
Fort Leonard Wood	39	74	84	90	34	41
Fort Meade	42	73	79	87	34	47
Fort Polk	36	68	82	89	31	41
Fort Riley	37	68	81	89	30	41
Fort Rucker	55	82	83	88	36	50
Fort Sill	40	79	84	91	33	41
Army	**39**	**73**	**83**	**90**	**35**	**44**

Performance Triad

	7+ hours of sleep [weeknights] (%)	7+ hours of sleep [weekends] (%)	2+ days per week of resistance training (%)	150+ minutes per week of aerobic activity* (%)	2+ servings of fruits per day (%)	2+ servings of vegetables per day (%)
Fort Stewart	36	67	82	89	31	41
Fort Wainwright	37	69	82	90	31	43
Hawaii	39	69	81	89	33	45
JB Elmendorf-Richardson	38	70	84	91	34	45
JB Langley-Eustis	41	72	81	89	33	42
JB Myer-Henderson Hall	44	77	81	89	41	55
JB San Antonio	43	79	81	88	39	51
Presidio of Monterey	46	84	84	90	39	55
USAG West Point	49	82	80	88	40	56
INSTALLATIONS OUTSIDE THE UNITED STATES						
Japan	39	70	81	88	33	47
USAG Bavaria	40	70	84	90	33	43
USAG Daegu	33	70	80	89	30	40
USAG Humphreys	39	70	81	88	30	40
USAG Red Cloud	31	65	80	89	29	40
USAG Rheinland-Pfalz	37	69	79	88	34	44
USAG Stuttgart	39	70	81	88	34	48
USAG Vicenza	38	70	84	89	34	48
USAG Wiesbaden	39	70	79	87	32	45
USAG Yongsan	39	70	81	88	30	43
Army	**39**	**73**	**83**	**90**	**35**	**44**

APPENDICES

- *Methods*
- *Acknowledgments*
- *References*
- *Acronyms and Abbreviations*
- *Index*

METHODS

I. Methodological and Data Updates

The 2019 edition of *Health of the Force* includes methodological and data updates which limit direct comparison to prior reports. Changes that affected more than one metric are summarized below, and metric-specific changes are included in subsequent sections.

- The most notable change with this iteration of the *Health of the Force* report was the use of the Army Analytics Group (AAG) as the medical encounter and personnel data provider. Last year, the Armed Forces Health Surveillance Branch (AFHSB) provided these data to the U.S. Army Public Health Center (APHC). While this change improved the APHC's analytic capability, differences in data processing between data providers may have affected the results generated for metrics derived from medical data (i.e., injury, behavioral health, substance use, sleep disorders, obesity, and chronic disease). However, both the AAG and AFHSB rely on the same data sources (i.e., Military Health System [MHS] Data Repository [MDR] and Defense Manpower Data Center [DMDC]).
- Deployed personnel were not excluded from analyses for the 2019 *Health of the Force* report, as was the case in previous editions. In 2018, DMDC reported data quality issues with the Contingency Tracking System, which precluded accurate identification of deployed Soldiers. Although operational tempo was low in 2018, the inability to identify and exclude deployed personnel from analyses may result in underestimation of incidence measures. Some installations may have been impacted more than others by this change in methodology.
- As with the 2018 edition of the report, Joint Base Lewis-McChord (JBLM) was excluded due to its transition to MHS Genesis in the fall of 2017. JBLM population statistics that were unaffected by the MHS Genesis implementation are reported as part of the Army Active Component (AC) community demographics and the environmental health indicators (EHIs).
- Soldiers' age was calculated as the difference between the first day of the calendar year (January 01, 2018) and the Soldier's date of birth, rather than using the midpoint of the year, as was done in previous years. This change allowed us to stabilize the age categories across all data sources.
- When appropriate, multi-year trend charts were included to provide historical Army-wide estimates. For these presentations, medical metrics for prior years were reanalyzed using the same methodology and data provider used for the 2018 metrics. Medical metrics may differ from the corresponding estimates presented in previous *Health of the Force* editions. For the most part, 5-year trends are reported (2014–2018); however, injury data were restricted to 3 calendar years (2016–2018) due to the October 2015 *International Classification of Diseases, 10th revision, Clinical Modification* (ICD-10-CM) conversion. The ICD-CM-10 medical diagnosis codes used as the foundation for the APHC injury taxonomy and injury definition are updated annually by the World Health Organization and the Centers for Disease Control and Prevention (CDC) (APHC, 2017a).

- Crude figures are presented (unadjusted for age and sex) in the Report Highlights (pages 6–7) and the Medical Metrics pages (pages 14–51). Adjusted figures (adjusted for age and sex) are presented in the Installation Health Index (pages 84–88), Installation Profiles (pages 90–131), and the Selected Medical Metrics (pages 134–135).
- The "Tobacco Use" section has been renamed "Tobacco Product Use" to reflect the inclusion of vaping and e-cigarette survey questions in the Periodic Health Assessment (PHA). The most recent version of the PHA also reworded the questions regarding tobacco product use. Therefore, direct comparisons of 2018 tobacco product use prevalence to those estimated from previous years' PHA responses are not exact comparisons.
- The metrics comprising the Installation Health Index (IHI) were revised and reweighted based on potential health, readiness, and mission impacts. Specifically, weighting was increased for injury and tobacco product use metrics, which have relatively greater immediate readiness impact and near-term healthcare implications. Although behavioral health and substance use impact readiness, these two metrics were removed from the IHI in an effort to avoid stigmatizing Soldiers who seek treatment. Additionally, since treatment options for behavioral health and substance abuse conditions are not uniformly available across installations, removing them from the IHI eliminated this potential bias. Weights were assigned to the IHI as described in the table to the right.

2019 *Health of the Force* IHI Metric	Weight (%)
Injury	30
Sleep disorders	15
Obesity	15
Chronic disease	15
Tobacco product use	15
Sexually transmitted infections (chlamydia)	5
Air quality	5

- Previous *Health of the Force* reports use the term "health metrics." The current report uses the term "medical metrics." Medical metrics include injury, behavioral health, substance use, sleep disorders, obesity, tobacco product use, heat illness, hearing, sexually transmitted infections (chlamydia), and chronic disease.

II. AC Soldier Population and Installation Selection

AC Soldier demographic information (age, sex, race/ethnicity, military occupational specialty, unit identification code, and assigned unit ZIP code) was abstracted from DMDC personnel rosters.

The AC Soldier population was estimated from AC Soldier person-time using available quarterly DMDC personnel rosters. A soldier's contribution to the AC person-time denominator was equivalent to the number of days of the year that Soldier was on active duty. A Soldier on active duty for an entire year contributed one person-year to the denominator (population). Two different Soldiers on active duty for 6 months together contributed one person-year to the denominator (population). In this way, an average population count was estimated by counting the time each Soldier contributed to the AC cohort.

To determine installation population, Soldiers were assigned to installations using their assigned unit ZIP code at the end of calendar year 2018. Installation summaries are provided for installations and joint bases with an estimated minimum average population of 1,000 AC Soldiers. Estimates from the selected installations were included in the installation profile summaries (pages 132–133) and installation profile pages. However, overall AC Army averages were estimated using data from all AC Soldiers and are provided in the report demographics section. Personnel and medical data were not available for cadets; therefore, U.S. Army Garrison (USAG) West Point estimates using DMDC-derived data are limited to permanent party AC Soldiers.

Information corresponding to U.S. military installations located outside the United States was presented separately from that available for installations located within the U.S., due to inherent differences which could bias comparisons. For example, Soldiers stationed outside the U.S. are more likely to meet deployment medical standards compared to Soldiers stationed at U.S. installations. There may also be differences in the data capture of healthcare delivery, given that installations located outside the U.S. may be more likely to outsource care.

III. Medical Metrics

Medical metrics were adapted from nationally recognized health indicators routinely tracked by public health authorities such as the CDC, the Robert Wood Johnson Foundation, and the United Health Foundation. For the AC Soldier population, the APHC-selected metrics used specific criteria: 1) the importance of the problem to Force health and readiness (e.g., prevalence and severity of the condition), 2) the preventability of the problem, 3) the feasibility of the metric, 4) the timeliness and frequency of data capture, and 5) the strength of supporting evidence (DHHS, 2018). Metrics and supporting health outcomes included in the report are described below; metrics included in the IHI computation are designated with an asterisk.

Data used to calculate medical metric estimates were abstracted from the Military Health System Data Repository (MDR) and the Disease Reporting System, internet (DRSi). MDR ambulatory encounters were captured through the Comprehensive Ambulatory Professional Encounter Record (CAPER) and the TRICARE Encounter Record – Non-Institutional (TED-NI). MDR inpatient admissions were captured through the Standard Inpatient Data Record (SIDR) and the TRICARE Encounter Record – Institutional (TED-I). Ambulatory encounters were captured through the CAPER and the TED-NI. Inpatient admissions were captured through the SIDR and the TED-I.

1. Injury*

Injury incidence rate: Number of newly diagnosed injuries per 1,000 person-years among AC Soldiers in the calendar year

The incidence rate of injuries and musculoskeletal (MSK) conditions resulting from injury were evaluated for AC Soldiers and trainees. Estimates were derived from outpatient and inpatient medical and personnel records. Installation assignment was determined by the Soldier's assigned unit ZIP code at the time of injury.

Injuries were defined using *A Taxonomy of Injuries for Public Health Monitoring and Reporting* (APHC, 2017a), which is based on the ICD-10-CM adopted in the U.S. as of fiscal year 2016. Injury is defined

*Metrics that were included in the IHI computation are designated with an asterisk.

as any damage to, or interruption of, body tissue caused by an energy transfer (energy may be mechanical, thermal, nuclear, electrical, or chemical). Injury diagnoses include those for traumatic injuries (ICD-10-CM S- and selected T-codes) and for injury-related MSK conditions (selected ICD-10-CM M-codes).

Initial medical encounters with injury diagnosis codes included in the case definition were counted; follow-up visits less than 60 days apart were excluded. After 60 days, a medical encounter with a qualifying diagnosis was counted as a new injury. Rates per 1,000 person-years were computed based on Soldier person-time. The percentage of Soldiers who received at least one new injury diagnosis during the calendar year was also reported by age and sex.

2. Behavioral Health

Behavioral health disorder prevalence: Percentage of AC Soldiers with at least one qualifying behavioral health diagnosis in the calendar year or in the previous year

The annual prevalence of seven sets of diagnosed behavioral health disorders of interest (adjustment disorders, mood disorders, anxiety, posttraumatic stress disorder (PTSD), substance use disorders, personality disorders, and psychoses) among AC Soldiers and trainees was estimated from ICD-10-CM diagnosis codes identified in Soldiers' medical records. Case definitions established by the APHC were applied for the seven disorders of interest. Soldiers could have one or more diagnosed behavioral health conditions. A composite measure, "any behavioral health disorder", included Soldiers with any of these disorder diagnoses. Installation assignment was determined by the Soldier's last assigned unit ZIP code for calendar year 2018.

The case definition used for this year's report included a change from previous years; in prior reports, Soldiers who had ever had a qualifying behavioral health diagnosis recorded in their military medical record were considered prevalent cases. For this report, the look-back period for existing cases was limited to 12 months in order to more accurately reflect the percentage of Soldiers with current diagnoses.

The prevalence of substance use disorders, a subcomponent of the behavioral health disorder measure, was evaluated for AC Soldiers and trainees. Disorder categories, which include alcohol; opioids; cannabis; sedatives; cocaine; other stimulants; hallucinogens; inhalants; and other psychoactive substance-related disorders, are presented in aggregate. As with the broader behavioral health disorder metric, substance use disorder prevalence was estimated using ICD-10-CM diagnosis codes identified in the Soldier's medical records. Installation assignment was determined by the Soldier's last assigned unit ZIP code for calendar year 2018.

3. Sleep Disorders*

Sleep disorder prevalence: Percentage of AC Soldiers with at least one qualifying sleep disorder diagnosis in the calendar year

Sleep disorders were defined as a diagnosis of one of the following conditions: insomnia, hypersomnia, circadian rhythm sleep disorder, sleep apnea, narcolepsy and cataplexy, parasomnia, and sleep-related movement disorders. The prevalence of sleep disorders among AC Soldiers and trainees was estimated from ICD-10-CM diagnosis codes identified in the Soldier's medical records. Installation assignment was determined by the Soldier's last assigned unit ZIP code for calendar year 2018.

4. Obesity*

Obesity prevalence: Percentage of AC Soldiers with a body mass index (BMI) greater than or equal to 30

BMI was calculated from height and weight measurements obtained from the Clinical Data Repository Vitals module captured during outpatient medical encounters for AC Soldiers and trainees. Soldiers' installation assignments were based on the last assigned unit ZIP code for calendar year 2018.

- Obese: BMI ≥30
- High Overweight: BMI ≥27.5 and <30
- Low Overweight: BMI ≥25 and <27.5
- Normal Weight: BMI ≥18.5 and <25
- Underweight: BMI <18.5

BMI was not calculated for females who had a pregnancy-related diagnosis code in their ambulatory record or who were assigned a pregnancy-related Medicare Severity Diagnosis Related Group code in their inpatient record in 2018. Mean BMI for AC Soldiers was compared to that of employed U.S. population by sex and age (18–65).

The prevalence of obesity was calculated for AC Soldiers and compared to the employed U.S. population adjusted for the age and sex distribution of the 2015 Army AC population. Readily available survey data from the Behavioral Risk Factor Surveillance System (BRFSS) were used for the analysis of the U.S. population.

5. Tobacco Product Use*

Tobacco product use prevalence: Percentage of AC Soldiers who reported having used at least one tobacco product in the 30 days prior to completing the PHA

Tobacco product use data were obtained from the PHA, which is used to collect self-reported information on respondents' current smoking behavior, use of smokeless tobacco, and e-cigarette use. Installation assignment was determined by the Soldier's last assigned unit ZIP code for calendar year 2018.

Tobacco product use among the U.S. population, aged 18–64 years, was compared to that of the AC Soldier population by adjusting national prevalence estimates to the 2015 AC Soldier age and sex distribution. Readily available survey data from the BRFSS were used for the analysis of the U.S. population. Tobacco product use questions in the 2018 PHA were modified to collect more detailed information regarding the types of tobacco used, including e-cigarette/vaping information. Questions were also reworded to include any use within the past 30 days. This broader definition of current tobacco product use may have resulted in the inclusion of casual users in addition to the frequent users identified in prior assessments. To be categorized as a tobacco product user in national surveys such as the BRFSS, the respondent must meet a designated use threshold (e.g., 100 cigarettes) and self-report current use, as opposed to any use in the past 30 days. Therefore, AC Soldier tobacco product use prevalence estimates may be inflated relative to U.S. estimates. Comparisons of 2018 PHA data to historical PHA data and to national data should be interpreted with caution.

6. Heat Illness

> Heat illness cases: Number of AC Soldiers who had one or more qualifying heat exhaustion or heat stroke diagnoses, or who were reported as a case of heat exhaustion or heat stroke through the DRSi in the calendar year

Heat illnesses among AC Soldiers and trainees were reported based on incident cases identified in the Defense Health Agency's Weather-related Injury Repository, which captures a selection of ICD-10-CM codes in inpatient and outpatient medical encounter records and medical event reports of heat exhaustion and heat stroke through the DRSi. The diagnostic codes used to identify heat illnesses were adapted from standard case definitions of heat exhaustion and heat stroke established by the AFHSB. Soldiers were counted as an incident case if they had an initial encounter for a heat illness within that calendar year. Soldiers with only a follow-up or sequelae visit for a heat illness within a calendar year were excluded. This differs from how heat illness cases were counted in the last edition of the *Health of the Force*. Consistent with the AFHSB case definition, Soldiers were considered an incident case only once per calendar year. Installation assignment was determined by the Soldier's assigned unit ZIP code at the time of the heat illness event.

7. Hearing

> Hearing injury incidence: Percentage of AC Soldiers with a new significant threshold shift (STS) in the calendar year
>
> Hearing loss prevalence: Percentage of AC Soldiers with a clinically significant hearing loss and/or requiring a fitness-for-duty hearing readiness evaluation
>
> Not hearing ready: Percentage of AC Soldiers who are overdue for their annual hearing test, are in need of a follow-up hearing test, or have missed a follow-up hearing test window

Army hearing loss and injury data were obtained from the system of record, the Defense Occupational and Environmental Health System – Hearing Conservation (DOEHRS-HC) Data Repository utilized by the Medical Protection System (MEDPROS). Hearing injury and hearing readiness classification metrics are updated on a monthly basis in the Strategic Management System (SMS). Projected hearing profile metrics are updated in SMS on an annual basis. Hearing metrics were compared to goals established by the Army Hearing Program.

8. Sexually Transmitted Infections (Chlamydia)*

> Sexually transmitted infections (Chlamydia) incidence rate: Number of new chlamydia infections reported through DRSi per 1,000 person-years among AC Soldiers in the calendar year

The incidence of reported chlamydia infections was evaluated for AC Soldiers and trainees. Installation assignment was based on the location of the medical treatment facility (MTF) reporting the infection. New or incident infections were identified from medical event reports submitted through the DRSi using case definitions published by the AFHSB. Incident case reports were counted; follow-up reports less than 30 days apart were excluded. After 30 days, follow-up reports were counted as a new infection. STI rates per 1,000 Soldiers were computed using Soldier person-time.

Chlamydia infection rates for installations with fewer than 20 cases were not reported and were excluded from the IHI computation since small case counts limit the reliability of the estimates. Poor reporting compliance (<50%) was also considered as an exclusion criteria; however, all installations met the reporting threshold. Reporting compliance was determined by the Navy and Marine Corps Public Health Center, which manages the DRSi.

Data extracted from the MHS Population Health Portal in Carepoint were used to examine annual chlamydia screening among MHS-enrolled female AC Soldiers under age 25. The screening estimates contextualize the reported rates and identify areas for improvement.

9. Chronic Disease*

> Chronic disease prevalence: Percentage of AC Soldiers with at least one qualifying new or existing chronic disease diagnosis in the calendar year

The prevalence of seven chronic conditions of interest (asthma, arthritis, chronic obstructive pulmonary disease (COPD), cancer, diabetes, cardiovascular conditions, and hypertension) among AC Soldiers and trainees was estimated from ICD-10-CM diagnosis codes identified in the Soldier's medical records. Prevalent cases of chronic conditions were identified by diagnoses at any point within the window of available medical encounter data (2010–2018). Soldiers with one or more of the selected conditions were identified for the analysis, and Army-level trends were provided for each diagnostic subset. Installation assignment was determined by the Soldier's assigned unit ZIP code at the end of calendar year 2018.

IV. Performance Triad

Performance Triad (P3) metrics reflect the percentage of Soldiers meeting national sleep, activity, and nutrition (SAN) guidelines (e.g., CDC, National Sleep Foundation (NSF)). P3 measures were obtained in aggregate from the Army Resiliency Directorate (ARD) in coordination with AAG. Estimates were derived from relevant survey items collected within the Physical Domain of the Global Assessment Tool (GAT). Soldiers are required to complete the GAT annually per Army Regulation (AR) 350–53 (DA, 2014). In 2018, 66% of AC Soldiers completed the GAT. P3 data were reported as an aggregated

summary statistic when at least 40 responses were available per stratum (e.g., installation, sex, and age group).

1. Sleep

Sleep targets were based on CDC and NSF guidelines. Targets include the percentage of Soldiers reporting 7 or more hours of sleep per night on average. Hours of sleep were reported separately for (a) weeknights/duty nights and (b) weekends/non-duty nights because research indicates significant differences in behavior between these two duty statuses. Sleep metrics were based on GAT survey questions assessing self-reported average hours of sleep per 24-hour period during weeknights/duty nights and self-reported average hours of sleep per 24-hour period during weekends/days off.

2. Activity

Activity targets were similarly based on CDC recommendations. The first activity target included in this report is the percentage of Soldiers meeting the resistance training recommendation of 2 or more days per week. Data for this metric were derived from a GAT survey question asking Soldiers to report the average number of days per week in which they participated in resistance training in the last 30 days. The second activity target relates to aerobic exercise; the target may be met by performing either 75 minutes of vigorous aerobic activity per week, 150 minutes of moderate activity per week, or an equivalent combination of moderate and vigorous activity. The equivalent combination is based on a formula in which vigorous activity is more heavily weighted than moderate activity. The data for this metric are derived from a series of GAT questions asking about the average number of days per week in which the Soldier engaged in (a) vigorous activity and (b) moderate activity in the last 30 days, and the average number of minutes per day in which they engaged in these activity levels.

3. Nutrition

Nutrition targets were based on the U.S. Department of Agriculture (USDA) MyPlate recommendations* summarized in the table below.

	Age	Fruits	Vegetables
Females	19–30 years old	2 cups	2.5 cups
	31–50 years old	1.5 cups	2.5 cups
	51+ years old	1.5 cups	2 cups
Males	19–30 years old	2 cups	3 cups
	31–50 years old	2 cups	3 cups
	51+ years old	2 cups	2.5 cups

* These amounts are appropriate for individuals who participate in less than 30 minutes of physical activity (beyond normal daily activities) per day. Individuals who are more physically active may be able to consume higher quantities while staying within calorie needs.

Targets for fruit and vegetable consumption were analyzed as the percentage of Soldiers eating 2 or more servings of fruits and vegetables per day. The data for these metrics are based on GAT survey questions asking Soldiers to report the average number of fruit and vegetable servings they consumed per day, over the last 30 days. Due to differences in how servings of fruits and vegetables are quantified and how consumption frequencies are listed, both MyPlate and GAT servings are described in the table below.

	GAT	MyPlate
Fruits	Fresh, frozen, canned or dried, or 100% fruit juices. A serving is 1 cup of fruit or ½ cup of fruit juice.	1 cup of fruit or 100% fruit juice, or ½ cup of dried fruit can be considered as 1 cup from the Fruit Group.
Vegetables	Fresh, frozen, canned, cooked, or raw. A serving is 1 cup of raw vegetables or ½ cup of cooked vegetables.	1 cup of raw or cooked vegetables or vegetable juice, or 2 cups of raw leafy greens can be considered as 1 cup from the Vegetable Group.

V. Environmental Health Indicators (EHIs)

EHIs are calculated for Army installations and joint bases with an estimated minimum average population of 1,000 AC Soldiers. This includes the 40 installations shown in the Installation Profiles as well as JBLM (environmental data are not affected by the MHS Genesis exclusion). Aberdeen Proving Ground (APG) is also reported as a legacy installation because it has had a population above 1,000 AC Soldiers in the recent past. Furthermore, APG is included due to significance of regional environmental exposures.

1. Air Quality*

The metric for air quality is the number of days in a calendar year when ambient air pollution near an Army installation violates a short-term (≤24 hours) U.S. National Ambient Air Quality Standard (NAAQS). For U.S. installations, the number of poor air quality days was obtained from Air Quality Index (AQI) Reports and Daily Data summaries on the Environmental Protection Agency (EPA) Air Data website. The AQI is a location-specific, daily numerical index derived from air pollution measurements obtained at State- and Federally-operated air monitoring stations throughout the U.S. An AQI score greater than 100 denotes a poor air quality day during which local air pollution levels violated a short-term NAAQS and the air quality is considered unhealthy for some or all of the general public. Poor air quality days for a U.S. Army installation were calculated as the sum of all days in a calendar year when the local AQI score was greater than 100. Air monitoring data were not available from State or Federal regulatory authorities in the airsheds where the following U.S. Army installations are located: Fort Lee, Fort Leonard Wood, Fort Polk, Fort Riley, Fort Rucker, and Fort Stewart. For the purpose of the IHI computation, missing installation values were set to 0 because the lack of an air monitoring station was deemed indicative of low risk/need.

For installations outside the U.S., poor air quality days were determined by converting air monitoring data representative of the installation airshed to a daily AQI based on the relevant short-term NAAQS. Days when the AQI was greater than 100 were summed to determine the annual number of poor air quality days. Air monitoring data were obtained from the Air Quality e-Reporting database

at the European Environment Agency for installations in Germany and Italy, and host nation environmental authorities for installations in Japan and South Korea. Historic data from the prior year for USAG Vicenza were used for the IHI computation when the 2018 data were unavailable. The use of historical data for this installation was reasonable because USAG Vicenza consistently had elevated poor air quality days.

Green, amber, and red thresholds were established to create an awareness of air quality status in the affected community and to encourage participation in the behavior modifications recommended by public health authorities on days when air quality is degraded. The desired status is fewer poor air quality days.

- **Green:** ≤ 5 poor air quality days per year
- **Amber:** 6–20 poor air quality days per year
- **Red:** ≥ 21 poor air quality days per year

2. Drinking Water Quality

The metric for drinking water quality is whether an Army population has been exposed to drinking water from the installation's potable water system that failed to meet a health-based standard promulgated under the Safe Drinking Water Act (SDWA). Data on violations of health-based drinking water standards in the potable water systems serving Army installations were obtained from the semi-annual data calls for Army environmental data issued by Deputy Chief of Staff, G-9, Environmental Division. If there was uncertainty in these data, details of the violation were verified by discussion with garrison environmental staff. Additional references used to verify the occurrence of drinking water violations included the EPA Safe Drinking Water Information System (SDWIS) database and the annual Consumer Confidence Report (CCR) for the potable water system(s) serving the installation. The CCR is an EPA-mandated report published by a water purveyor for the purpose of informing consumers about their local drinking water quality. Green, amber, and red thresholds were established for the purpose of creating awareness of water quality status in the affected community. The desired status is no violation of any health-based drinking water standard.

- **Green:** No violation of any federal health-based drinking water standard
- **Amber:** Violation of a drinking water standard for non-acute health effects when population exposure has occurred
- **Red:** Violation of a drinking water standard for acute health effects when population exposure has occurred

3. Water Fluoridation

The metric for water fluoridation is the annual average concentration of fluoride in the potable water provided to an Army installation. This concentration is compared to the CDC-recommended optimal fluoride concentration of 0.7 mg/L, the SDWA secondary maximum contaminant level (SMCL) for fluoride of 2.0 mg/L, and the maximum contaminant level (MCL) of 4.0 mg/L. Fluoride concentration data for potable water systems serving Army installations were obtained from the Deputy Chief of Staff, G-9, Environmental Division. Installations that treat their own potable water monitor fluoride levels at least annually and compile this information in reports submitted to the responsible water regulatory authority. For installations that purchase potable water, fluoride data were obtained from the annual CCR for community water systems serving the installation.

Green, amber, and red thresholds were established to create awareness of water quality status in the affected community. A fluoride concentration of 0.7 mg/L is the desired status. A fluoride concentration greater than 4.0 mg/L is a violation of the SDWA MCL.

- **Green:** Average fluoride concentration is 0.7–2.0 mg/L
- **Amber:** Average fluoride concentration is less than 0.7 mg/L or from 2.1-4.0 mg/L
- **Red:** Any fluoride concentration >4.0 mg/L

4. Solid Waste Diversion

The metric for solid waste diversion evaluates the quantity of installation non-hazardous solid waste that is diverted from a disposal facility by means such as recycling, composting, mulching, and donating. It is calculated as the mass of diverted waste divided by the mass of the total waste stream (diverted plus disposed), and expressed as a percentage.

Installation solid waste diversion rate data were obtained from the Solid Waste Annual Reporting for the Web (SWARWeb), which is operated by the Deputy Chief of Staff (DCS), G-9, Energy and Facilities Engineering. The database is accessed through the DCS G-9 portal under the Installation Management Applications Resource Center (IMARC). SWARWeb tracks solid waste collection, disposal, and recycling efforts at installation and Command/HQ levels. Installation solid waste managers report their facility's tonnage for waste, recycling, and other diversion efforts to the database semiannually. SWARWeb calculates the installation solid waste diversion rate in accordance with the DOD Solid Waste Measures of Merit (MOM) in DODI 4715.23 (DOD, 2016b), and provides comprehensive MOM summary reports. For quality assurance, detailed reports for specific installations are reviewed, and installations are contacted directly to verify data integrity, spot anomalies, and analyze waste generation details. The solid waste diversion rate excludes waste generated from privatized housing and from construction and demolition activities.

Army installations that are part of joint bases where the Army is not the lead Service do not have a SWARWeb reporting requirement. Solid waste disposal tonnage and diversion rate from Joint Base Elmendorf-Richardson (JBER) were obtained directly from the Chief, Environmental Quality at JBER. The APHC was unable to obtain solid waste information from the other joint bases for FY18.

Green, amber, and red thresholds have been established for the purpose of creating awareness of solid waste management practices and tracking conformance with the current DOD solid waste diversion percentage goal. A diversion percentage ≥ 50% is the desired status, as stated in the DOD Strategic Sustainability Performance Plan (2016).

- **Green:** ≥ 50% solid waste diversion rate
- **Amber:** 25–49% solid waste diversion rate
- **Red:** ≤ 24% solid waste diversion rate

5. Mosquito-borne Disease

The metric for mosquito-borne disease reflects the risk of being infected with dengue, chikungunya, and Zika viruses from day-biting mosquitoes (*Aedes aegypti* and *Aedes albopictus*) at an Army installation. The risk estimate is calculated by combining applied modeling methods for the number of total and high transmission days per year, likelihood an installation has certain mosquito species, and the presence of local and imported cases of dengue, chikungunya, and Zika.

Indices ranging from 0 to 13 indicate the risk of contact with a dengue, chikungunya, or Zika-competent mosquito vector (day-biting mosquito) at each Army installation. An index score of 0–4 represents negligible or low risk. A score of 4.5–8.5 represents a moderate risk and suggests that the mosquito species may be present, but disease transmission may be low or underreported. A score of 9–13 represents a high risk where the mosquito vector is endemic, and potential for disease transmission is high on an installation.

Green, amber, and red categories have been established for the purpose of creating awareness of selected mosquito-borne disease risks in the affected community and to encourage participation in recommended behavior modifications, such as elimination of breeding and harborage sites, use of screens and self-closing doors, and the use of personal protective measures when active outdoors (DOD Insect Repellent System: permethrin-treated clothing, repellent on exposed skin, and proper wear of uniform).

- **Green:** Risk index score of 0–4.0; no or low risk of contacting day-biting mosquitoes
- **Amber:** Risk index score of 4.5–8.5; moderate risk of contacting day-biting mosquitoes
- **Red:** Risk index score of 9.0–13; high risk of contacting day-biting mosquitoes

The criteria used to compute the index scores are presented below.

Variables for Mosquito-borne Disease Risk Index	Risk Score
Percent of total transmission days (TTD) per year **0** – 0% TTD **1** – 0% < TTD ≤ 25% **2** – 25% < TTD ≤ 50% **3** – TTD > 50%	**0 to 3**
Percent of high transmission days (HTD) per year **0** – 0% HTD **1** – 0% < HTD ≤ 25% **2** – 25% < HTD ≤ 50% **3** – HTD > 50%	**0 to 3**
***Aedes aegypti* species presence** **0** – No recorded presence **2** – Collection record of presence	**0 or 2**
***Aedes albopictus* species presence** **0** – No recorded presence **2** – Collection record of presence	**0 or 2**
Human cases of Zika, dengue & chikungunya (separate scores) **+0** – No reported local or imported human cases **+0.5** – Reported imported human case **+0.5** – Reported local human case	**0 to 1**

6. Tick-borne Disease

The metric for tick-borne disease is an index reflecting the risk of coming into contact with a Lyme vector tick (i.e., the blacklegged tick *Ixodes scapularis* or the Western blacklegged tick *Ixodes pacificus*) that is infected with the agent of Lyme disease at an Army installation. The metric reflects a combination of county/state Lyme vector surveillance reports from public health authorities (such as the CDC), scientific literature, and data from the DOD Human Tick Test Kit Program (HTTKP) or a Regional Public Health Command. Ticks are voluntarily submitted to the HTTKP after being found attached to (biting) Active Duty, Reserve, or Retired personnel from all branches of military service; DOD Civilians; and Family members. For each Army installation, an index ranging from 0 to 5 indicates the risk of coming into contact with a Lyme vector tick infected with the agent of Lyme disease. If no data were available from either the HTTKP or a Regional Public Health Command, the installation received a score of "ND" or "No Data."

The criteria used to compute the index scores are presented below.

Variables for Tick-borne Disease Risk Index	Risk Score
Installation was in the CDC predicted range for either Lyme vector tick species (*I. scapularis* or *I. pacificus*), as published by Eisen et al., 2016. **0 - No Lyme vector tick present,** **1 - Lyme vector tick reported,** **2 - Lyme vector tick established**	**0 to 2**
The CDC has documented cases of Lyme disease within the last 10 years from within the county where the installation is located (CDC, 2017b). **0 - False** **1 - True**	**0 or 1**
Human-biting ticks submitted to the HTTKP (or a Regional Public Health Command) in 2018 were identified as Lyme vector ticks. **0 - False** **1 - True**	**0 or 1**
Lyme vector ticks submitted to the HTTKP (or a Regional Public Health Command) in 2018 were positive for Lyme disease pathogen. **0 - False** **1 - True**	**0 or 1**

Green, amber, and red categories have been established for the purpose of creating awareness of Lyme disease risk in the affected community, and to encourage participation in surveillance programs such as the HTTKP and in the recommended behavior modifications, such as conducting tick-checks, using repellent, and adhering to the DOD Insect Repellent System.

- **Green:** Index score of 0–1; no or low risk of contacting a Lyme vector tick
- **Amber:** Index score of 2–3; moderate risk of contacting a Lyme vector tick
- **Red:** Index score of 4–5; high risk of contacting a Lyme vector tick

7. Heat Risk

The metric for heat risk reflects the portion of the year when outdoor temperatures heighten the risk of heat-related health impacts, and whether the year of interest is consistent with or different from the prior 10-year period. Heat risk days are calculated as the number of days in a calendar year with at least 1 hour when the heat index is above 90^{0}F. This corresponds to an outdoor heat status of "Extreme Caution" as classified by the National Weather Service.

Hourly measurements for outdoor temperature and relative humidity are obtained from land-based airport weather stations in closest proximity to installation cantonment areas or population centers. Using these data, the U.S. Air Force 14th Weather Squadron computes hourly heat index values for each location of interest. Annual heat risk days are calculated for the year of interest and each of the 10 years prior to the year of interest. The mean and standard deviation (SD) for the prior 10 years are calculated. Annual heat risk days for the year of interest are compared to the prior 10-year average ± 1 SD to show whether the year of interest is consistent with the prior decade, or if the year of interest trended higher or lower than the recent past.

VI. Installation Health Index (IHI)

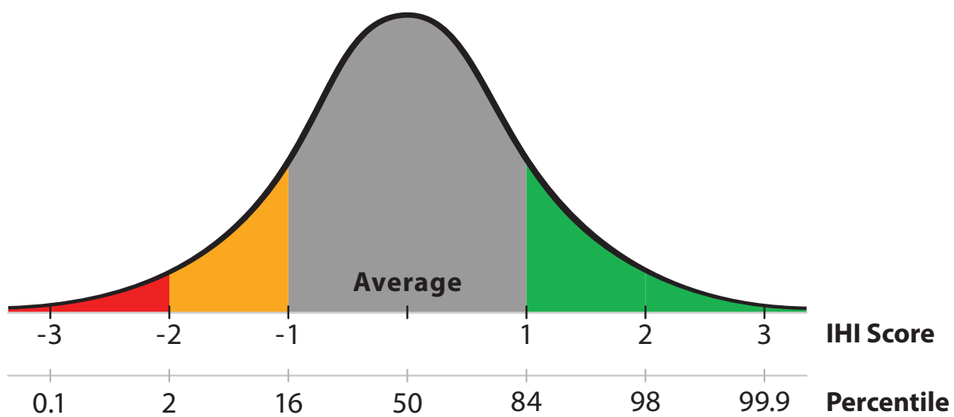
Health indices are widely used to gauge the overall health of populations. Such indices can be used to rank communities (e.g., installations) relative to each other, which can drive community interest and motivate improvements in public health. Healthcare and public health decision makers should take care to review individual measures that comprise these indices in order to identify and effectively target key outcomes or behaviors that have the most significant adverse effects on health and readiness for each installation.

The core metrics included in this report were prioritized for inclusion and weighting in the IHI calculation based jointly on the prevalence of the condition or factor, the potential health or readiness impact, the preventability of the condition or factor, the validity of the data, supporting evidence, and the importance to Army leadership. Although behavioral health impacts readiness, the behavioral health medical metric was not included in the IHI for 2018 to avoid stigmatizing Soldiers who seek treatment, and because treatment options for behavioral health conditions are not uniformly available across all installations.

In generating an IHI, six selected medical metrics (injury, obesity, sleep disorders, chronic disease, tobacco product use, and STIs [chlamydia]) for each included installation were individually standardized to the average across these installations using z-scores. The medical metrics were adjusted by age and sex prior to standardization to allow more valid comparisons. Z-scores follow a standard normal distribution, and reflect the number of standard deviations (amount of variation in data values for a given metric) the installation is from the average for that medical metric. Values above the average have positive z-scores, while values below the average have negative z-scores.

The IHI also includes one installation environmental health metric – number of poor air quality days. The poor air quality days data are not normally distributed, and vary widely by geographic location, particularly for installations outside the U.S., where the number of poor air quality days were especially high relative to the mean across all installations. Accordingly, the number of poor air quality days at each installation was scored as follows for use in calculating the IHI: installations with missing or non-reported air quality data received an air quality score of 0, and thus do not affect the IHI score; installations with no reported poor air quality days received an air quality score of 2, the highest (best) possible score; installations with between 1 and 4 poor air quality days received an air quality score of 1; installations with between 5 and 20 poor air quality days received an air quality score of -1; and installations with greater than 20 poor air quality days received an air quality score of -2, the lowest (worst) possible score. These categories align with those used in the Environmental Health Indicator – Air Quality section of *Health of the Force*.

Normally Distributed Data Curve



Each installation's IHI is a standardized score (z-score) calculated by pooling the metric-specific scores for that installation. Metric-specific scores were weighted to prioritize readiness detractors, as follows: injury–30%, sleep disorders–15%, obesity–15%, chronic disease–15%, tobacco product use–15%, STI (chlamydia)–5%, and air quality–5%. The resulting weighted averages of these metrics were then standardized using the mean and standard deviation across all installations presented in *Health of the Force* to create the IHI score for each installation.

For ease of interpretation, the IHI is presented as a percentile as well as a z-score. The IHI percentile is equal to the area under the standard normal probability distribution for each installation's IHI score. The IHI percentiles are categorized as follows: <20%, 20–29%, 30–39%, 40–49%, 50–59%, 60–69%, 70–79%, 80–89%, and ≥90%. Higher percentiles reflect more favorable health status.

VII. Installation Profile Summaries

The installation profile summary pages report population estimates, and age and sex distributions. Population estimates were derived from person-time calculated from DMDC personnel rosters. Person-time, which is analogous to Full-Time Equivalents (FTE), estimates the average number of Soldiers at an installation during the year. Installation assignments for AC Soldiers and trainees (excluding cadets) were determined by unit ZIP code.

Installations with a high turnover, such as those with a large trainee population, may not be accustomed to calculating their population size in this way. These estimates are intended to be a frame of reference and do not necessarily correspond to the population evaluated for each metric included in the installation profile summary and report.

VIII. Data Limitations

- Methodology and data source changes from prior *Health of the Force* reports prevent direct comparisons of measures across the reports. Updated trend charts are provided for affected metrics, and additional details regarding installation demographics and metric components are included to provide clarity.
- Higher estimates for a metric may not be indicative of a problem but rather may reflect a greater emphasis on detection and treatment.
- Composite measures or indices may mask important differences seen at the individual metric level. It is important to examine the components for which more targeted prevention programs can be developed.
- Personnel and medical data for cadets were not available; therefore, USAG West Point estimates using DMDC-derived data are limited to permanent party AC Soldiers.
- Metrics based on ICD-10-CM codes entered in patient medical records are subject to coding errors. Estimates may also be conservative given that individuals may not seek care or may choose to seek care outside the MHS or the TRICARE claims network.
- The BMI averages reported in *Health of the Force* accurately estimate population statistics, but may not be appropriate for smaller units and are not intended for individual Soldier assessment.
- Measures based on self-reported data (GAT and PHA) are limited to a subset of the population (i.e., survey respondents) and may be prone to biases.
- The STI (chlamydia) and heat illness metrics rely on reporting compliance. STI (chlamydia) estimates are conservative given the high proportion of asymptomatic infections that are undetected.
- GAT data used for the P3 measures were aggregated across demographic strata, and counts below 40 were not reported. Thus, age and sex adjustments for the installations were not possible.
- The Air Quality EHI relies on outdoor ambient air monitoring data that were deemed representative of air pollution levels experienced by the population working and living in the locale where the Army installation is situated. The metric does not reflect exposures from indoor air pollution sources.
- The Solid Waste Diversion EHI relies on SWARWeb solid waste generation and diversion data that may reflect estimates rather than the actual weight of materials.
- The Mosquito-borne Disease EHI relies on mosquito specimens acquired by installations and forwarded to the supporting Public Health Command Region for identification and pathogen testing. Robustness of the risk characterizations is dependent upon installation surveillance programs collecting specimens and ensuring delivery to the supporting region for identification and testing.

- The Tick-borne Disease EHI relies on tick specimens submitted to the DOD HTTKP for identification and pathogen testing. Robustness of the risk estimate is dependent upon installation populations submitting human ticks to the HTTKP for analysis.

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ACRONYMS AND ABBREVIATIONS

AAG – Army Analytics Group
AARL – U.S. Army Aeromedical Research Laboratory
AC – Active Component
ACFT – Army Combat Fitness Test
ACOM – Army Command
ACRC – U.S. Army Combat Readiness Center
AFH – Army Family Housing
AFHSB – Armed Forces Health Surveillance Branch
AHP – Army Hearing Program
AMEDD – U.S. Army Medical Department
AOHP – Army Occupational Health Program
APFT – Army Physical Fitness Test
APHC – U.S. Army Public Health Center
APHN – Army Public Health Nurse
AQI – Air Quality Index
AR – Army Regulation
ARD – Army Resiliency Directorate
ARMY DIR – Army Directive
ARNG – Army National Guard
ASAP – Army Substance Abuse Program
AWC – Army Wellness Center
BCT – Basic Combat Training
BH – Behavioral Health
BMI – Body Mass Index
CCR – Consumer Confidence Report
CDC – U.S. Centers for Disease Control and Prevention
CHCS – Composite Health Care System
COPD – Chronic Obstructive Pulmonary Disease
CR2C – Commander's Ready and Resilient Council
CSTA – Community Strengths and Themes Assessment
CWS – Community Water System
CY – Calendar Year
DA – Department of the Army
DA Pam –Department of the Army pamphlet
D/DBPR – Disinfectants/Disinfection Byproduct Rule
DHA – Defense Health Agency
DHHS – U.S. Department of Health and Human Services
DMDC – Defense Manpower Data Center
DOD – Department of Defense
DODI – Department of Defense Instruction
DOEHRS – Defense Occupational and Environmental Health Readiness System
DOEHRS-HC – Defense Occupational and Environmental Health Readiness System – Hearing Conservation
DOEHRS-IH – Defense Occupational and Environmental Health Readiness System – Industrial Hygiene
DPW – Department of Public Works
DRC – Dental Readiness Classification
DRSi – Disease Reporting System, internet
DSM – Dental Sleep Medicine
DSM-5 – Diagnostic and Statistical Manual of Mental Disorders
eBLL – Elevated Blood Lead Level
e-cig – Electronic Cigarette
EHI – Environmental Health Indicator
EPA – U.S. Environmental Protection Agency
EPICON – Epidemiological Consultation
EVALI – E-cigarette, or Vaping, Product Use-associated Lung Injury
FEHB – Federal Employees Health Benefits
FTE – Full-Time Equivalent
FY – Fiscal Year
GAT – Global Assessment Tool
HCR – High Caries Risk
HEHRR – Housing Environmental Health Response Registry
HP2020 – Healthy People 2020
HQDA – Headquarters, Department of the Army

HRC – Hearing Readiness Classification
HTD – High Transmission Day(s)
HTTKP – Human Tick Test Kit Program
ICD-10-CM – International Classification of Diseases, Tenth Revision, Clinical Modification
IEP – Initiative Evaluation Process
IET – Initial Entry Training
IHI – Installation Health Index
IMCOM – U.S. Army Installation Management Command
IPV – Intimate Partner Violence
JBER – Joint Base Elmendorf-Richardson
JBLE – Joint Base Langley-Eustis
JBLM – Joint Base Lewis-McChord
JBSA – Joint Base San Antonio
JCS – Joint Chiefs of Staff
LED – Light-Emitting Diode
µg/dL - Micrograms Per Deciliter
MCL – Maximum Contaminant Level
MDMP – Military Decision Making Process
MDO – Multi-Domain Operations
MDR – Medical Data Repository
MEDCOM – U.S. Army Medical Command
MEDPROS – Medical Protection System
mg/L – Milligrams Per Liter
MHS – Military Health System
MOM – Measure(s) of Merit
MOS – Military Occupational Specialty
MRC – Medical Readiness Classification
MSK - Musculoskeletal
MTF – Medical Treatment Facility
NAAQS – National Ambient Air Quality Standards
NCQA – National Committee for Quality Assurance
NDAA – National Defense Authorization Act
NDCEE – National Defense Center for Energy and Environment
NIDA – National Institute on Drug Abuse
NIHL – Noise-Induced Hearing Loss
NPDWR – National Primary Drinking Water Regulations
NSF – National Sleep Foundation
NWS – National Weather Service
OH – Occupational Health
OPAT – Occupational Physical Assessment Test
OSA – Obstructive Sleep Apnea
OSHA – Occupational Safety and Health Administration
OSUT – One Station Unit Training
OTSG – Office of The Surgeon General
P3 – Performance Triad
PDC – Physical Demand Category
PHA – Periodic Health Assessment
PHS – U.S. Public Health Service
$PM_{2.5}$ – Fine Particulate Matter
ppb – Parts Per Billion
PRWG – Physical Resiliency Working Group
PT – Physical Training
PTSD – Posttraumatic Stress Disorder
PWS – Public Water System
R2 – Ready and Resilient
RHC – Regional Health Command
RHC-A – Regional Health Command – Atlantic
RHC-C – Regional Health Command – Central
RHC-E – Regional Health Command – Europe
RHC-P – Regional Health Command – Pacific
RR – Risk Ratio
SAN – Sleep, Activity, and Nutrition
SD – Standard Deviation
SDWA – Safe Drinking Water Act
SDWIS – EPA Safe Drinking Water Information System
SEM – Social-Ecological Model
SHARP – Sexual Harassment/Assault Response and Prevention
SMS – Strategic Management System
SR2 – U.S. Army SHARP Ready & Resilient Directorate
SRO – Senior Responsible Officer
STI – Sexually Transmitted Infection
STS – Significant Threshold Shift
SUD – Substance Abuse Disorder
SUDCC – Substance Use Disorder Clinical Care
SWARWeb – Solid Waste Annual Reporting for the Web
SWET – Soldier Water Estimation Tool
SWTR – Surface Water Treatment Rule
TB MED – Technical Bulletin, Medical
TRADOC – U.S. Army Training and Doctrine Command
TRIR – Training-Related Injury Report
TTD – Total Transmission Days
USAG – U.S. Army Garrison
USARAK – U.S. Army Alaska
USARIEM – U.S. Army Research Institute for Environmental Medicine
USDA – U.S. Department of Agriculture
USGCRP – U.S. Global Change Research Program
USPSTF – U.S. Preventive Services Task Force
UV – Ultraviolet
WBGT – Wet-Bulb Globe Temperature
WHO – World Health Organization
WTBD – Warrior Tasks and Battle Drills

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