

TIP No. 63-001-0322

Annual Eye Injury Surveillance Report – CY 2021 Active Components of the U.S. Armed Forces

MILITARY SIGNIFICANCE

This document describes eye injury medical encounters, including deployment-associated medical encounters, of Active Duty (AD) Service members (SMs) in the Department of Defense (DOD) in calendar year (CY) 2021. The purpose of this annual surveillance report is to inform military commanders of their most common types of eye injuries and at-risk occupations. Additional information about installation-specific eye injury rates are provided in separate quarterly updates (described in Appendix A).

ABSTRACT

Eye injuries, as the primary medical diagnosis, accounted for 8,609 Military Treatment Facility (MTF) ambulatory encounters and 315 deployment-associated healthcare encounters in the Active Component of the U.S. Armed Forces in CY 2021. There were 120 hospitalizations that eye injury was the primary diagnosis (n=16) or all medical diagnoses (n=104). The most common type was “Superficial” eye injury and causes of the injury were mostly unknown (i.e., no coding documentation in the medical record).

The “Craftwork & Construction,” followed by the “Healthcare” and “Electrical Mechanical Repair” enlisted occupational groups had the highest eye injury rate in the DOD. The “Healthcare,” “Scientists & Professional,” and “Engineering & Maintenance” officers had higher rates of eye injury. The Students, Trainees & Unknown Officer or Enlisted groups had the lowest eye injury rate.

The overall eye injury rate in the AD SM population showed no significant change ($p>0.05$) in the Army, Air Force, Navy from 2012 to 2019. Marine AD SM population trends showed a slight increase in rate over the same period ($p=.0495$). The rates for all services dropped significantly in 2020 and 2021. Note that this corresponds with the height of the COVID 19 pandemic where many in the population began teleworking and there was a reduction in access to healthcare.

BACKGROUND

During the Operation Iraqi Freedom and Operation Enduring Freedom, about 13% of the U.S. military SMs who were medically evaluated had significant eye injuries and about a third of these injuries led to legal blindness.^{1,2} Since the implementation of new vision conservation and Military Combat Eye Protection (MCEP) policies in 2004,³ overall eye injuries among the U.S. AD military SMs have decreased.

Monitoring of public health outcomes is one of the 10 essential public health services according to the Centers for Disease Control and Prevention (CDC) (www.cdc.gov). In addition to providing routine monitoring and surveillance of eye injuries, the objectives of this report were to recognize trends, define magnitude and distribution of eye injuries, and identify emerging issues for guiding military injury prevention policies and priorities.

An analysis of military eye injury trends from 1996 to 2005 was published in the peer review literature in 2010.⁴ That same year, the Tri-Service Vision Conservation and Readiness Branch

(TSVCRB) of the U.S. Army Public Health Center (APHC) and the Armed Forces Health Surveillance Division (AFHSD) of the Defense Health Agency (DHA) developed a standard surveillance report called the *Annual Military Active Duty Eye Injury Summary*. Additionally, military installation quarterly eye injury surveillance started in 2012 (Appendix A).

Though the format of the standardized report has undergone some minor changes since its first edition in 2011, the products continue to provide military service with an overview of the types of eye injuries most currently being experienced by different military occupational groups. The following are resources where the report data are found:

- The surveillance data presented in this document, along with past annual military eye injury surveillance and quarterly military installation eye injury surveillance summaries, are also available on the APHC Periodic Publications page: <https://phc.amedd.army.mil/news/Pages/PublicationDetails.aspx?type=Active%20Duty%20Eye%20Injury%20Report%20Summary>
- Military service eye injury rates and case counts can be found at: <https://www.sms.army.mil/>, and navigating the menus to Dashboards (from the top left drop-down) > Army Enterprise (from the left menu pane) > OTSG/MEDCOM > OTSG/MEDCOM HQ > DCS, Public Health > Occupational & Environmental Medicine Portfolio (OEM) > OEM Vision Readiness & Eye Injury Surveillance > Eye Injury Surveillance - Overall by Service. Deployment-associated eye injury can be found at <https://www.sms.army.mil/>, and navigating the menus to Dashboards (from the top left drop-down) > Army Enterprise -> User Workspace > OTSG/MEDCOM > OTSG/MEDCOM HQ > DCS Public Health > Occupational & Environmental Medicine Portfolio (OEM) > OEM Vision Readiness & Eye Injury Surveillance > Eye Injury Surveillance - Annual Deployment-Associated.
- Quarterly eye injury installation surveillance can be found at <https://www.sms.army.mil/>, and navigating the menus to Dashboards (from the top left drop-down) > Army Enterprise > User Workspace > OTSG/MEDCOM > OTSG/MEDCOM HQ > DCS Public Health > Occupational & Environmental Medicine Portfolio (OEM) > OEM Vision Readiness & Eye Injury Surveillance > Eye Injury Surveillance – Installation.

METHODS

Surveillance Population. The surveillance population included members who served in the Active Component of the U.S. Armed Forces at any time during the surveillance period. Eye injury diagnoses were derived from standardized records of medical encounters that occurred in (a) fixed military and non-military medical treatment facilities (MTF) in the U.S., and (b) overseas and deployed military medical facilities.

Data Source. Surveillance data were from the Defense Medical Surveillance System (DMSS),⁵ which included medical encounters from the new DOD electronic health record (i.e., Military Health System (MHS) Genesis). The DMSS receives data feeds from the Defense Manpower Data Center (DMDC). All data include military population counts, military occupational specialty (MOS) grouping, and deployment-associated medical encounters that were from the DMDC.

Case definition. For both annual and quarterly reports, an eye injury was defined as a hospitalization or ambulatory encounter with at least one diagnosis indicative of an eye injury.

The diagnoses for both annual and quarterly eye injury reports use the International

Classification of Diseases (ICD)-10 and ICD-9 codes specified in Table 1.³ The “Corneal Disorders Due to Contact Lens” ICD codes are for quarterly installation level surveillance only. Because of the Lifetime Incidence rule, the ICD-9 codes were to assess historic data to determine if an SM ever had one of the qualifying conditions.

If more than one eye injury diagnosis was reported during a single medical encounter, only the first listed of the diagnoses was included. For individuals with more than one eye injury documented in different clinical settings, hospitalizations in fixed medical facilities were prioritized over deployed-setting medical encounters, which were then prioritized over outpatient encounters in fixed medical facilities.

Table 1. Eye Injury Categories and ICD Code Description^a

INJURY TYPE	DESCRIPTION	ICD-10 CODE	ICD-9 CODE^a
High Risk Blindness	ocular laceration and rupture with prolapse or loss of intraocular tissue	<i>S05.2</i>	<i>871.0</i> <i>871.1</i>
	ocular laceration without prolapse or loss of intraocular tissue	<i>S05.3</i>	<i>871.2</i> <i>871.3</i>
	penetrating wound with foreign body of eyeball	<i>S05.5</i>	<i>871.4</i> <i>871.5</i>
	penetrating wound without foreign body of eyeball	<i>S05.6</i>	<i>871.6</i> <i>871.7</i>
	avulsion of eye	<i>S05.7</i>	<i>871.7</i> <i>871.9</i>
	other injuries of eye and orbit. lacks specificity and is not included in the code set	<i>S05.8</i>	
Anterior Segment	hyphema	<i>H21.0</i>	<i>364.41</i> <i>366.21</i> <i>366.22</i> <i>364.76</i>
	iridodialysis	<i>H21.53</i>	
	unspecified traumatic cataract	<i>H26.10</i>	
	localized traumatic opacities	<i>H26.11</i>	
	total traumatic cataract	<i>H26.13</i>	
Burns	burn of eyelid and periocular area	<i>T26.0</i>	<i>940.0</i> <i>940.1</i> <i>940.2</i> <i>940.3</i> <i>940.4</i> <i>940.5</i> <i>940.9</i> <i>941.02</i> <i>941.12</i> <i>941.22</i> <i>941.32</i> <i>941.42</i> <i>941.52</i>
	burn of cornea and conjunctival sac	<i>T26.1</i>	
	burn with resulting rupture and destruction of eyeball	<i>T26.2</i>	
	burns of other specified parts of eye and adnexa	<i>T26.3</i>	
	burn of eye and adnexa, part unspecified	<i>T26.4</i>	
	corrosion of eyelid and periocular area	<i>T26.5</i>	
	corrosion of cornea and conjunctival sac	<i>T26.6</i>	
	corrosion with resulting rupture and destruction of eyeball	<i>T26.7</i>	
	corrosion of other specified parts of eye and adnexa	<i>T26.8</i>	
	corrosion of eye and adnexa, part unspecified	<i>T26.9</i>	
Contusion	contusion of eyelid and periocular area	<i>S00.1</i>	<i>921.0</i> <i>921.1</i> <i>921.2</i> <i>921.3</i> <i>921.9</i>
	contusion of eyeball and orbital tissues	<i>S05.1</i>	
	unspecified injury of eye and orbit (lacks specificity and is not included in the code set)	<i>S05.9</i>	
Lid/Adnexa	unspecified open wound of eyelid and periocular area	<i>S01.10</i>	<i>870.0</i> <i>870.1</i> <i>870.2</i> <i>870.8</i> <i>870.9</i>
	laceration without foreign body of eyelid and periocular area	<i>S01.11</i>	
	laceration with foreign body of eyelid and periocular area	<i>S01.12</i>	
	puncture wound without foreign body of eyelid and periocular area	<i>S01.13</i>	

INJURY TYPE	DESCRIPTION	ICD-10 CODE	ICD-9 CODE ^a
	puncture wound with foreign body of eyelid and periocular area	S01.14	
	open bite of eyelid and periocular area	S01.15	
Optic/Cranial Nerve	injury of optic nerve	S04.01A	950.0
	injury of oculomotor nerve	S04.1	950.1
	injury of trochlear nerve	S04.2	950.9
	injury of abducent nerve	S04.4	951.0
			951.1
			951.3
Orbit	fracture of orbital floor	S02.3	802.6
	unspecified fracture of facial bones	S02.92	802.7
	penetrating wound of orbit with or without foreign body	S05.4	802.8
	hemorrhage of orbit	H05.23	870.3
			870.4
			376.32
Posterior Segment	unspecified choroidal hemorrhage	H31.30	362.81
	expulsive choroidal hemorrhage	H31.31	361.0
	choroidal rupture	H31.32	361.00
	retinal detachments and breaks	H33.0	361.01
	retinal detachment with retinal break	H33.00	361.02
	retinal detachment with single break	H33.01	361.03
	retinal detachment with multiple breaks	H33.02	361.04
	retinal detachment with giant retinal tear	H33.03	361.05
	retinal detachment with retinal dialysis	H33.04	361.06
	total retinal detachment	H33.05	361.07
	other retinal detachments	H33.8	363.61
	retinal hemorrhage	H35.6	363.63
	vitreous hemorrhage	H43.1	379.23
	unspecified purulent enophthalmitis	H44.00	360.00
			360.01
Superficial	other and unspecified superficial injuries of eyelid and periocular area	S00.2	918.0
	unspecified superficial injuries of eyelid and periocular area	S00.20	918.1
	abrasion of eyelid and periocular area	S00.21	918.2
	blister	S00.22	918.9
	superficial foreign body of eyelid and periocular area	S00.25	930.0
	insect bite	S00.26	930.1
	other superficial bite of eyelid and periocular area	S00.27	930.2
	injury of conjunctiva and corneal abrasion without foreign body	S05.0	930.8
	foreign body on external eye	T15	930.9
	foreign body in cornea	T15.0	
	foreign body in conjunctival sac	T15.1	
	foreign body in other and multiple parts of external eye	T15.8	
	foreign body on external eye, unspecified eye, initial encounter	T15.9	
Corneal Disorders due to Contact	corneal edema secondary to contact lens	H18.21	None
	corneal disorder due to contact lens	H18.82	

INJURY TYPE	DESCRIPTION	ICD-10 CODE	ICD-9 CODE ^a
Lens^b	corneal disorder due to contact lens, unspecified eye	H18.829	
<p>Notes:</p> <p>^a The AFHSD case definition⁶ was updated in January 2016 and is currently used in the annual report and quarterly eye injury reports. Though a broader list of ICD-10 codes was identified by the taxonomy of injuries developed by the APHC,^{7,8} because of the Lifetime Incidence rule (for which the ICD-9 codes were necessary to assess historic data), both the ICD-9 and ICD-10 codes identified by the AFHSD are currently used for specific eye-injury surveillance analyses.</p> <p>^b The “Corneal Disorders Due to Contact Lens” ICD codes are used only for quarterly eye injury surveillance and are not included in the annual report.</p>			

Incidence Rules:

For AD SMs who met the case definition above, the following rules would apply:

- 60-day incidence rule. For “superficial” or “Contact Lens” eye injuries, an individual may be considered an incident case only once every 60 days.
- Lifetime rule. For non-superficial eye injuries, an individual may be considered an incident case only once per lifetime. It applies to eye injury categories: Contusion, Orbit, Lid/adnexa, Posterior Segment, High Risk of Blindness, Burns, Anterior Segment, and Optic/cranial Nerve injuries.
- Incidence date. The date of the first hospitalization or outpatient medical encounter that includes a defining diagnosis of eye injury. If more than one ocular injury diagnosis is reported during a single hospitalization or outpatient encounter, only the first listed of the diagnoses is included.

Rates of eye injuries in fixed medical facilities were calculated as incident medical encounters per 100,000 person-years in the Active Component of the U.S. Armed Forces. Rates of injuries diagnosed in deployed settings were not calculated due to lack of reliable person-time estimates for denominators.

Causes of injury were assessed using external cause of injury codes (ICD-9/10-CM “E codes”) for eye injuries treated in ambulatory settings and standardization agreement (STANAG) (NATO STANAG No. 2050) codes for hospitalized eye injuries.

Causes of eye injury included:

- (1) Guns and explosives;
- (2) Sports;
- (3) Machinery and tools;
- (4) Land transport;
- (5) Other transport;
- (6) Slips, trips and falls;
- (7) Fighting, assault and horseplay; and
- (8) Other and unknown causes.

Enlisted occupational groups based on the U.S. MOS codes included:

- (1) Infantry, Guncrew, Seamen;
- (2) Electronic Equipment Repair;

- (3) Communications & Intelligence;
- (4) Healthcare;
- (5) Technical & Other Professional;
- (6) Functional Support & Admin;
- (7) Electrical/Mechanical Repair;
- (8) Craftwork & Construction;
- (9) Service, Transport & Supply; and
- (10) Students, Trainees & Unknown Enlisted.

Officer occupational groups included:

- (1) General/Flag Officers & Executives;
- (2) Tactical Operations Officers;
- (3) Intelligence Officers;
- (4) Engineering & Maintenance Officers;
- (5) Healthcare Officers;
- (6) Scientists & Professional Officers;
- (7) Administrative Officers;
- (8) Supply & Logistics Officers; and
- (9) Students, Trainees & Unknown Officers.

RESULTS

The CY 2021 eye injury rates by injury category, causes of injury, and occupational groups as well as percentage of deployment-associated eye injuries were summarized for (1) the DOD in Figures 1-5, (2) the Air Force in Figures 6-10, (3) the Army in Figures 11-15, (4) the Navy in Figures 16-20, and (5) the Marine Corps in Figures 21-25.

Department of Defense

As the primary medical diagnosis, eye injuries accounted for 8,609 MTF ambulatory encounters and 315 deployment-associated healthcare encounters in the Active Component of the U.S. Armed Forces in CY 2021. As all medical diagnoses (i.e., primary, secondary, tertiary, and more diagnoses), eye injuries accounted for 10,263 MTF ambulatory medical encounters and 329 deployment-associated healthcare encounters. There were 120 hospitalizations that eye injury was the primary diagnosis (n=16) or all medical diagnoses (n=104).

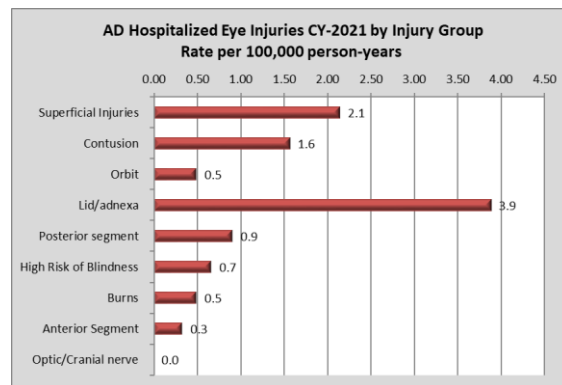
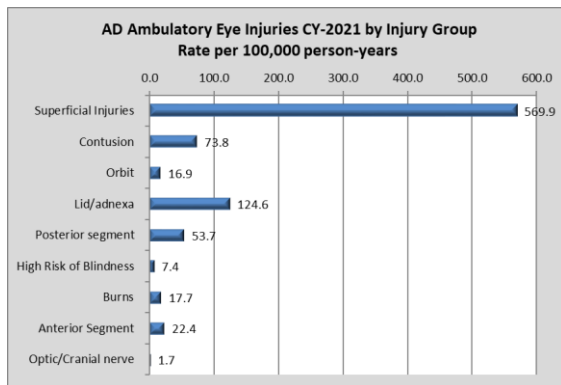


Figure 1. Eye Injury Rates by Injury Category, U.S. DOD AD SMs, CY 2021

Medical treatment facility ambulatory visits (left) and hospitalization (right):

- “Superficial injuries” had the highest ambulatory incidence rate.
- The “Lid/adnexa” (i.e., open wound of ocular adnexa) had the highest hospitalized incidence rate.
- Incidence rate of severe injury, such as the “High Risk of Blindness,” “Burns,” or “Optic/Cranial Nerve” was low.

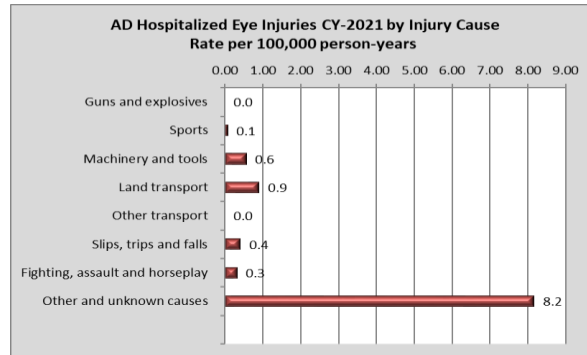
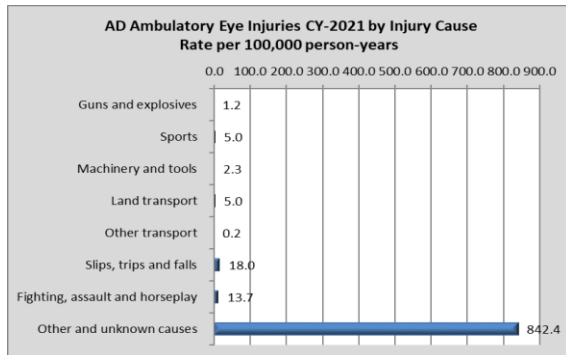


Figure 2. Eye Injury Rates by Injury Causes, U.S. AD SMs, CY 2021

Medical treatment facility ambulatory visits (left) and hospitalization (right):

- Most causes of eye injury (94.7%) were not recorded in the medical encounter.
- Among those that were documented in the medical records, “Slips, Trips and Falls” and “Fighting, Assault and Horseplay” categories were the common causes of eye injury.

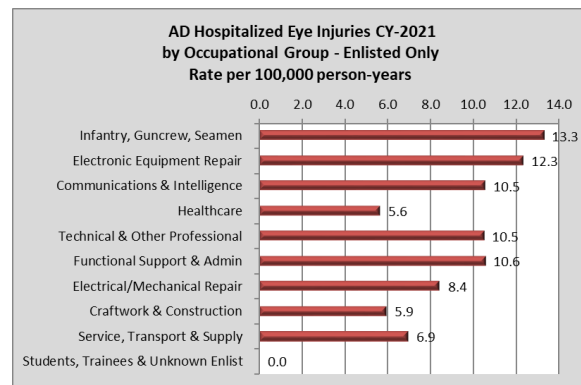
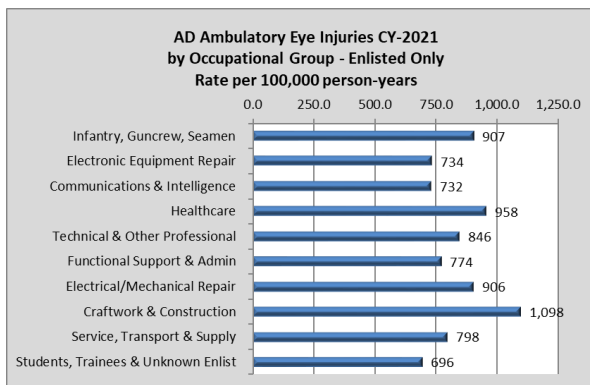


Figure 3. Eye Injury Rates by Enlisted Occupational Groups, U.S. DOD AD SMs, CY 2021

Medical treatment facility ambulatory visits (left) and hospitalization (right):

- The “Craftwork & Construction,” followed by the “Healthcare”(958 & 5.6) enlisted occupational groups had the highest rate of eye injury.
- The “Students, Trainees & Unknown Enlisted”(696 & 0) group had the lowest eye injury rate.

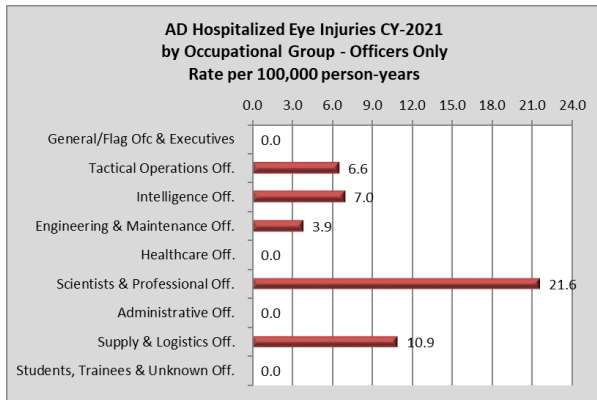
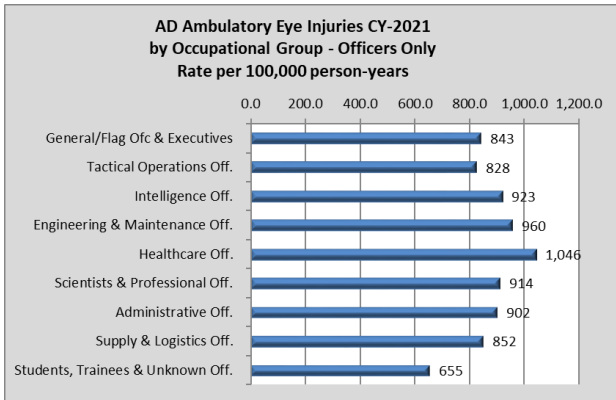


Figure 4. Eye Injury Rates by Officer Occupational Groups, U.S. AD SMs, CY 2021
Medical treatment facility ambulatory visits (left) and hospitalization (right):

- Among the nine military officer occupational groups, the “Healthcare,” “Engineering & Maintenance,” “Scientist & Professional,” and “Intelligence” officers have higher rates of eye injury.
- The “Students, Trainees & Unknown Officer” group had the lowest eye injury rate.

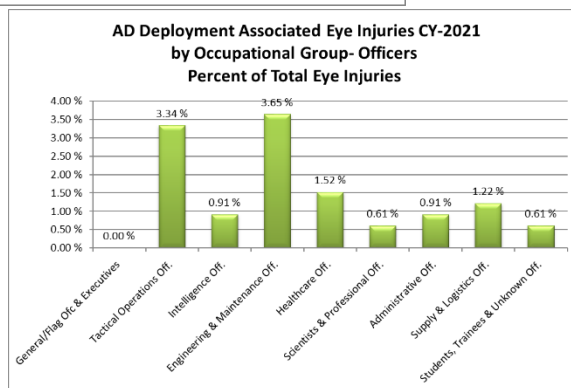
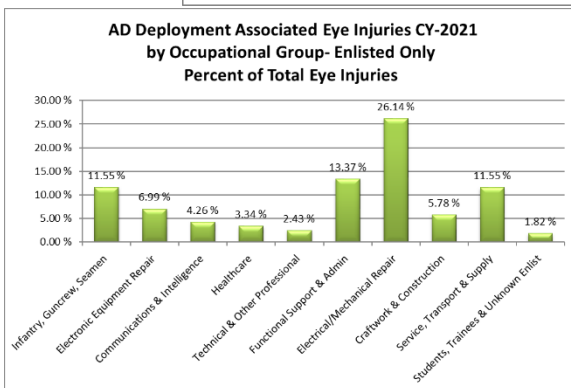
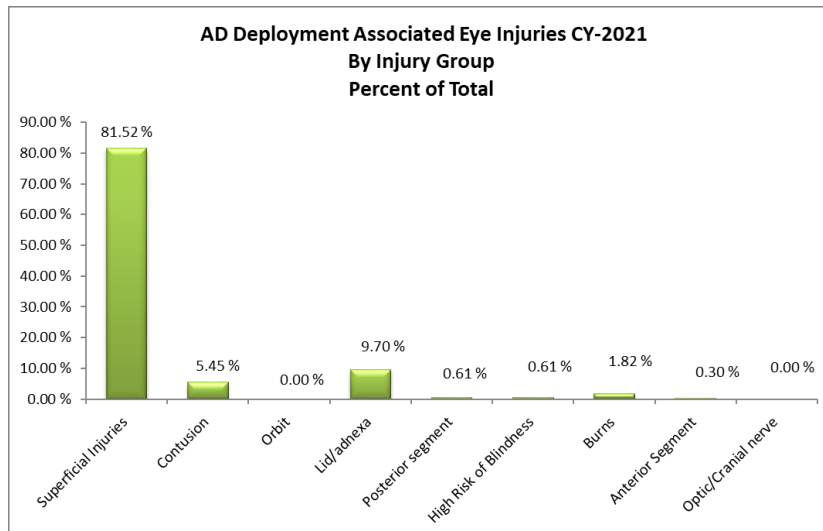


Figure 5. Percentage of Deployment-associated Eye Injuries by Injury Category (top) and by Occupational Group of the Enlisted (left) and Officer (right) Personnel, U.S. DOD AD SMs, CY 2021

- 81.52% of deployment-associated eye injuries were “Superficial Injuries.”
- Eye injuries occurred the most often among enlisted personnel of the “Electrical/Mechanical Repair” (26.14%), “Functional Support & Admin” (13.37%), “Infantry, Guncrew, Seamen” (11.55%), and “Service, Transport & Supply” (11.55%) occupational groups.
- The “Engineering & Maintenance” (3.65%) and “Tactical Operation” (3.34%) officers had the most deployment-associated eye injuries among the officer occupational groups.

U.S. Air Force

As the primary medical diagnosis, eye injuries accounted for 2,070 MTF ambulatory encounters and 80 deployment-associated healthcare encounters in the Active Component of the U.S. Air Force in CY 2021. As all medical diagnoses (i.e., primary, secondary, tertiary, and more diagnoses), eye injuries accounted for 2,439 MTF ambulatory medical encounters and 84 deployment-associated healthcare encounters. There were 16 hospitalizations that eye injury was the primary diagnosis (n=4) or all medical diagnoses (n=12) in the Active Component of the U.S. Air Force in 2021.

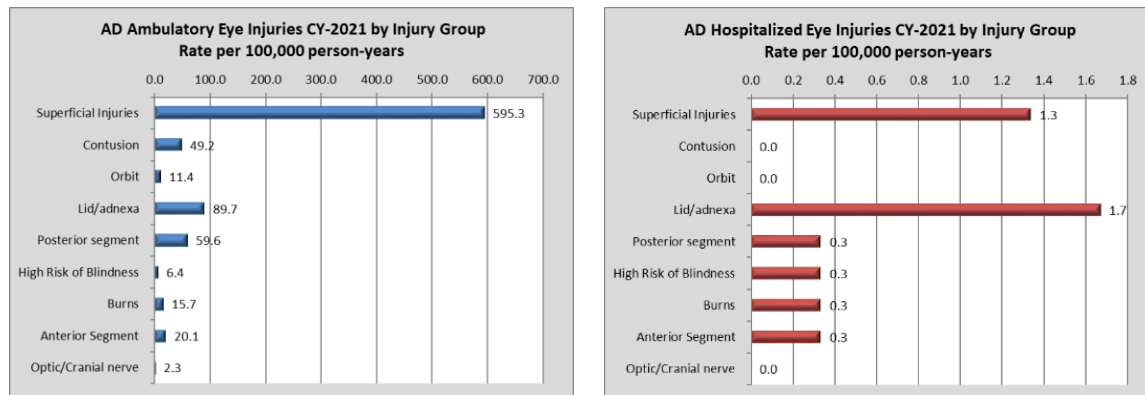


Figure 6. Eye Injury Rates by Injury Category, U.S. Air Force AD SMs, CY 2021
Medical treatment facility ambulatory visits (left) and hospitalization (right):

- “Superficial injuries” had the highest incidence rate.
- The “Lid/adnexa” (i.e., open wound of ocular adnexa), “Posterior segment,” and “Contusion” (i.e., bruise or “black eye”) incidence rates were relatively higher than that of the remaining injury categories.
- Incidence rate of severe injury, such as the “High Risk of Blindness,” “Burns,” or “Optic/Cranial Nerve” was low.

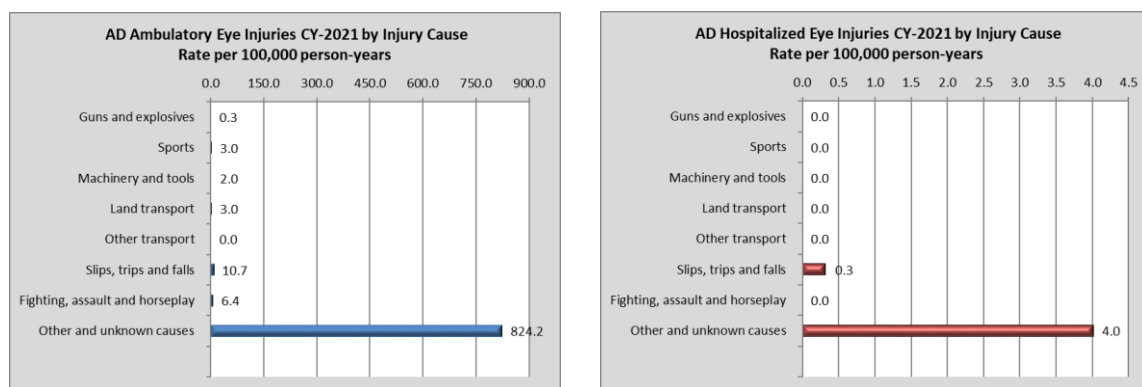


Figure 7. Eye Injury Rates by Injury Causes, U.S. Air Force AD SMs, CY 2021
Medical treatment facility ambulatory visits (left) and hospitalization (right):

- Most causes of eye injury (97.0%) were not recorded in the medical encounter.
- Among those that were documented in the medical records, “Slips, Trips and Falls” and “Fighting, Assault and Horseplay” categories were the common causes of eye injury.

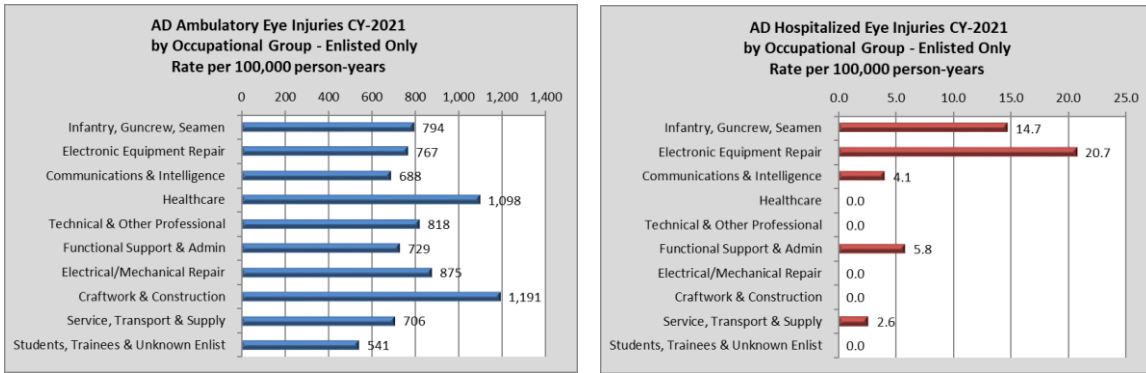


Figure 8. Eye Injury Rates by Enlisted Occupational Groups, U.S. Air Force AD SMs, CY 2021

Medical treatment facility ambulatory visits (left) and hospitalization (right):

- The “Craftwork & Construction” group had the highest rate of eye injury, followed by the “Healthcare” and “Electrical/Mechanical Repair” occupational groups.
- The “Students, Trainees & Unknown Enlisted” personnel had the lowest eye injury rate.

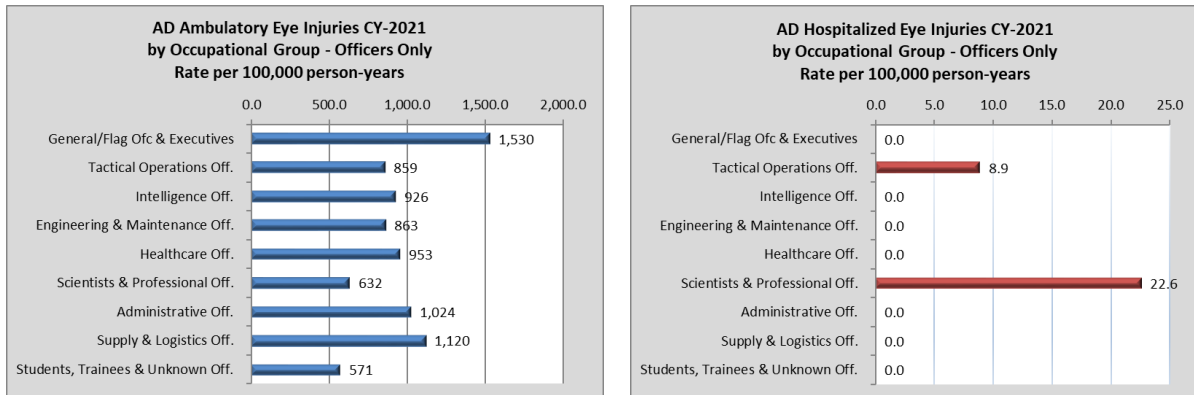


Figure 9. Eye Injury Rates by Officer Occupational Groups, U.S. Air Force AD SMs, CY 2021

Medical treatment facility ambulatory visits (left) and hospitalization (right):

- Among the nine U.S. Air Force officer occupational groups, the “General/Flag Ofc & Executives,” “Supply & Logistics,” and “Administrative” officers had higher rates of eye injury, while the “Students, Trainees & Unknown” officers had the lowest rate.

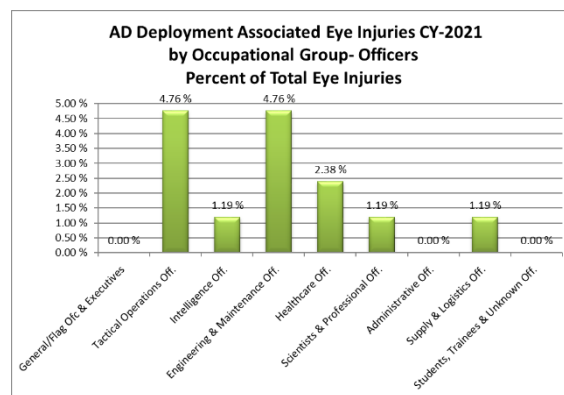
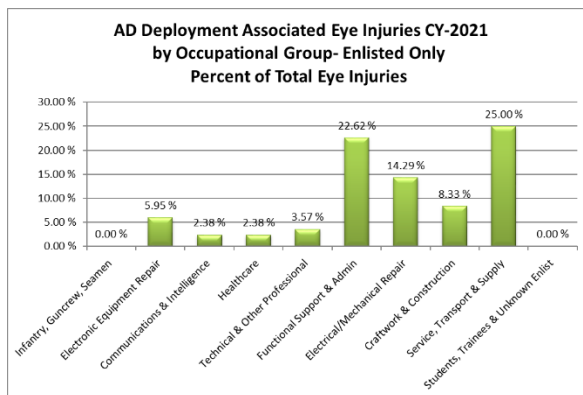
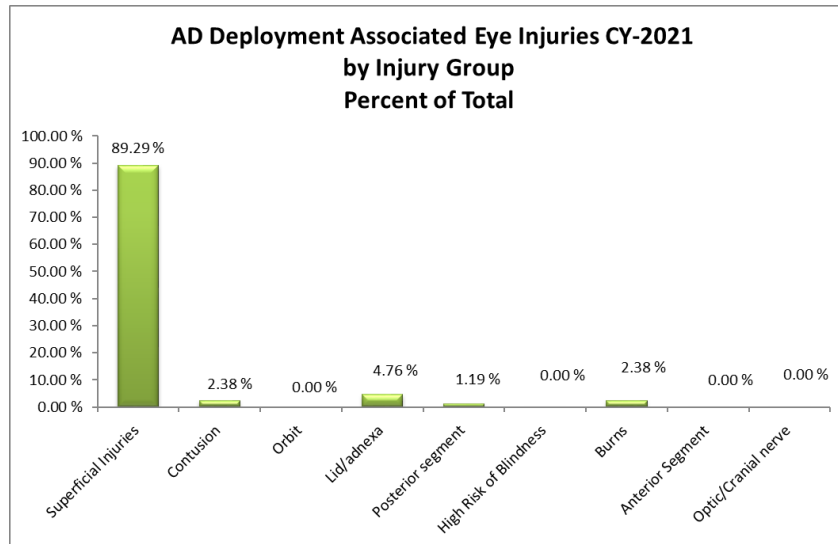


Figure 10. Percentage of Deployment-associated Eye Injuries by Injury Category (top) and by Occupational Group of the Enlisted (left) and Officer (right) Personnel, U.S. Air Force AD SMs, CY 2021

- “Superficial Injuries” accounted for 89.3% of all Deployment-associated eye injuries.
- Eye injuries occurred the most often among enlisted personnel of the “Service, Transport & Supply” (25%), “Functional Support & Admin” (23%), and “Electrical/Mechanical Repair” (14%) occupational groups.
- The “Tactical Operations” officers (4.8%) and “Engineering & Maintenance” (4.8%) had the most deployment-associated eye injuries among the officer occupational groups.

U.S. Army

As the primary medical diagnosis, eye injuries accounted for 3,515 MTF ambulatory encounters and 104 deployment-associated healthcare encounters in the Active Component of the U.S. Army in CY 2021. As all medical diagnoses (i.e., primary, secondary, tertiary, and more diagnoses), eye injuries accounted for 4,217 MTF ambulatory medical encounters and 108 deployment-associated healthcare encounters. There were 53 hospitalizations that eye injury was the primary diagnosis (n=7) or all medical diagnoses (n=46) in the Active Component of the U.S. Army in 2021.

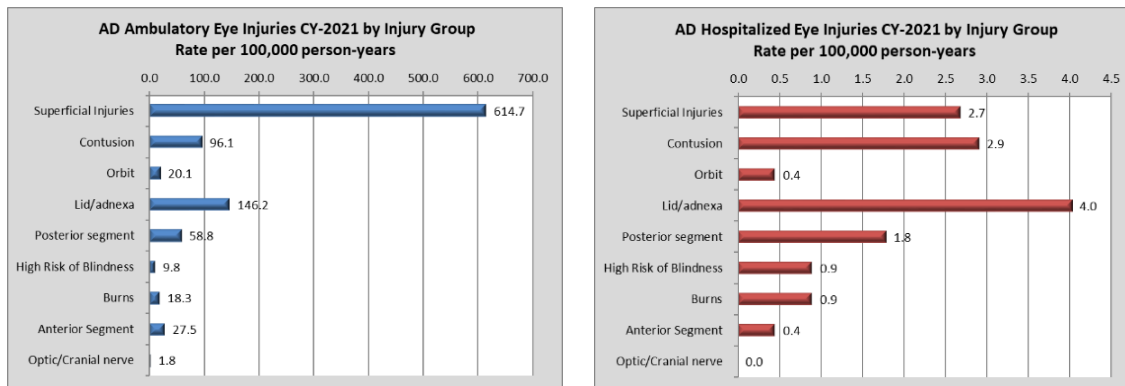


Figure 11. Eye Injury Rates by Injury Category, U.S. Army AD SMs, CY 2021
Medical treatment facility ambulatory visits (left) and hospitalization (right):

- “Superficial injuries” had the highest incidence rate.
- The “Lid/adnexa” (i.e., open wound of ocular adnexa) and “Contusion” (i.e., bruise or “black eye”) incidence rates were relatively higher than that of the remaining injury categories.
- Incidence rate of severe injury, such as the “High Risk of Blindness,” “Burns,” or “Optic/Cranial Nerve” was low.

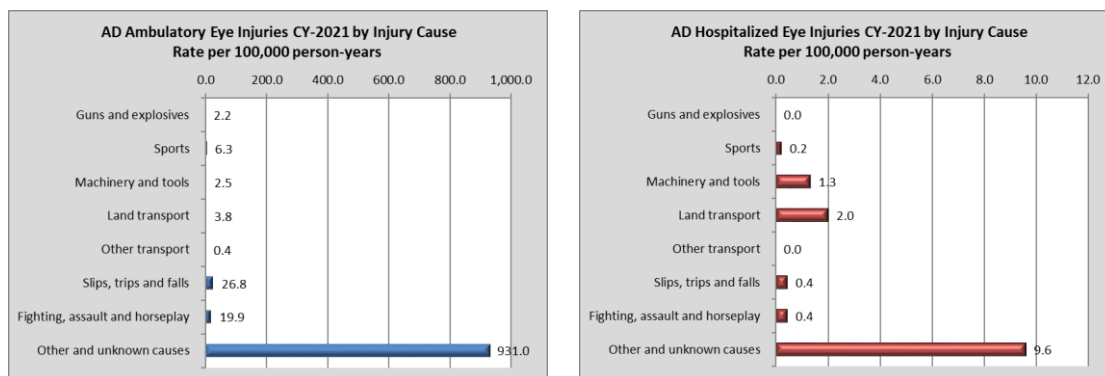


Figure 12. Eye Injury Rates by Injury Causes, U.S. Army AD SMs, CY 2021
Medical treatment facility ambulatory visits (left) and hospitalization (right):

- Most causes of eye injury (93.4%) were not recorded in the medical encounter.
- Among those that were documented in the medical records, “Slips, Trips and Falls,” “land transport,” and “Fighting, Assault and Horseplay” categories were the common causes of eye injury.

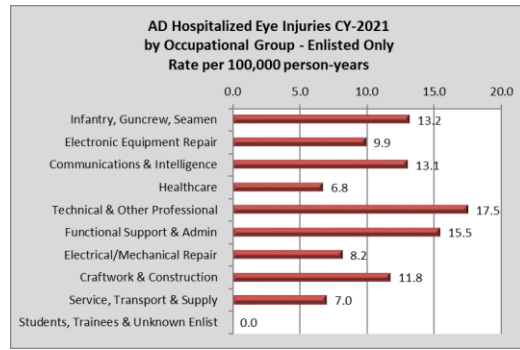
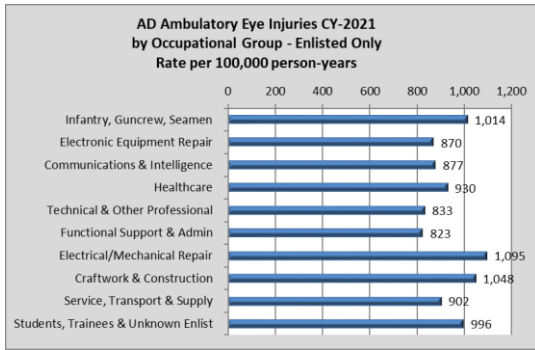


Figure 13. Eye Injury Rates by Enlisted Occupational Groups, U.S. Army AD SMs, CY 2021

Medical treatment facility ambulatory visits (left) and hospitalization (right):

- The “Electrical/Mechanical Repair” group had the highest rate of eye injury, followed by the “Craftwork & Construction,” and “Infantry, Guncrew, Seamen” occupational groups.
- The “Students, Trainees & Unknown Enlist” personnel had the lowest eye injury rate.

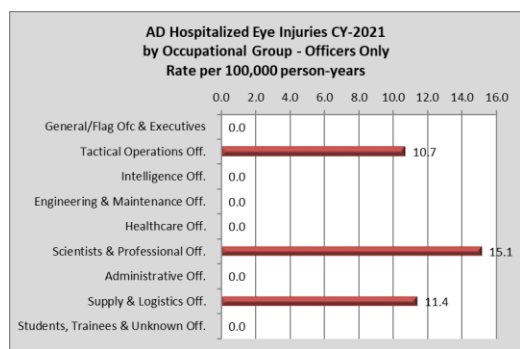
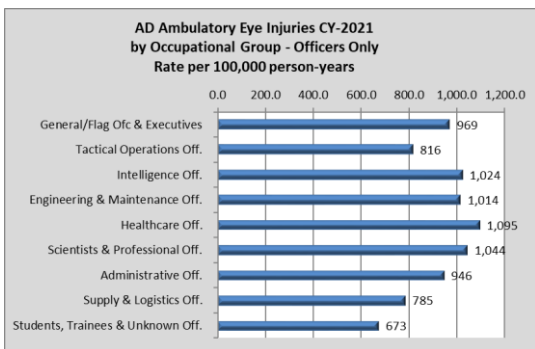


Figure 14. Eye Injury Rates by Officer Occupational Groups, U.S. Army AD SMs, CY 2021

Medical treatment facility ambulatory visits (left) and hospitalization (right):

- Among the nine U.S. Army officer occupational groups, “Healthcare Officer” group had the highest eye injury rate, followed by the “Scientists & Professional,” “Intelligence,” and “Engineering & Maintenance” officers.

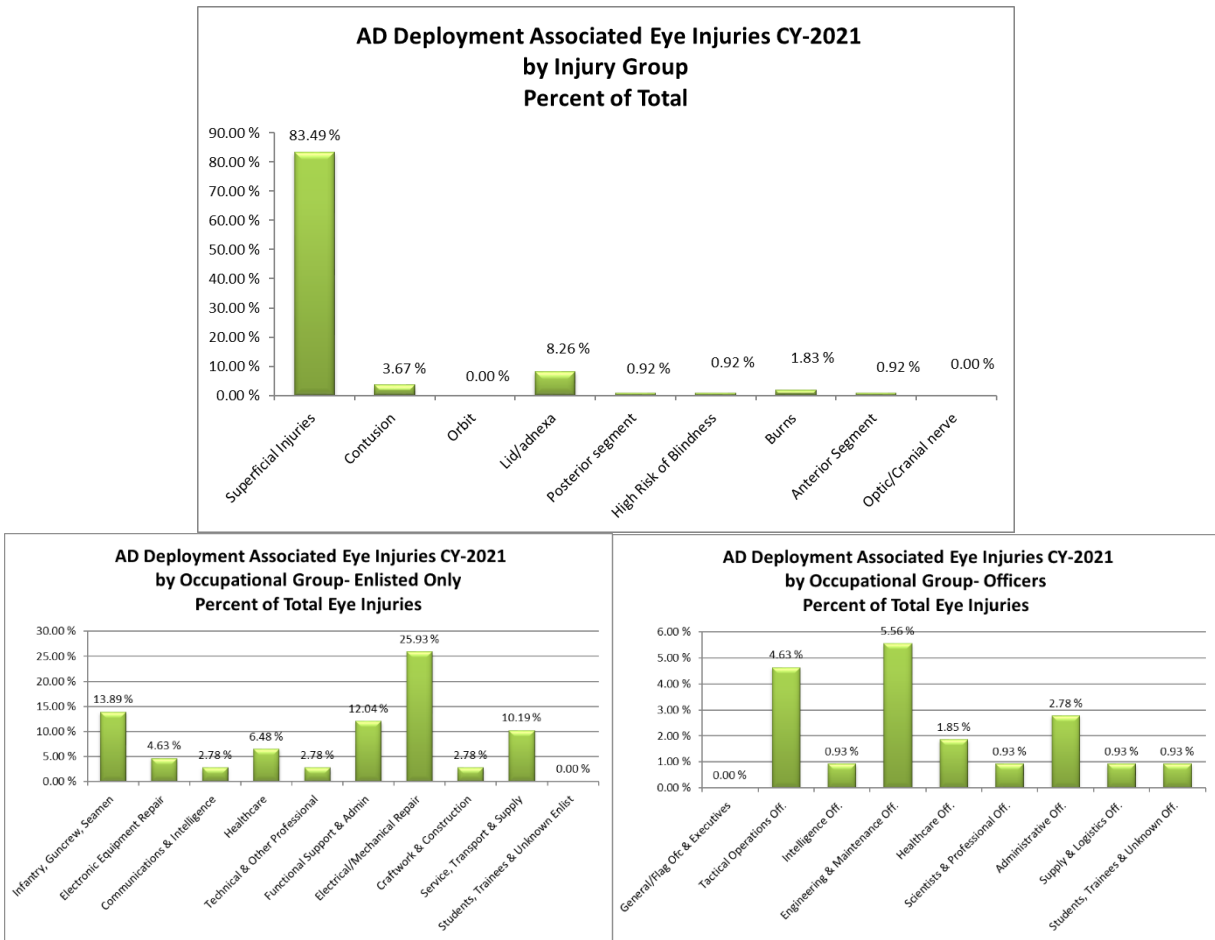


Figure 15. Percentage of Deployment-associated Eye Injuries by Injury Category (top) and by Occupational Group of the Enlisted (left) and Officer (right) Personnel, U.S. Army AD SMs, CY 2021

- “Superficial Injuries” accounted for 83.5% of all Deployment-associated eye injuries.
- Eye injuries occurred the most often among enlisted personnel of the “Electrical/Mechanical Repair” (26%), “Infantry, Guncrew, Seamen” (14%), “Functional Support & Admin,” (12%) and “Service, Transport & Supply” (11%) occupational groups.
- The “Engineering & Maintenance” officers had the most deployment-associated eye injuries (5.6%) among the officer occupational groups followed by “Tactical Operation” officers (4.6%).

U.S. Navy

As the primary medical diagnosis, eye injuries accounted for 1,784 MTF ambulatory encounters and 110 deployment-associated healthcare encounters in AD Navy SMs in CY 2021. As all medical diagnoses (i.e., primary, secondary, tertiary, and more diagnoses), eye injuries accounted for 2,093 MTF ambulatory medical encounters and 114 deployment-associated healthcare encounters. There were 29 hospitalizations that eye injury was the primary diagnosis (n=1) or all medical diagnoses (n=28) of U.S. Navy AD SMs in 2021.

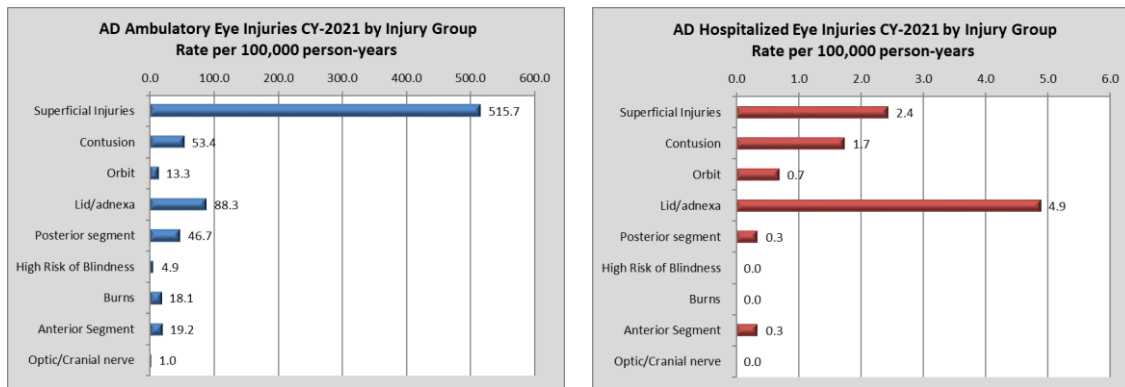


Figure 16. Eye Injury Rates by Injury Category, U.S. Navy AD SMs, CY 2021
Medical treatment facility ambulatory visits (left) and hospitalization (right):

- “Superficial injuries” had the highest incidence rate.
- The “Lid/adnexa” (i.e., open wound of ocular adnexa), “Contusion” (i.e., bruise or “black eye”), and “Posterior segment” incidence rates were relatively higher than that of the remaining injury categories.
- Incidence rate of severe injury, such as the “High Risk of Blindness,” “Burns,” or “Optic/Cranial Nerve” was low.

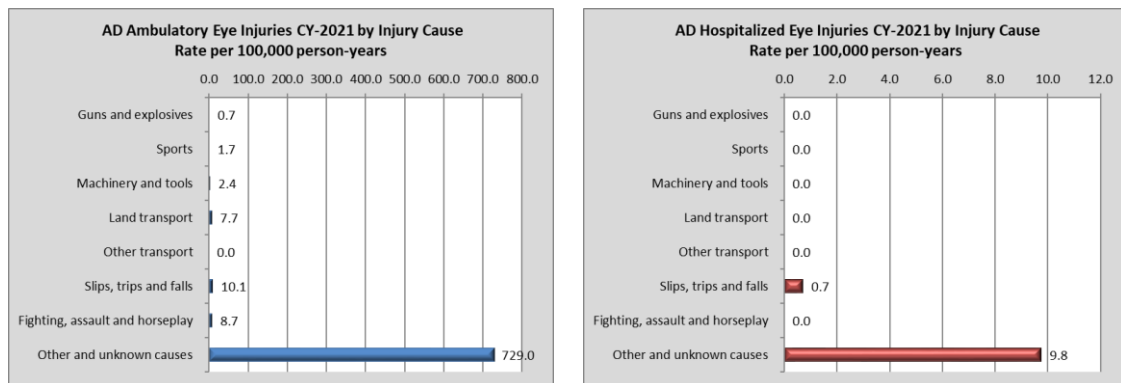


Figure 17. Eye Injury Rates by Injury Causes, U.S. Navy AD SMs, CY 2021
Medical treatment facility ambulatory visits (left) and hospitalization (right):

- Most causes of eye injury (95.8%) were not recorded in the medical encounter.
- Among those documented in the medical records, “Fighting, Assault and Horseplay,” “Slips, Trips and Falls,” and “Land transport” categories were the common causes of eye injury.

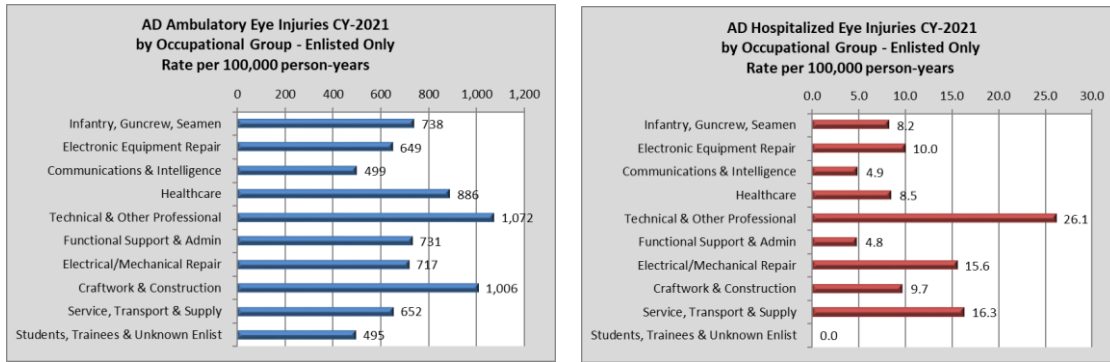


Figure 18. Eye Injury Rates by Enlisted Occupational Groups, U.S. Navy AD SMs, CY 2021
Medical treatment facility ambulatory visits (left) and hospitalization (right):

- The “Technical & other Professional,” followed by the “Craftwork & Construction” and “Healthcare” occupational groups had the highest rate of eye injury.
- The “Students, Trainees & Unknown Enlist” personnel had the lowest eye injury rate.

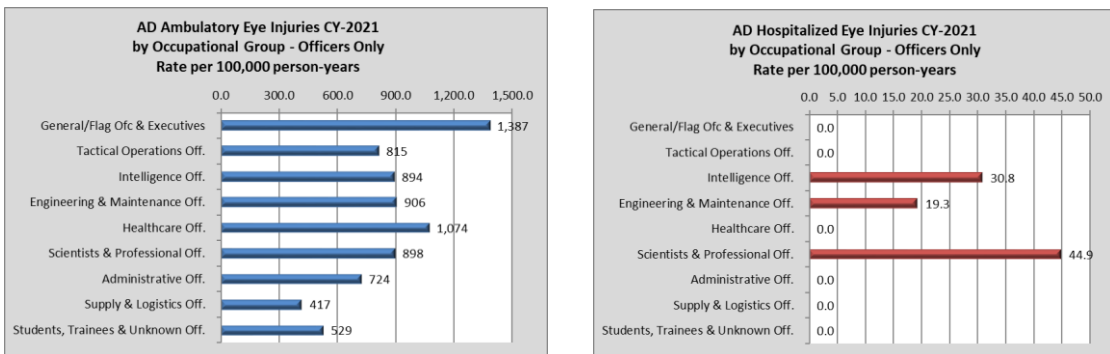


Figure 19. Eye Injury Rates by Officer Occupational Groups, U.S. Navy AD SMs, CY 2021
Medical treatment facility ambulatory visits (left) and hospitalization (right):

- Among the nine U.S. Navy officer occupational groups, the “General/Flag Ofc Executives” had the highest eye injury rate, followed by the “Healthcare,” “Scientists & Professional,” “Engineering & Maintenance,” and “Intelligence” groups.
- The “Supply & Logistics Officer” group had the lowest eye injury rate.

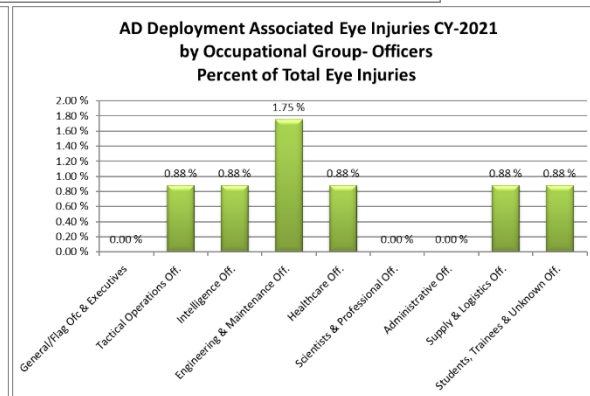
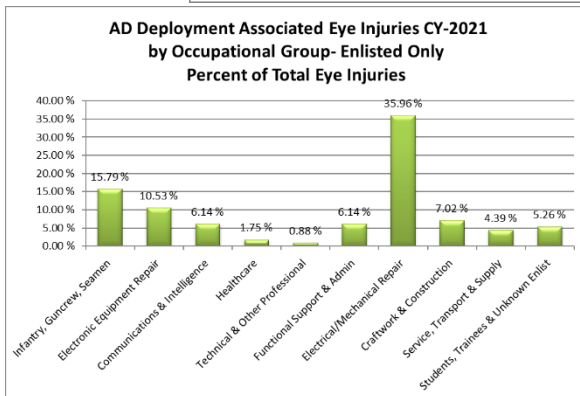
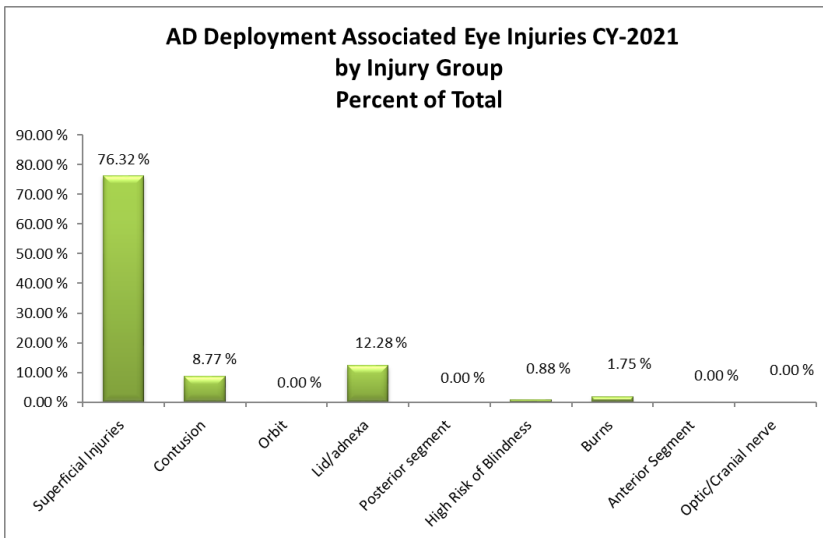


Figure 20. Percentage of Deployment-associated Eye Injuries by Injury Category (top) and by Occupational Group of the Enlisted (left) and Officer (right) Personnel, U.S. Navy AD SMs, CY 2021

- “Superficial Injuries” accounted for 76.3% of all Deployment-associated eye injuries.
- Eye injuries occurred the most often among enlisted personnel of the “Electrical/Mechanical Repair” (36%), “Infantry, Guncrew, Seamen” (16%), and “Electronic Equipment Repair” (11%) occupational groups.
- The “Engineering & Maintenance” officers had the most deployment-associated eye injuries (1.8%) among the officer occupational groups.

U.S. Marine Corps

As the primary medical diagnosis, eye injuries accounted for 1,240 MTF ambulatory encounters and 21 deployment-associated healthcare encounters in AD SMs of the U.S. Marine Corps in CY 2021. As all medical diagnoses (i.e., primary, secondary, tertiary, and more diagnoses), eye injuries accounted for 1,514 MTF ambulatory medical encounters and 23 deployment-associated healthcare encounters. There were 22 hospitalizations that eye injury was the primary diagnosis (n=4) or all medical diagnoses (n=18) in the Active Component of the U.S. Marine Corps in 2021.

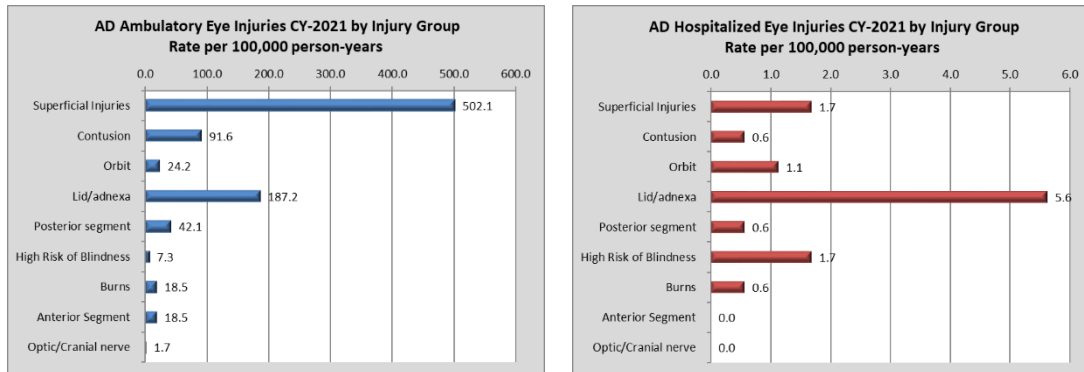


Figure 21. Eye Injury Rates by Injury Category, U.S. Marine Corps AD SMs, CY 2021
Medical treatment facility ambulatory visits (left) and hospitalization (right):

- “Superficial injuries” had the highest incidence.
- The “Lid/adnexa” (i.e., open wound of ocular adnexa) and “Contusion” (i.e., bruise or “black eye”) incidence rates were relatively higher than that of the remaining injury categories.
- Incidence rate of severe injury, such as the “High Risk of Blindness” or “Optic/Cranial Nerve” was low.

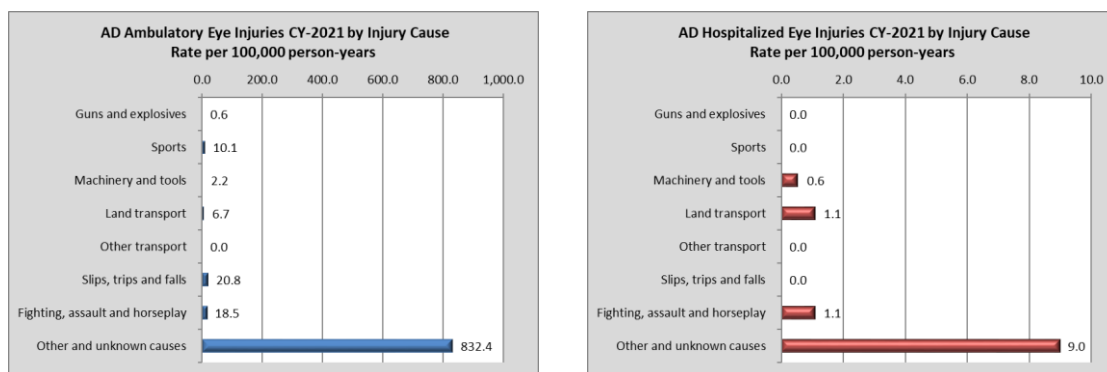


Figure 22. Eye Injury Rates by Injury Causes, U.S. Marine Corps AD SMs, CY 2021
Medical treatment facility ambulatory visits (left) and hospitalization (right):

- Most causes of eye injury (93.2%) were not recorded in the medical encounter.
- Among those that were documented in the medical records, “Slips, Trips and Falls,” “Fighting, Assault and Horseplay,” and “Sport” categories were the common causes of eye injuries.

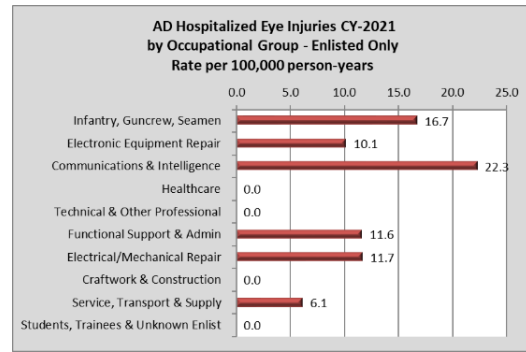
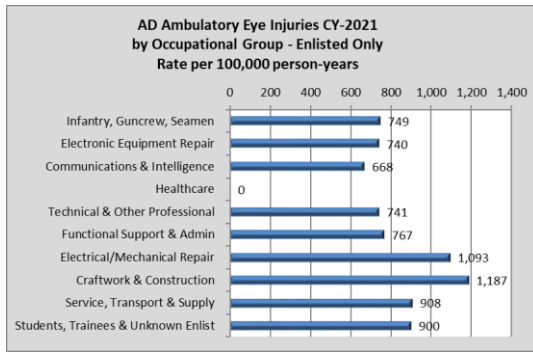


Figure 23. Eye Injury Rates by Enlisted Occupational Groups, U.S. Marine Corps AD SMs, CY 2021

Medical treatment facility ambulatory visits (left) and hospitalization (right):

- The “Craftwork & Construction,” “Electrical Mechanical Repair,” “Service, Transport & Supply,” and “Students, Trainees & Unknown” enlisted occupational groups had the highest rate of eye injury.
- The rate of the “Healthcare” category is zero because the “Healthcare” enlisted personnel were from the U.S. Navy (see Figure 18).

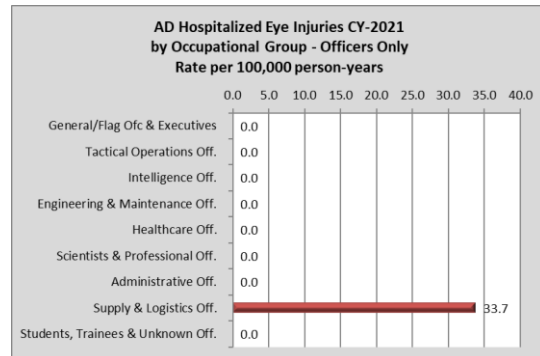
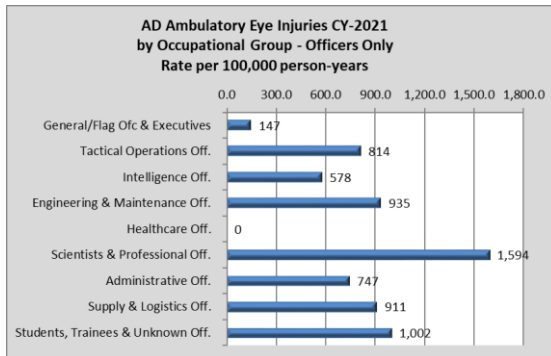


Figure 24. Eye Injury Rates by Officer Occupational Groups, U.S. Marine AD SMs, CY 2021

Medical treatment facility ambulatory visits (left) and hospitalization (right):

- Among the nine military officer occupational groups, the “Scientists & Professional,” “Students, Trainees & Unknown,” “Supply & Logistics,” and “Engineering & Maintenance” officers had higher eye injury rates.
- The rate of the “Healthcare” category is zero because the “Healthcare” officers were from the U.S. Navy (see Figure 19).

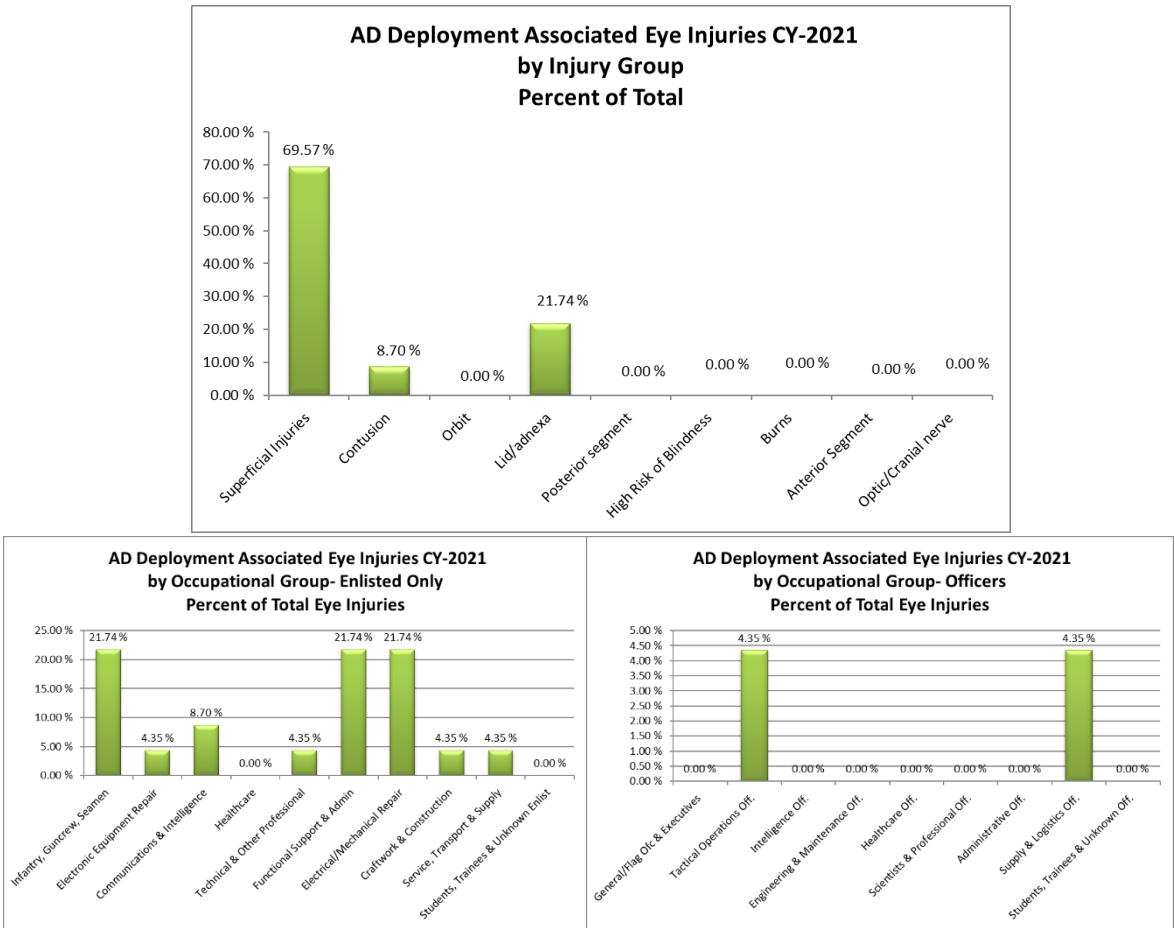


Figure 25. Percentage of Deployment-associated Eye Injuries by Injury Category (top) and by Occupational Group of the Enlisted (left) and Officer (right) Personnel, U.S. Marine Corps AD SMS, CY 2021

- “Superficial Injuries” accounted for 69.6% of all Deployment-associated eye injuries.
- Eye injuries occurred the most often among enlisted personnel of the “Electrical/Mechanical Repair” (22%), “Functional Support & Admin” (22%), and “Infantry, Guncrew, Seamen” (22%) occupational groups.
- The “Tactical Operations” (4.4%) and “Supply & Logistics” (4.4%) officers accounted for all of the deployment-associated eye injuries among the officer occupational groups.

Time Trend of Overall Eye Injuries

Figure 26 shows the time trend of the overall eye injury rate and case count in the **AD SM population**. The overall eye injury rate in the AD SM population showed no significant change ($p>0.05$) in the Army, Air Force, Navy from CY 2012 to CY 2019. Marine AD SM population trends showed a slight increase in rate over the same period ($p=.0495$). The rates for all services dropped considerably in CY 2020 and then rose again in CY 2021. The CY 2021 rates, though still lower than average CY 2020 rates, are much closer to average pre-pandemic rates.



Figure 26. Time Trend of the Overall Eye Injury Rate (left axis) and Case Counts (right axis) of DOD AD SMs, from CY 2008 to CY 2021; Injury rate per 1,000 person-years.

DISCUSSION

The report shows magnitude, type, and causes of eye injuries in the AD military population in CY 2021. Results are provided for all individual Services as well as the combined DOD AD population. Though Service-specific findings are included, results were generally similar across the AD population. Eye injury-related hospitalizations were rare and 98.8% of the eye injury cases were ambulatory (outpatient) encounters.

The most common category of eye injury among all Services was “Superficial Injury” (569.9 per 100,000 person-years). In comparison, severe and potentially sight-threatening eye injuries, such as the “High Risk of Blindness” (7.4 per 100,000 person-years), the “Ocular Burns” (17.7 per 100,000 person-years), or the “Optical or Cranial nerve injury” (1.7 per 100,000 person-years) were rare. However, as noted in previous years, not all superficial eye injuries are benign because about 9% of superficial eye injuries may later develop more severe ocular complications.

Mechanism of Eye Injury. Most (94.7%) of the medical encounters did not document any codes for causes of eye injuries. In the cases that did include documented codes, “Slips, Trips and Falls,” “Fighting, Assault and Horseplay,” “Sports,” “Land Transport,” “Machinery and Tools,” and “Guns and Explosives” were the common mechanism of eye injuries in CY 2021. Though the value of this finding is limited, it hints to the importance of ensuring eye protection is worn during combat drills, sports, occupational settings, and when performing tactical training or combat.

Occupational Group. Among enlisted occupational groups, the “Craftwork & Construction” (1,098 per 100,000 person-years), “Healthcare” (958 per 100,000 person-years), “Infantry, Guncrew, Seamen” (907 per 100,000), and “Electrical Mechanical Repair” (906 per 100,000 person-years) had the highest eye injury rates. Among the officer occupational groups, the “Healthcare” (1,046 per 100,000 person-years), “Engineering & Maintenance” (960 per 100,000 person-years), “Intelligence” (923 per 100,000 person-years), and “Scientists & Professional” (914 per 100,000 person-years) had the highest eye injury rates.

Deployment-Associated Eye Injury. Enlisted personnel accounted for 87.2% of all deployment-associated eye injuries. The “Electrical/Mechanical Repair” (26.14%), “Functional Support & Admin” (13.37%), “Infantry, Guncrew, Seamen” (11.55%), and “Service, Transport & Supply” (11.55%) had the most eye injuries among enlisted occupational groups. The “Students, Trainees & Unknown” group had the lowest eye injury cases (1.82%) among the enlisted personnel while the “General/Flag Ofc & Executives” (0.00%) were the lowest among the officer occupational groups. The “Engineering & Maintenance Off.” (3.65%) had the most deployment-associated eye injuries among officer occupational groups.

Trend over Time. From CY 2012 to CY 2019, the overall eye injury rate remained steady in all services except for Marines where there was a slight increase. There was a noticeable drop in the number and the rate across the services from CY 2019 to CY 2020 and an increase from CY 2020 to CY 2021. It should be noted that these changes took place during the pandemic where a migration towards telework and limited access to medical care may have had profound effects on the rate of reported eye injuries.

Limitations. This report does not contain comprehensive medical record review or safety incidence reports that may provide further information on causes and outcomes of the injury.

Moreover, rates of injuries that diagnosed in deployed settings were not calculated due to lack of reliable person-time estimates.

CONCLUSION

Eye injury led to over 10,000 medical encounters in CY 2021. In addition to direct and indirect costs to the MHS, the operational impacts of these injuries can be significant due to personnel and mission readiness, unit morale, and extra logistical burden from casualty evacuation from deployment settings.

Though the majority of eye injuries identified in CY 2021 were superficial injuries, some of these injuries may become long-term medical problems. Severe injuries, such as high risk of blindness continue to be rare.

Commanders, leadership, and Warfighters should routinely evaluate the safety of a workplace, understand hazards, and implement protections to reduce and eliminate hazards; this aims to prevent future workplace injuries and illnesses. To further assist with local assessments of the eye injury problem, the TSVCRB also provides quarterly installation eye injury surveillance reports (Appendix A).

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Appendix A

Military Installation Quarterly Eye Injury Surveillance

In addition to the Annual Eye Injury Surveillance Reports, the TSVCRB also provides quarterly military installation eye injury surveillance updates.

The quarterly update highlights overall eye injury rate, case count, and time-trend of the last 12 quarters at the level of individual military installation. The purpose of the quarterly update is to provide installation commanders and safety officers with installation-specific eye injury quarterly surveillance.

The methodology used to determine installation-specific rates in the quarterly reports is similar to that described in this annual eye injury report, with the following exceptions: In addition to the nine categories and associated ICD diagnoses codes analyzed for annual reports, the quarterly reports include diagnoses codes for a 10th category, “Corneal Disorders Due to Contact Lens.” The 60-day incidence rule applies to both these and the “Superficial” eye injury categories in the quarterly reports. Moreover, the quarterly update provides a rolling average of the DOD eye injury rate of the last five quarters. Commanders may use it as a dynamic DOD reference (i.e., a moving DOD average) for their assessment of eye injuries on the installation.

Quarterly eye injury installation surveillance can be found at <https://www.sms.army.mil/>; navigating the menus to Dashboards (from the top left drop-down) > Army Enterprise > User Workspace > OTSG/MEDCOM > OTSG/MEDCOM HQ > DCS Public Health > Occupational & Environmental Medicine Portfolio (OEM) > OEM Vision Readiness & Eye Injury Surveillance > Eye Injury Surveillance – Installation.