

# Hearing Health Surveillance Data Review Military Hearing Conservation – Fiscal Year 2020

## Department of Defense Hearing Center of Excellence

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## Definitions

**Active duty:** Full-time duty in the active military service of the United States.

**Hearing impairment:** Any tested frequency exceeding 25 decibel hearing level (dB HL) in either ear.

**Permanent Threshold Shift (PTS):** An STS that fails to resolve on follow-up testing is determined to be a permanent decrease in hearing. An STS that does not receive follow-up testing within the required timeframe is also identified as a PTS.

**Reserve Component:** The term “reserve component” means, with respect to the Armed Forces (a) the Army Reserve; (b) the Navy Reserve; (c) the Marine Corps Reserve; (d) the Air Force Reserve; (e) the Space Force Reserve; (f) the Coast Guard Reserve; (g) the Army National Guard of the United States; and (h) the Air National Guard of the United States. 38 USC § 101(27)

**Significant Threshold Shift (STS):** Hearing thresholds changed, relative to the applicable baseline, an average of 10 dB HL or more at 2000, 3000, and 4000 Hertz (Hz) in either ear. An STS may be positive (decreased hearing) or negative (improved hearing) and requires follow-up testing to determine if it is permanent (PTS) or temporary (TTS).

**STS Follow-up test compliance:** An audiogram conducted after an STS is identified on a periodic exam. Used to determine if the STS is temporary or permanent. Compliance is determined by the number of members who completed required follow-up hearing tests following a positive STS on their periodic hearing test. Current follow-up period for active duty and noise-exposed civilians is 30 days. Follow-up period for the Reserve and National Guard is 60 days.

**Temporary Threshold Shift (TTS):** An STS that resolves on follow-up testing.

**VA hearing threshold disability criteria:** Any reference or periodic test with a pure-tone average (PTA) of 26 dB HL or more at any three frequencies (500, 1000, 2000, 3000 or 4000 Hz), or a threshold of 40 dB HL or more at any one of those same individual frequencies per 38 CFR 3.385.

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## Background

This report covers fiscal year (FY) 2013 through 2020 and includes Department of Defense (DOD) and service-level measures of effectiveness (MOEs) on hearing conservation metrics. It consolidates the MOEs from all service components and examines service-level efforts to prevent hearing loss resulting from occupational and operational illness and injury and improve hearing health (MOEs, June 2019).

Each service varies in how the hearing data are gathered and reported. For example, significant threshold shift (STS) and permanent threshold shift (PTS) rates are not always standardized and thus not always comparable due to different approaches to service-level Hearing Conservation Programs (HCPs, Batchelor et al., 2020). For example, the Air Force and Navy provide annual monitoring audiometry only to Service members who are routinely exposed to hazardous noise (at risk approach) and the Army and Marine Corps provide annual monitoring audiometry to all Service members (total force approach).

In 2018, the DOD Hearing Conservation Working Group (HCWG) agreed to use standard HCP MOEs to resolve the above discrepancies among the services' HCP implementation. The DOD HCWG approved MOEs include the following: STS rates, STS follow-up compliance, hearing impairment rates, and VA auditory threshold disability criteria. One additional metric included in this report is audiogram completion rates. The metrics and data in this report are prepared and codified by the United States Air Force School of Aerospace Medicine, Public Health and Preventive Medicine Department, Epidemiology Consult Service Division and the Defense Health Agency Armed Forces Health Surveillance Branch Air Force Satellite at Wright-Patterson AFB, Ohio (Batchelor et al., 2020). This report provides a consistent method of reporting data on service HCPs using the standard MOEs. The report is not intended to provide a comprehensive epidemiological analysis of exposed versus (vs) unexposed populations as some of the audiograms counted in the numerator may not belong to personnel in the denominator and vice versa (McKenna et al., 2018).

The source of this data is the Defense Occupational Environmental Health Readiness System – Hearing Conservation Data Repository (DOEHRs-HC DR). The DOEHRs-HC DR data evolves over time as additional data are uploaded.

The leadership of each of the military services' HCPs reviewed the metrics and data in this report. For questions regarding the data presented in this report, contact the DOD Hearing Center of Excellence Prevention and Surveillance Branch at: <https://hearing.health.mil/hcehome/Contact-Us>.

This report includes a graphic representation of unique hearing tests completed, by each service component, in FY19 vs FY20. The difference in total unique tests from FY19 to FY20 was divided into the total number of unique tests completed in FY19 to determine the percent decrease in compliance for FY20.

MOE 1 examines the potential hearing injuries/illnesses by calculating the percentages of tested individuals who had results of STS, PTS, and temporary threshold shift (TTS). This calculation is determined by using the number of unique individuals meeting each STS criteria on an annual audiogram per FY and dividing the total number of individuals who received an annual test.

MOE 2 examines the STS follow-up testing compliance for individuals with STS on the annual audiogram. This is calculated by dividing the number of individuals with STS who did not obtain a follow-up audiogram within each service-specific required timeframe by the total number of STS per year. The graphs within the report include the STS follow-up compliance which is based on the non-compliance metric.

MOE 3 focuses on the measure of the proportion of individuals in the HCP population who have hearing impairment (thresholds above 25 dB HL) vs. the proportion of those with normal hearing (25 dB HL or below) in the HCP population. This is calculated by taking the number of individuals with results showing hearing impairment on a periodic or reference audiogram test per FY and dividing by the total number of individuals who received a periodic or reference audiogram in the same FY.

MOE 4 calculates the percentage of Service members who might qualify for Department of Veterans Affairs (VA) based only on auditory threshold disability criteria per 38 CFR, 3.385, Disability due to impaired hearing. This percentage is determined by the number of individuals who met the VA hearing threshold auditory threshold criteria per FY divided by the total number of individuals obtaining an audiogram within that same FY.<sup>1</sup>

## Executive Summary

It is DOD policy to: 1) protect all military personnel and noise-exposed civilian personnel from hearing loss resulting from occupational and [Table 1](#) and operational noise exposure to personnel to enhance mission readiness, communication, and safety (DODI 6055.12, Hearing Conservation Program, August 14, 2019).

Each DOD component establishes, maintains, and evaluates the effectiveness of their HCPs. Because of the unique differences in mission execution, Service member requirements, and expected exposure to hazardous noise, not all Service members are monitored as part of an HCP. The data reported herein only represent Service members and civilians enrolled in an HCP. [Figure 1](#) below reflects the relative size

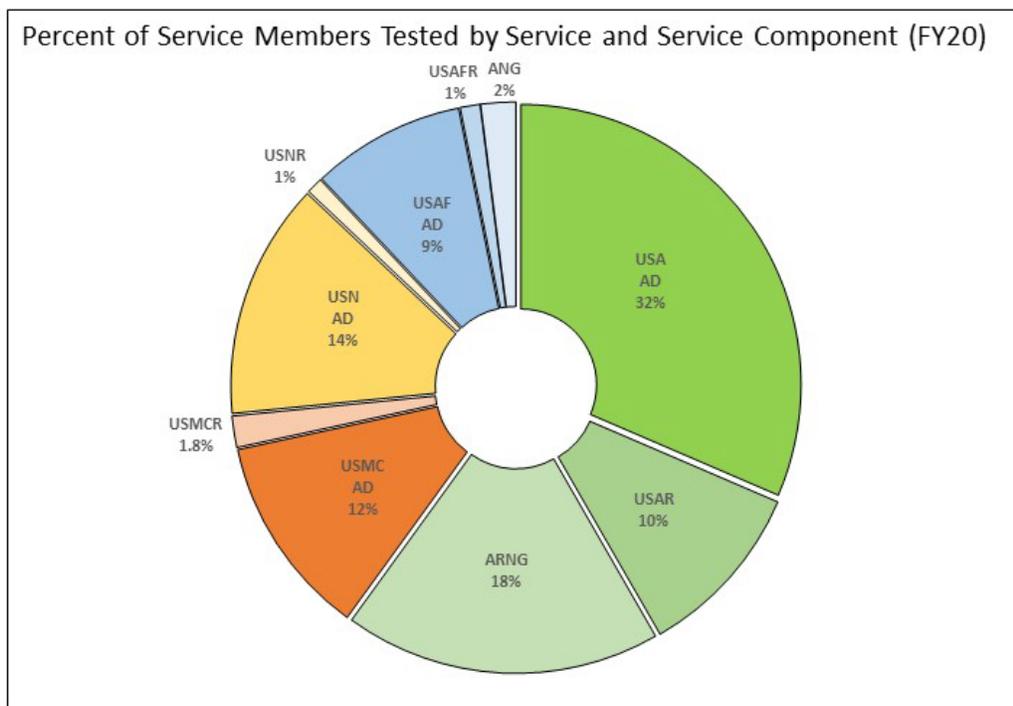
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<sup>1</sup> The award of VA service-connected disability benefits for hearing loss can be made by Veterans Benefits Administration (VBA), Department of Veterans Affairs (VA) based on many factors - not only changes in hearing (auditory) threshold levels during military service. For example, in granting service-connection for hearing loss VBA considers:

- Word Recognition Scores (testing to determine the Veteran's optimum performance for word recognition under controlled and standardized conditions) of less than 94%;
- A permanent positive threshold shift worse than reference audiogram threshold "greater than normal measurement variability" at any frequency between 500 – 6000 Hz; and
- Determination of etiology affected by several facts, per court decisions and/or directed by VBA for instance:
  - Instead of conceding noise exposure for a military occupational specialty (MOS) with moderate or high probability for noise exposure, Veteran Service Representatives and Rating Veteran Service Representatives must now concede noise exposure for ALL military occupational specialties (low, moderate, and high probability of noise exposure rather than only moderate and high probability of noise exposure MOS') for the purposes of establishing an event in service;
  - When hazardous noise exposure is conceded based on the Veteran engaging in combat, accept satisfactory lay or other evidence of service incurrence or aggravation of such injury or disease, if consistent with the circumstances, conditions, or hardships of such service, even if there is no official record of such incurrence or aggravation in such service. There is a requirement to resolve every reasonable doubt in favor of the Veteran unless there is clear and convincing evidence to the contrary. (*Reeves v. Shinseki*, 682 F.3d 988, Fed.Cir. 2012)

of each service’s HCP for the total number (100 %) of all Service members tested in DoD HCPs in FY20 by showing the ratio of Service members tested by service and service component (active duty, and Reserve Component that includes the Reserves and National Guard).

[Figure 1. Percent of Service Members Tested by Service and Service Component](#)



[Table 1. FY20 Unique Individual Tests](#)

Fiscal Year 2020	Military	Active Duty	Reserve	National Guard
Unique Tests				
Army	881,208	468,902	154,346	257,960
Marine Corps	206,814	183,530	23,284	*
Navy	210,428	198,018	12,410	*
Air Force	183,032	141,398	14,554	27,080
Department of Defense	1,481,482	991,848	204,594	285,040

Source: Defense Occupational Environmental Health Readiness System-Hearing Conservation Data Repository (DOEHRS-HC DR)

\*No National Guard Component in the Marine Corps and Navy

[Summary Findings for FY20](#)

Hearing health in the DOD appears to be improving for Service members and civilians in HCPs. The evidence suggests a trend of an overall decrease in hearing impairment (Graph 9) and decreased rates of Service members who meet established VA auditory threshold disability criteria from FY19 to FY20 (Graph 12). Compliance for STS follow-up testing continues to improve for all service components except for the Reserves (Graph 7) and STS follow-up testing continues to improve for noise-exposed civilians (Graph 8). Threshold shift rates for STS and TTS remain relatively stable, and PTS rates show a slight decrease for all service components from FY19 to FY20. Civilian rates for TTS, STS, and PTS show a steady decrease from FY19 to FY20.

### [Unique Individuals by Personnel Category \(FY19 and FY20\)](#)

The number of unique hearing tests completed by DOD, service, and individual service components showed a decrease in FY20 compared to FY19 ([Graph 1](#)). This may be due to limited access to hearing health services as a result of COVID-19 pandemic restrictions. As a result, traditional audiometry conducted in an audiometric test booth was limited by infection control measures due to social distancing, increased cleaning/sanitizing requirements, and compliance with Centers for Disease Control and Prevention (CDC) guidance (CDC, 2003) regarding room air exchange requirements. For example, air exchange requirements within a booth can increase the time interval between testing personnel that significantly impacts patient flow and timely access to care for clinical and hearing conservation hearing testing.

### [Significant Threshold Shift Rates by FY20](#)

Significant Threshold Shift (STS) rates are the number of Service members or noise-exposed civilians who have a change in hearing (an average change of +/- 10dB HL or greater at 2000, 3000, and 4000 Hz in either ear on a periodic audiogram compared to the individual's applicable baseline audiogram. Follow-up testing is required to determine if the STS is a TTS that resolves on follow-testing or a PTS that is confirmed on follow-up testing or lack of follow-up testing completed within the required service's timeframe. Both STS and TTS rates have remained stable, PTS rates have decreased for all Service members ([Graph 2](#)), and STS, TTS, and PTS continue to decrease for noise-exposed civilians ([Graph 6](#)).

FY20 STS rates for DOD Service members are 12.0% for STS, 2.7% for TTS and 7.9% for PTS. PTS rates for active duty (5.3%) and noise-exposed civilians (8.1%) are lower (more accurate) and may in part be due to their higher follow-up testing compliance than for the Reserve Components. In FY20, the National Guard and Reserve show PTS rates of 12.7% and 18.6%, respectively. [Graphs 3, 4, and 5](#) reflect the STS, TTS, and PTS rates for active duty, Reserves, and National Guard, respectively.

### [STS Follow-up Test Compliance](#)

The purpose of the STS follow-up test is to determine whether the hearing change was temporary or permanent. Those who complete the follow-up test and still have STS are referred for an audiological evaluation. Without follow-up tests, hearing status is unknown. An increase in follow-up testing compliance will result in more accurate hearing status. Over the past 8 years the effect of increased follow-up testing compliance is best seen in decreased PTS rates in the civilian and active duty Service members. Follow-up testing compliance in the National Guard showed an increase in STS follow-up testing associated with decreased PTS over the past 4 years. In FY20, active duty and noise-exposed civilians have the highest follow-up compliance rates (73.5% and 75.9%, respectively) while the National Guard (33.5%) and Reserves (18.1%) rates remain low. [Graphs 7 and 8](#) reflect the follow-up testing compliance for Service members and noise-exposed civilians, respectively.

## Hearing Impairment

The percent of hearing-impaired Service members (14.5%) and noise-exposed civilians (39.3%) continues to decrease over the past 7 years. Active duty Service members have the lowest rates of hearing impairment in FY20 (12.9%) compared to the Reserves (17.6%) and National Guard (17.7%). Graphs 9 and 10 reflect hearing impaired rates for all Service members and noise-exposed civilians, respectively.

Graph 11 provides the percent of enlisted accessions that are hearing impaired. The percent of enlisted accessions with hearing impairments show an increase in FY20 (9.7%) compared to FY19 (7.3%). Reserves enlisted accessions have the lowest rates (9%) of hearing impairment compared to the active duty (9.5%) and National Guard (10.8%).

## VA Auditory Threshold Disability Criteria

Graph 12 provides the percent of Service members meeting the established VA auditory threshold disability criteria. The percent of Service members who meet established VA auditory threshold disability criteria continues to decrease over the past 7 years, with active duty Service members having the lowest rates in FY20 (4.5%) followed by the Reserves (7.3%) and National Guard (7.5%).

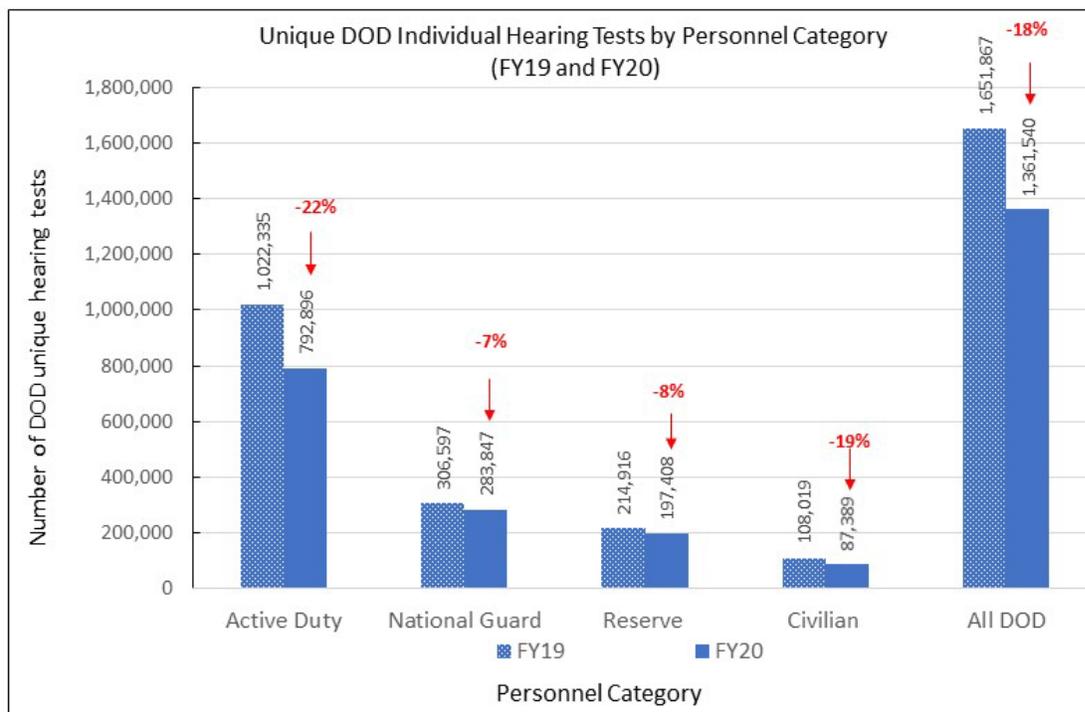
## Hearing Health - DOD Hearing Conservation Program

The following data represent Service members and noise-exposed civilians enrolled in an HCP. Each service enrolls Service members into their HCP based on different criteria, so these data do not represent the hearing health of all Service members in DOD. The general finding of these data is that the overall hearing health for DOD Service members and noise-exposed civilians in an HCP continues to improve since FY13.

### Unique Hearing Tests by Personnel Category

The number of unique hearing tests by component showed a decrease in all components during FY20 compared to FY19. Overall, there was an 18% decrease in testing for all Service members and a 19% decrease for civilian personnel in FY20 compared to FY19 (Graph 1). This decrease in testing is consistent with limited access to hearing health services due to COVID-19 pandemic restrictions. Traditional audiometry conducted in an audiometric test booth was limited by infection control measures for social distancing, increased cleaning/sanitizing requirements, and compliance with CDC guidance (CDC, 2003) regarding room air exchange.

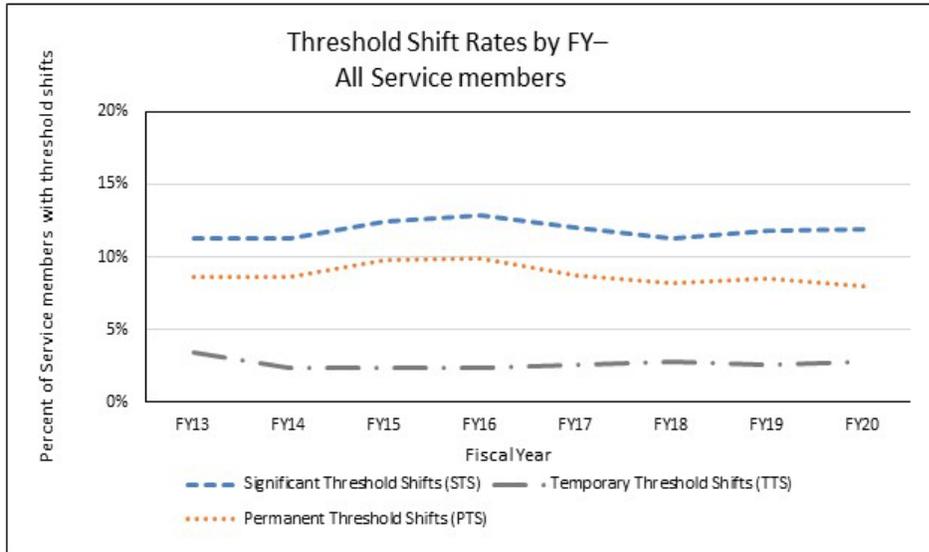
Graph 1. Unique DoD Individual Hearing Tests by Personnel Category (FY19 and FY20)



### Significant Threshold Shift Rates by FY

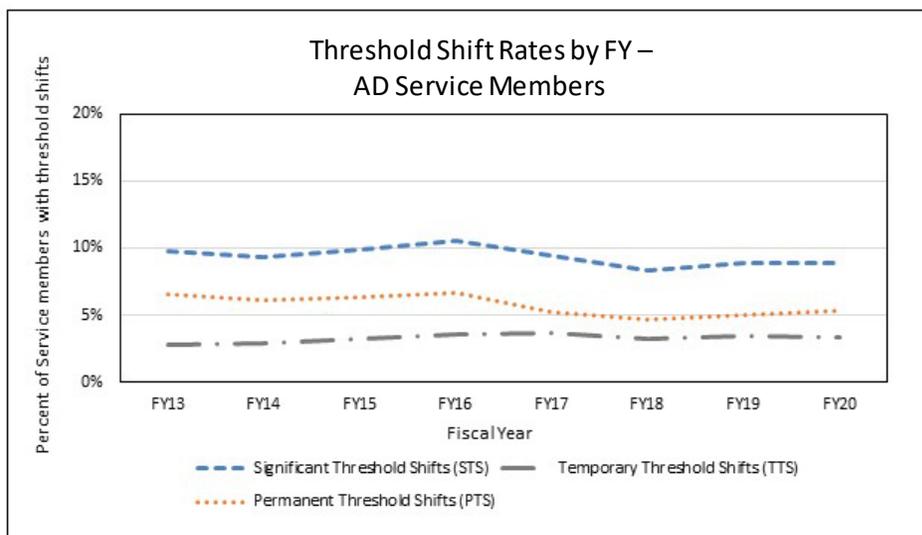
In FY20, military STS, TTS, and PTS rates have remained essentially stable when compared to FY19 STS, TTS, and PTS rates. Threshold shift rates for all Service members (all components) indicate 12.0% STS, 2.7% TTS, and 7.9% PTS rates in FY20 (Graph 2).

[Graph 2. Threshold Shift Rates by FY - All Service Members](#)



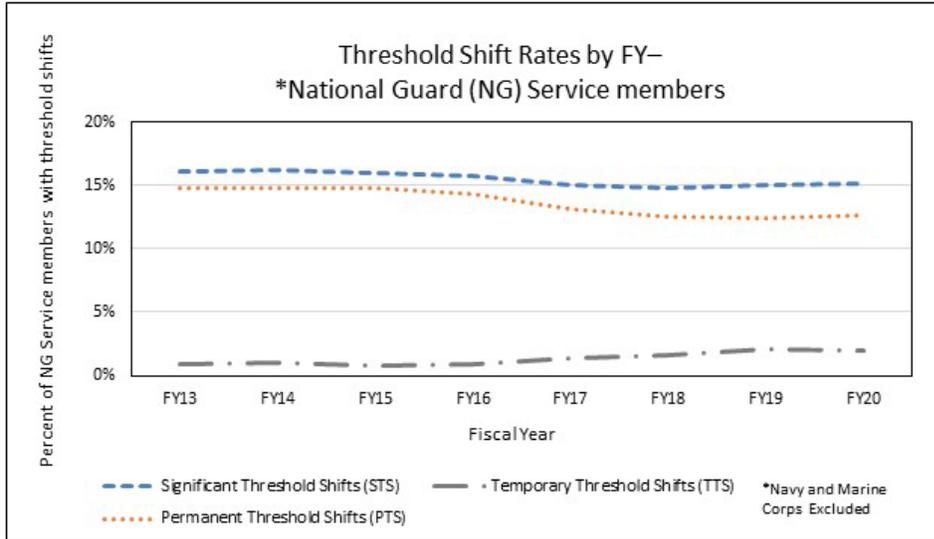
Active duty Service members have the lowest PTS rates compared to other components for FY13 – FY20. Threshold shift rates for active duty Service members indicate 8.9% STS, 3% TTS, and 5.3% PTS rates in FY20 (Graph 3). Improved follow-up testing compliance in the active-duty population (see Graph 7, page 8) shows that about half of all the STS initially identified are found to be PTS.

[Graph 3. Threshold Shift Rates by FY – AD Service Members](#)

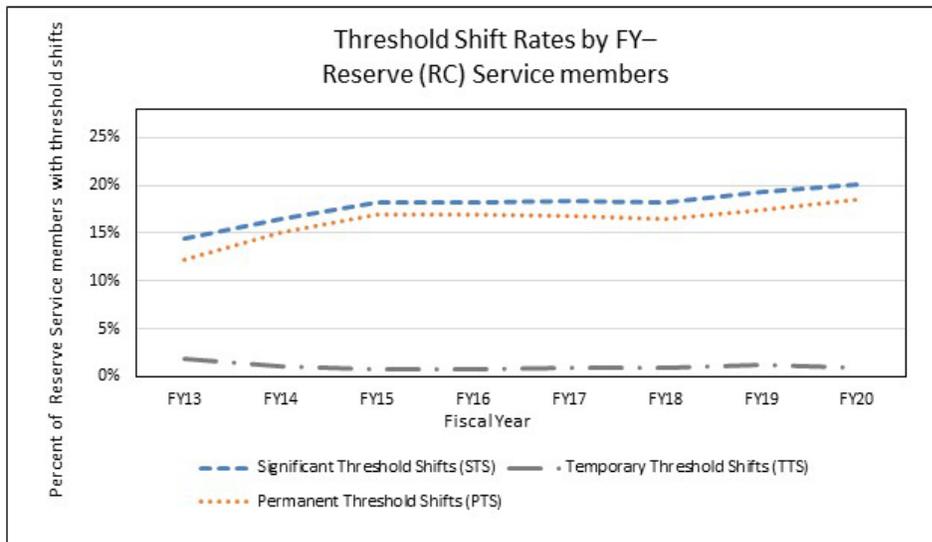


National Guard (Navy and Marine Corps do not have National Guard Service members) rates for FY20 are: 15.2% STS, 2.0% TTS, and 12.7% PTS ([Graph 4](#)). Reserves rates for FY20 are: 20.0% STS, 1.0% TTS, and 18.6% PTS ([Graph 5](#)). Reserves and National Guard STS and PTS rates remain elevated, possibly due to a lack of STS follow-up testing. Failure to conduct STS follow-up testing prevents the accurate identification of TTS vs. PTS.

[Graph 4. Threshold Shift Rates by FY - National Guard \(NG\) Service Members](#)

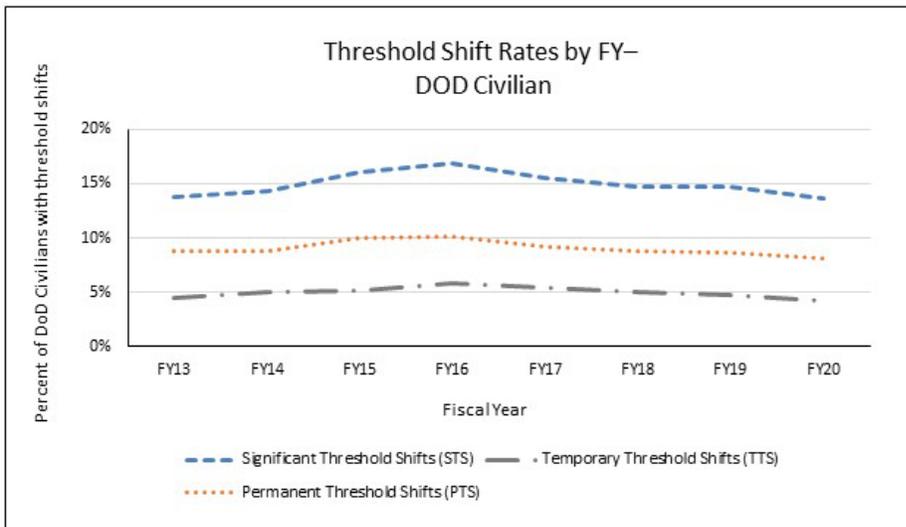


[Graph 5. Threshold Shift Rates by FY - Reserve Service Members](#)



Civilian STS and PTS rates remain high compared to active duty Service members. Civilian rates for FY20 are: 13.7% STS, 4.2% TTS, and 8.1% PTS ([Graph 6](#)). The gradual decrease in PTS (from FY 16 to FY20) may, in part, be due to increased STS follow-up testing compliance (see [Graph 8](#)) that increased almost 24% from FY13 to FY 20.

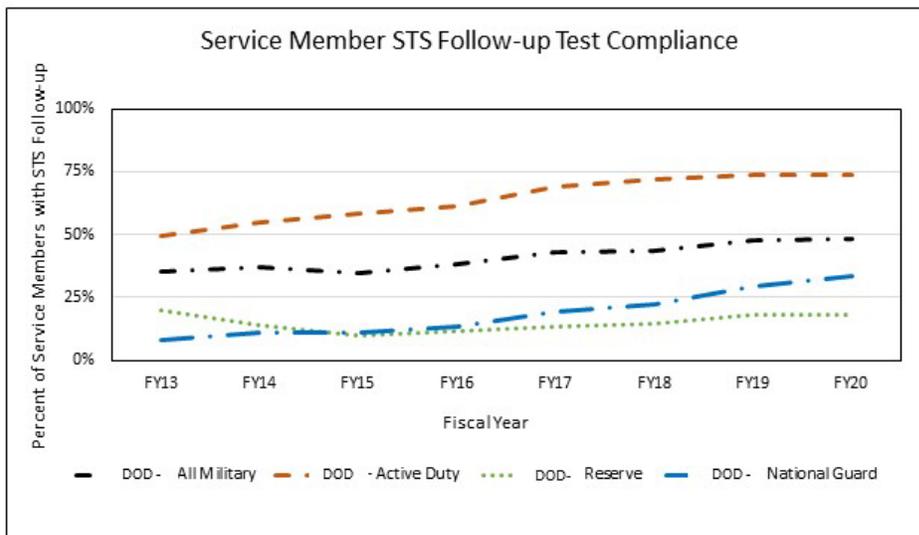
Graph 6. Threshold Shift Rates by FY– DOD Civilian



### Significant Threshold Shift Follow-up Compliance

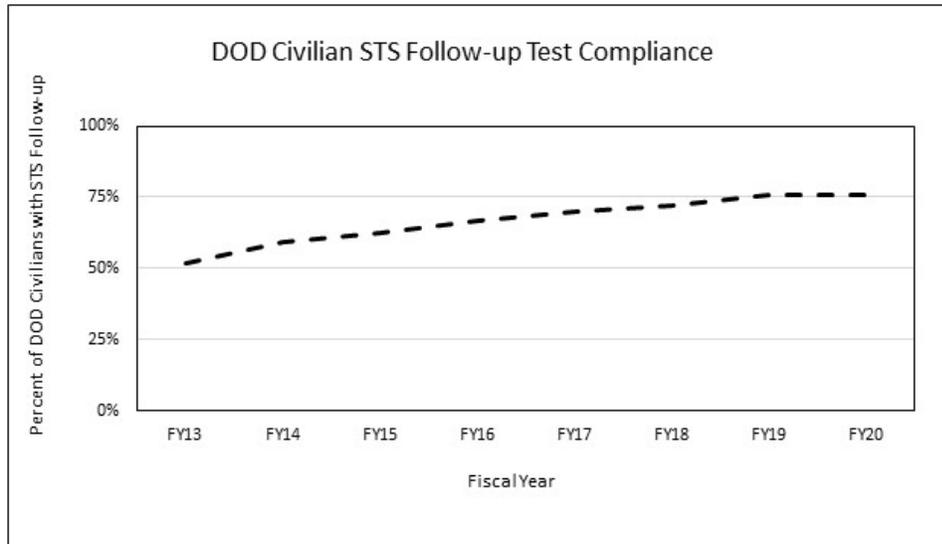
The STS follow-up testing compliance showed marginal improvement in FY20 (Graph 7). Overall compliance for military follow-up testing improved from 35.2% in FY13 to 48.1% in FY20. Compliance in the active duty and National Guard has improved since FY13, while compliance in the Reserves has remained the same. Failure to conduct STS follow-up testing will: 1) elevate STS rates (i.e., the initial STS may be identified every year until follow-up testing is performed and a new baseline is established, if required) and 2) prevent accurate identification of PTS and TTS (i.e., STS with no follow-up hearing test defaults to a PTS when the service-specific follow-up test window has closed. This results in artificially high STS and PTS rates that do not reflect the true incidence of new military hearing injuries (McKenna et al., 2018).

Graph 7. Service Member STS Follow-up Test Compliance



DOD civilian STS follow-up testing compliance in FY20 is consistent with FY19 follow-up compliance. However, overall compliance improved from 52.1% in FY13 to 75.9% in FY20 (Graph 8).

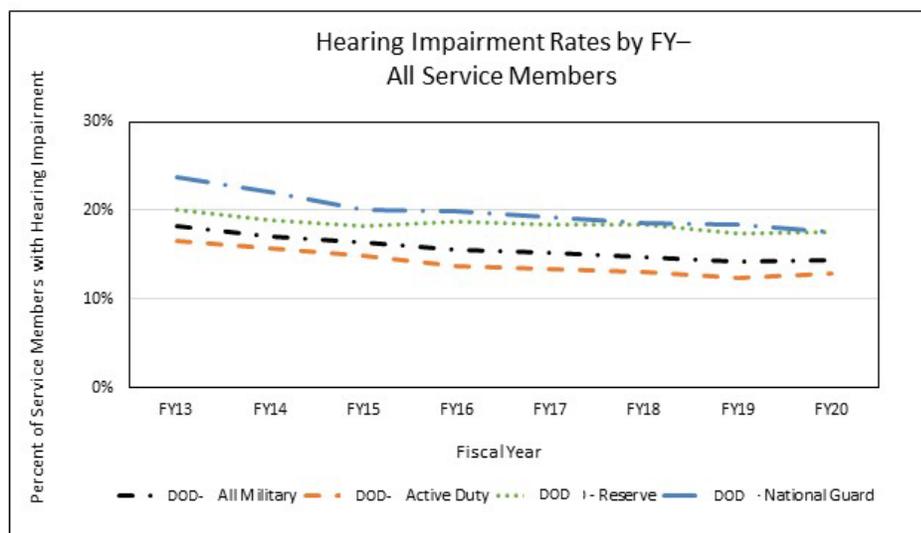
Graph 8. DoD Civilian STS Follow-up Test Compliance



## Hearing Impairment

The percent of hearing impaired Service members is decreasing for all DOD components. DOD Service members with hearing impairment decreased from 18.2% in FY13 to 14.5% in FY20. Graph 9 provides the percent of Service members with hearing impairment by component.

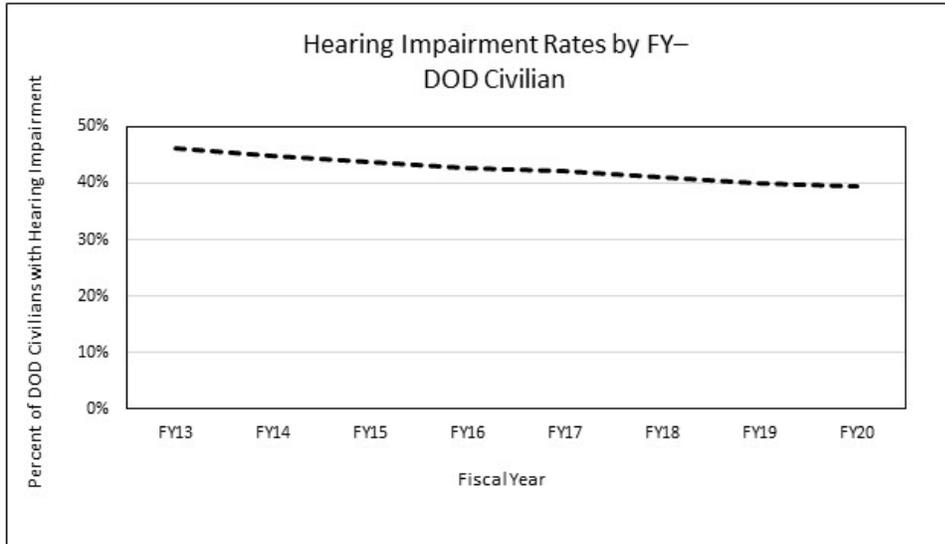
Graph 9. Hearing Impairment Rates by FY - All Service Members



The percent of noise-exposed civilians with hearing impairment continues to show a gradual decrease over the last several years. The percent of noise-exposed civilians with hearing impairment decreased

from 46.1% in FY13 to 39.3% in FY20 (Graph 10). The high percentage of hearing impaired civilians is suspected to be, in part, reflective of differences in age and/or years of noise exposure compared to Service member populations (Batchelor et al., 2020).

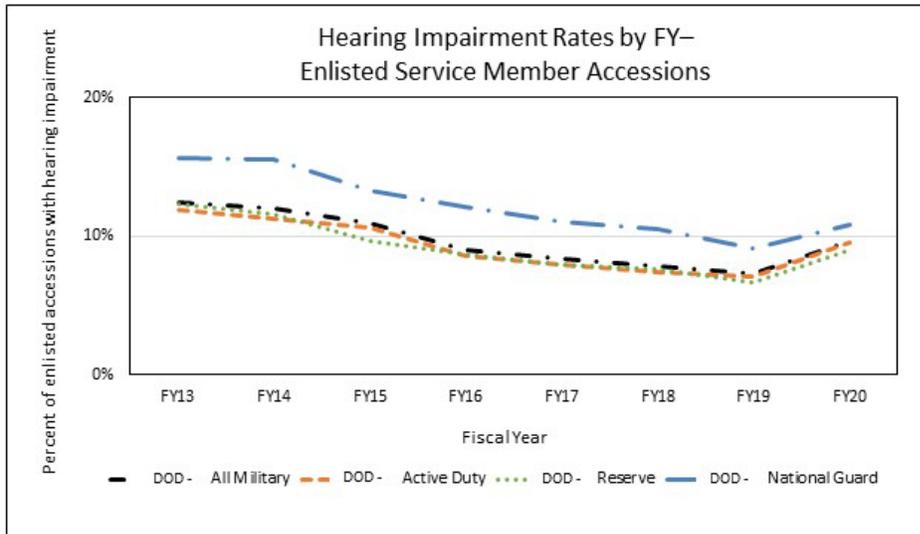
Graph 10. Hearing Impairment Rates by FY – DOD Civilian



### [Hearing Impairment – Enlisted Accession Data](#)

Service members receive a hearing test as part of basic training at their entrance to military service. Those reference audiograms are used to determine the percent of all new recruits who come into the military with hearing impairment (hearing worse than 25 dB at any test frequency). The percent of enlisted accessions with hearing impairment has decreased for all DOD components since FY13; however, the data show an increase in enlisted hearing impairment in FY20 compared to FY19. The percent of DOD enlisted accessions with hearing impairment decreased from 12.5% in FY13 to 7.3% in FY19, then up to 9.7% in FY20 (Graph 11).

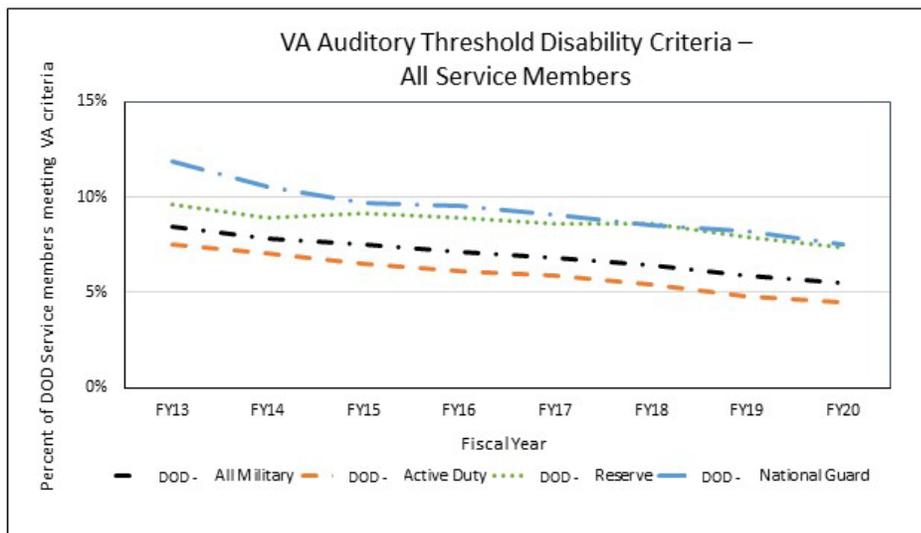
Graph 11. Hearing Impairment Rates by FY – Enlisted Service Member Accessions



### VA Auditory Threshold Disability Criteria

The percent of Service members meeting established VA auditory threshold disability criteria is decreasing for all DOD components. The percentage of DOD Service members potentially eligible for VBA service-connected disability compensation for hearing loss decreased from 8.5% in FY13 to 5.5% in FY20 (Graph 12).

Graph 12. VA Auditory Threshold Disability Criteria – All Service Members



## Summary and Conclusions

Hearing health for Service members and noise-exposed civilians in the DOD Hearing Conservation Program is improving. Evidence of this is seen in decreased hearing impairment, decreased hearing impairment in enlisted accessions, and decreased rates of Service members meeting VA auditory threshold eligibility criteria for hearing loss. The STS rates for all military were essentially stable for FY13 to FY20. There was an increase in the STS rates for the Reserves for all Services for FY13 to FY20. Active duty and noise-exposed civilian populations show the trend of improving follow-up STS testing compliance. According to Batchelor et al. (2020), overall comparisons between these four groups should be undertaken with care because of the differences in their contributions to the dataset (active component, 67%; National Guard, 19%; and Reserves, 14%).

[Table 2. Data Summary – DOD](#)

Source: DOEHS-HC DR

Service	Chart Title	Category	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
DOD	Threshold Shift Rates - All Service Members	STS	11.3	11.3	12.5	12.8	12.0	11.3	11.8	12.0
		TTS	2.4	2.3	2.3	2.6	2.8	2.6	2.8	2.7
		PTS	8.6	8.6	9.8	9.9	8.7	8.2	8.5	7.9
	Threshold Shift Rates - AD Service Members	STS	9.7	9.3	9.8	10.6	9.4	8.3	8.9	8.9
		TTS	2.8	2.9	3.2	3.6	3.7	3.3	3.5	3.3
		PTS	6.6	6.1	6.3	6.6	5.3	4.7	5.0	5.3
	Threshold Shift Rates - NG Service Members	STS	16.1	16.2	15.9	15.7	15.0	14.8	15.1	15.2
		TTS	0.9	1.0	0.8	0.9	1.4	1.6	2.1	2.0
		PTS	14.8	14.8	14.8	14.3	13.1	12.6	12.4	12.7
	Threshold Shift Rates - Reserve Service Members	STS	14.4	16.5	18.3	18.2	18.4	18.3	19.3	20.0
		TTS	1.9	1.1	0.8	0.7	0.9	0.9	1.2	1.0
		PTS	12.3	15.0	17.0	16.9	16.9	16.5	17.5	18.6
	Threshold Shift Rates - DOD Civilian	STS	13.8	14.4	16.1	16.8	15.5	14.8	14.7	13.7
		TTS	4.5	5.0	5.2	5.8	5.5	5.1	4.7	4.2
		PTS	8.9	8.8	10.1	10.2	9.2	8.8	8.7	8.1
	STS Follow-Up Test Compliance	DOD - All Service Members	35.2	37.1	34.4	38.1	42.7	43.7	47.7	48.1
		DOD - AD Service Members	49.5	54.9	58.6	61.3	68.8	72.2	73.9	73.5
		DOD - NG Service Members	8.3	10.9	11.1	13.6	19.2	22.4	29.5	33.5
		DOD - Reserve Service Members	19.6	13.9	9.8	11.7	13.3	14.8	17.9	18.1
		DOD - Civilian	52.1	59.3	62.7	66.6	69.8	72.0	74.3	75.9
	Hearing Impairment Rates	DOD - All Service Members	18.2	17.1	16.4	15.6	15.2	14.8	14.3	14.5
		DOD - AD Service Members	16.6	15.7	14.9	13.8	13.5	13.0	12.5	12.9
		DOD - NG Service Members	23.8	22.1	20.1	19.9	19.3	18.6	18.5	17.7
		DOD - Reserve Service Members	20.0	18.9	18.3	18.7	18.5	18.4	17.5	17.6
		DOD - Civilian	46.1	44.9	43.6	42.5	42.0	40.9	40.1	39.3
	Hearing Impairment Rates Enlisted Accessions	DOD - All Service Members	12.5	12.0	10.9	9.0	8.3	7.8	7.3	9.7
		DOD - AD Service Members	11.9	11.3	10.6	8.6	8.0	7.4	7.0	9.5
		DOD - NG Service Members	15.7	15.5	13.3	12.2	11.0	10.5	9.1	10.8
		DOD - Reserve Service Members	12.3	11.6	9.6	8.6	7.9	7.6	6.6	9.0
	VA Auditory Threshold Criteria	DOD - All Service Members	8.5	7.8	7.5	7.2	6.9	6.4	5.9	5.5
		DOD - AD Service Members	7.5	7.0	6.5	6.1	5.9	5.4	4.8	4.5
		DOD - NG Service Members	11.9	10.6	9.7	9.6	9.1	8.5	8.2	7.5
		DOD - Reserve Service Members	9.6	8.9	9.1	8.9	8.6	8.6	7.9	7.3

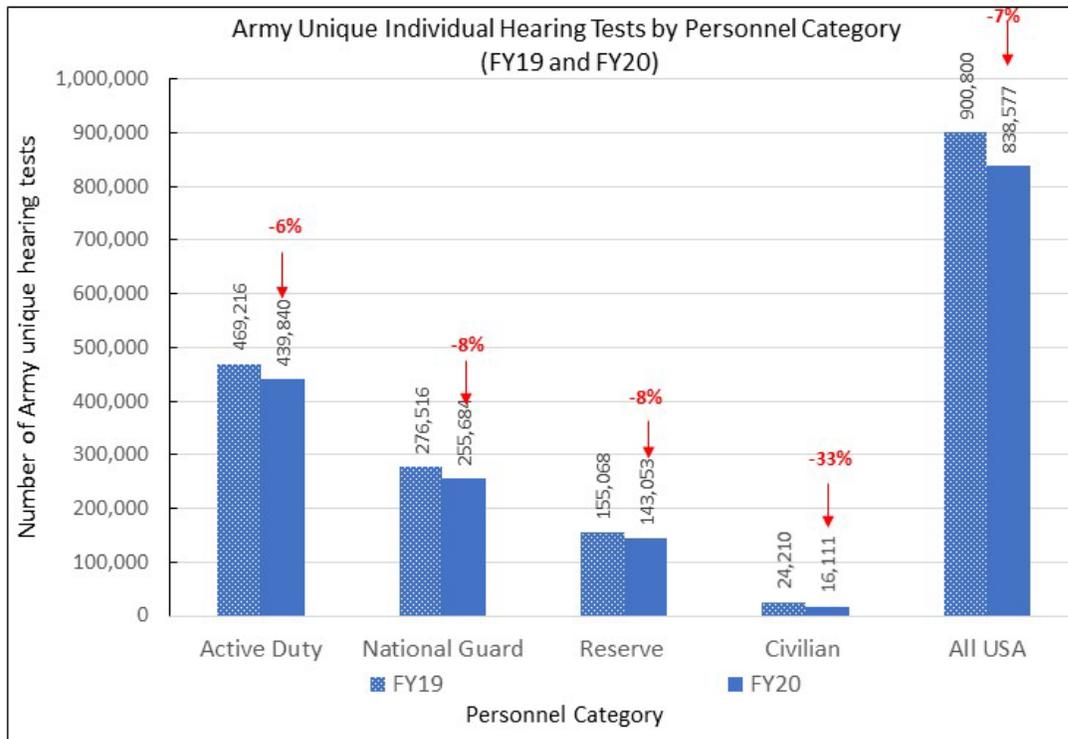
## [Appendix A: Hearing Health - Army](#)

The mission of the Army Hearing Program (AHP) is to maximize Soldier and Department of the Army (DA) noise-exposed civilian hearing and communication abilities through implementation of the components of hearing readiness, clinical and operational hearing services, and hearing conservation, thus contributing to survivability, lethality, mission effectiveness, and quality of life. All active duty Soldiers require an annual hearing readiness evaluation regardless of their noise-exposure risk. All Army Reserve (USAR) and Army National Guard (ARNG) Soldiers assigned to Table of Organization and Equipment (TOE) units or hazardously noise-exposed USAR and ARNG Soldiers assigned to Table of Distribution and Allowances (TDA) units require annual DOEHRS-HC hearing tests. Soldiers experiencing a change in hearing or other hearing-related issues, regardless of exposure, are treated as if they were at risk and receive follow-up testing, counseling, and referrals as needed. DA civilians are also enrolled in the AHP when they meet HCP exposure criteria. The following data represent the test results from all Soldiers and noise-exposed civilians who received DOEHRS-HC hearing tests in FY20. Data in this review indicate that the overall hearing health for Soldiers is good and continues to improve. The data in this review indicate the overall hearing health for noise-exposed DA civilians is only fair although essentially stable.

### [Unique Hearing Tests by Personnel Category](#)

The number of unique individual hearing tests conducted by the Army showed a decrease in all Army components and DA noise-exposed civilians during FY20 compared to FY19. There was a 7% decrease in testing for all Soldiers and a 33% decrease for DA noise-exposed civilians in FY20 compared to FY19 (Graph 13). This is thought to be influenced by limited access to hearing health services resulting from COVID-19 pandemic restrictions. Traditional audiometry conducted in test booths was limited by infection control measures for physical distancing, increased cleaning/sanitizing requirements, compliance with CDC guidance (CDC, 2003) regarding room air exchange, and reallocation of resources for pandemic efforts.

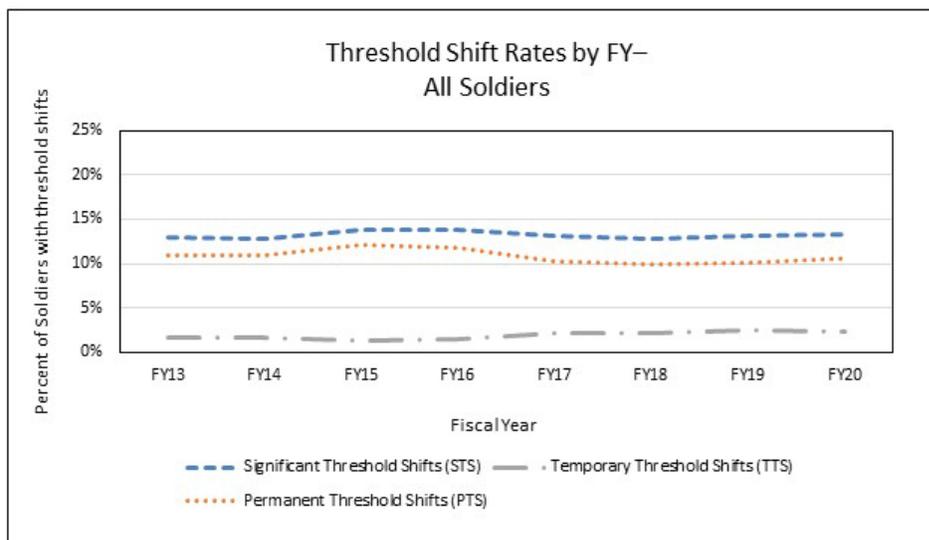
Graph 13. Army Unique Individual Hearing Tests by Personnel Category (FY19 and FY20)



### Significant Threshold Shift Rates by FY

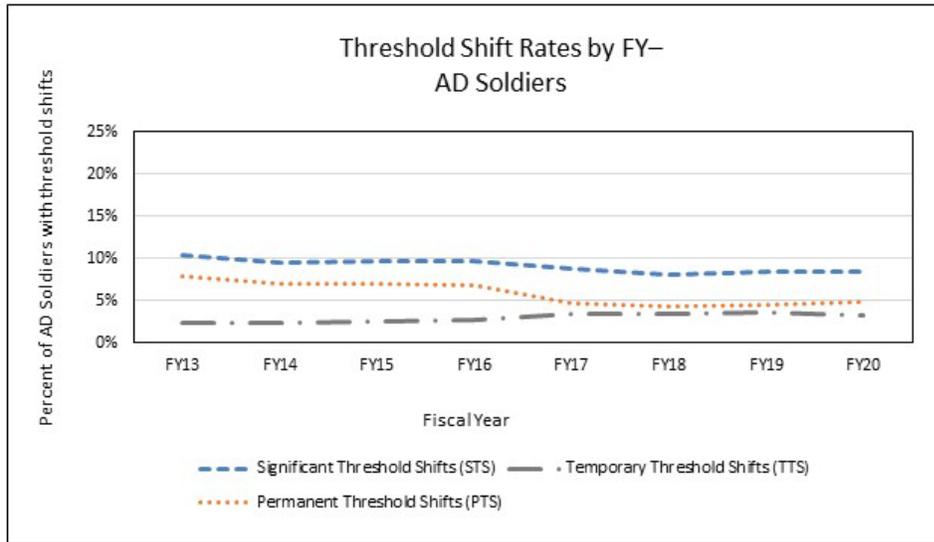
In FY20, all Soldier (all Army components combined) STS, TTS, and PTS rates remained essentially stable compared to FY19 rates and FY13 rates (Graph 14). FY 20 Threshold shift rates for all Soldiers were 13.3% STS, 2.3% TTS, and 10.6% PTS. The accuracy of PTS and TTS are dependent upon STS follow-up testing compliance ([Graph 19](#)).

Graph 14. Threshold Shift Rates by FY - All Soldiers



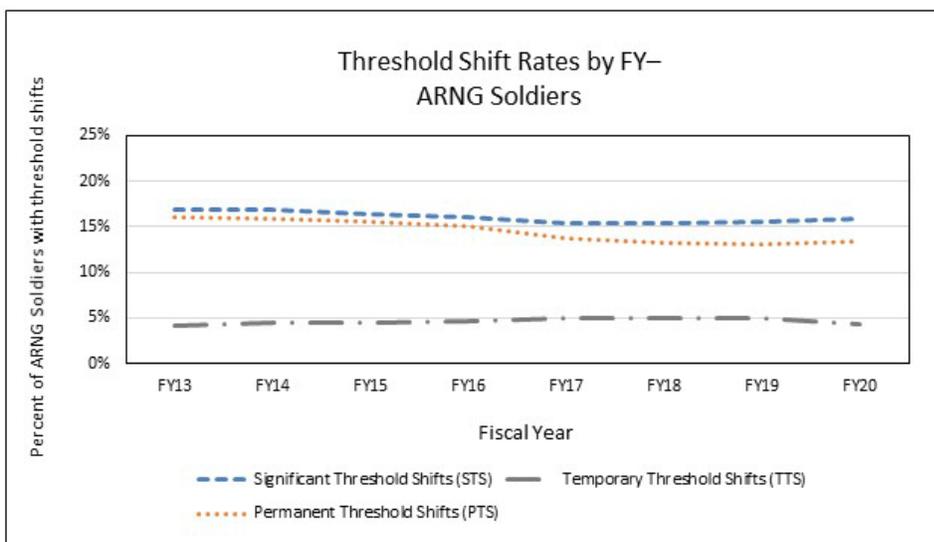
AD Soldier rates remained stable at 8.4% STS, 3.2% TTS, and 4.9% PTS in FY20 (Graph 15) when compared to FY19 rates. Accuracy of PTS and TTS rate can be dependent upon STS follow-up testing compliance ([Graph 19](#)). Improved STS follow-up testing for AD Soldiers (compared to USAR and ARNG Soldiers) show about half of all STS identified are found to be PTS.

Graph 15. Threshold Shift Rates by FY - AD Soldiers



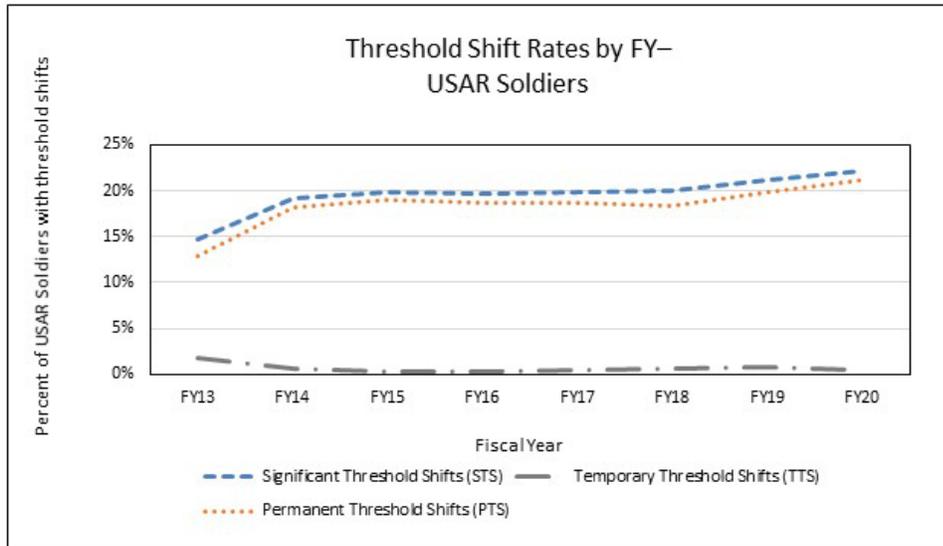
ARNG Soldier rates show a slight decrease in PTS since FY13 with FY20 rates at 15.8% STS, 1.9% TTS, and 13.4% PTS (Graph 16). STS and PTS rates remain high possibly due to a lack of STS follow-up testing compliance. Failure to conduct STS follow-up testing causes a given STS to be identified repeatedly until follow-up testing is completed and prevents the accurate identification of TTS vs. PTS.

Graph 16. Threshold Shift Rates by FY - ARNG Soldiers



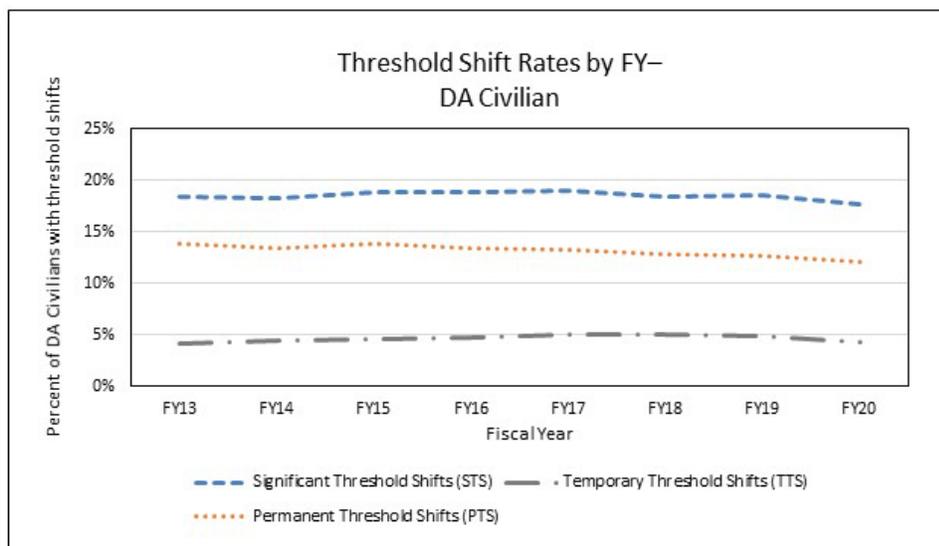
USAR Soldier rates for FY20 are 22.2% STS, 0.5% TTS, and 21.1% PTS (Graph 17). Both STS and PTS rates remain high possibly due to a lack of STS follow-up testing. Failure to conduct STS follow-up testing prevents the accurate identification of TTS vs. PTS.

Graph 17. Threshold Shift Rates by FY - USAR Soldiers



Overall, civilian threshold shift rates remain high but stable from FY19 to FY20 at 17.7% STS, 4.4% TTS, and 12.0% PTS for FY20 with only negligible to marginal improvements for threshold shifts from FY13 to FY20 (Graph 18).

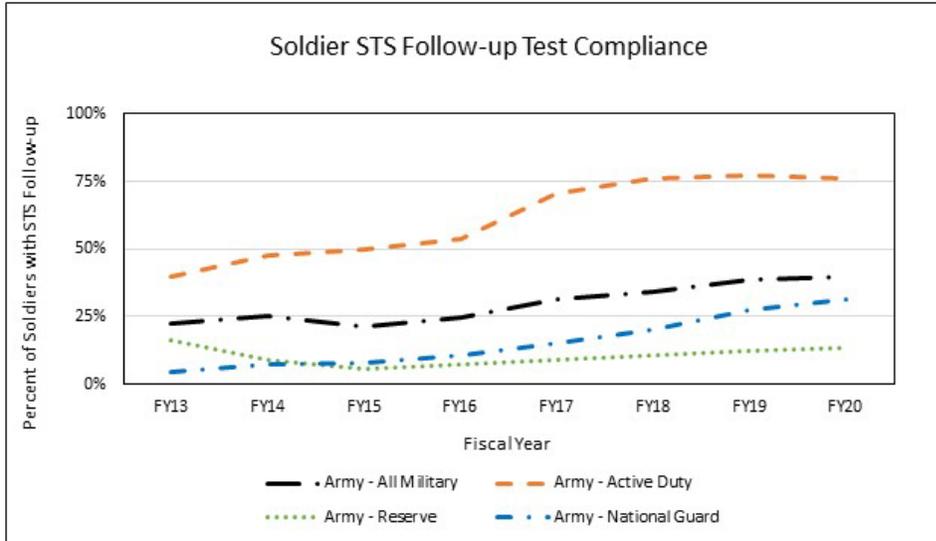
Graph 18. Threshold Shift Rates by FY - DA Civilian



## Significant Threshold Shift Follow-up Test Compliance

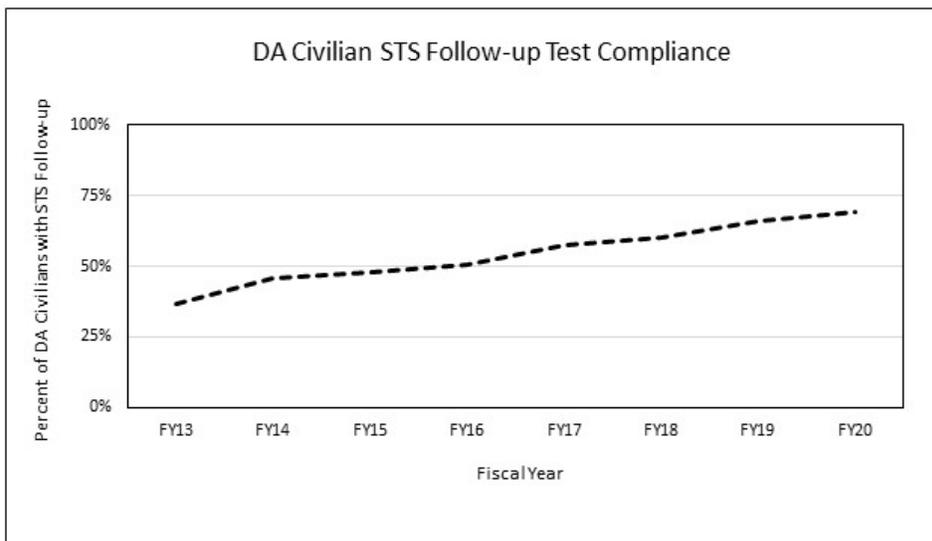
Follow-up test compliance (required for STS) showed continued improvement for AD and ARNG Soldiers since FY13. Overall follow-up test compliance (all Soldiers) improved from 22.6% in FY13 to 39.8% in FY20 and remained stable from FY19 to FY20. Failure to conduct follow-up testing will: 1) Elevate STS rates as the initial STS will be identified every year until follow-up testing is performed and a new baseline is established, if required, and 2) Prevent accurate identification of PTS and TTS, i.e., increase PTS and decrease TTS rates.

Graph 19. Soldier STS Follow-up Test Compliance



Civilian follow-up test compliance (required for STS) continues to show increased compliance rates since FY13. Overall compliance has increased from 36.7% in FY13 to 69.4% in FY20 (Graph 20).

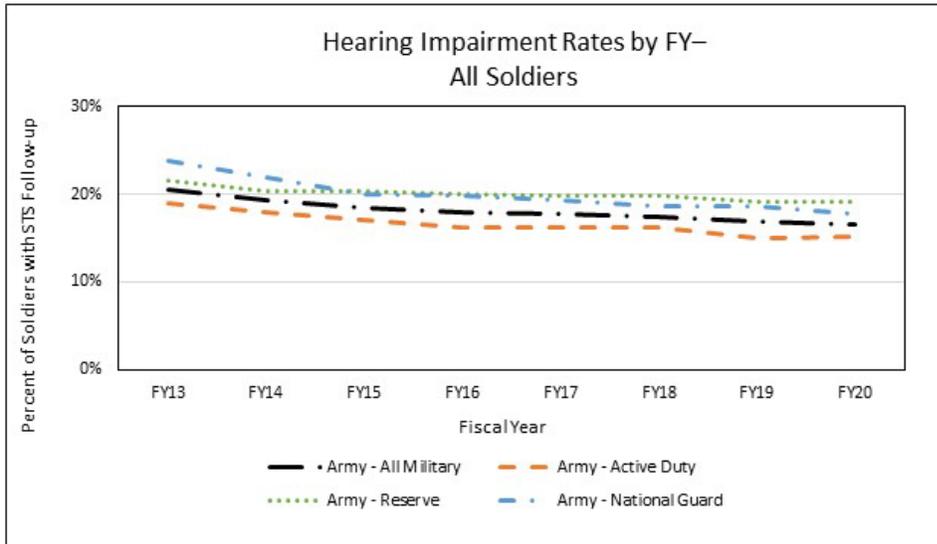
Graph 20. DA Civilian STS Follow-up Test Compliance



## Hearing Impairment

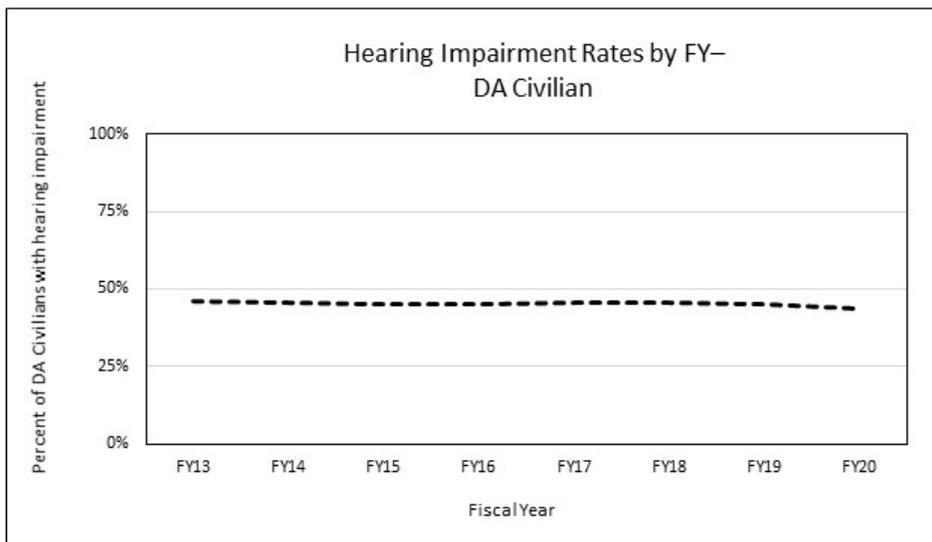
The percentage of all Soldiers with hearing impairment shows a slight decrease for all Army components combined and individually since FY13. The percentage of all Soldiers with hearing impairment decreased from 20.6% in FY13 to 16.6% in FY20 for all Army components combined. Rates of hearing loss for Soldiers for Army components combined and individually remained stable from FY19 to FY20.

Graph 21. Hearing Impairment Rates by FY – All Soldiers



The percent of noise-exposed DA civilians with hearing impairment remains high with only marginal improvement from FY13 to FY20. The percent of noise-exposed DA civilians with hearing impairment decreased from 45.9% in FY13 to 43.8% in FY20.

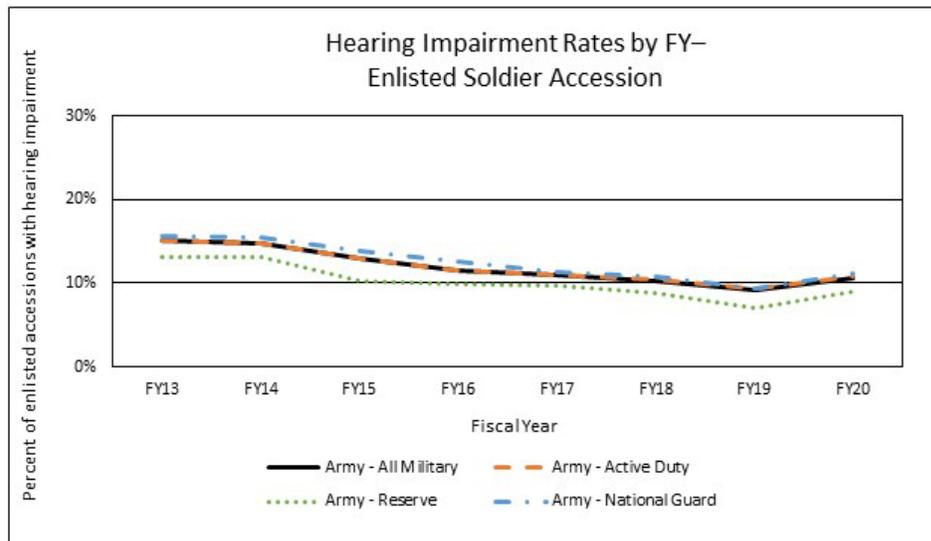
Graph 22. Hearing Impairment Rates by FY – DA Civilian



## Hearing Impairment – Enlisted Soldier Accession Data

All Soldiers receive a hearing test as part of basic training at their entrance to military service.<sup>2</sup> Those ‘reference audiograms’ are used to determine the percent of new recruits who come into the Army with hearing impairment, i.e., hearing worse than 25 dB at any test frequency. The percent of enlisted Soldier accessions with hearing impairment decreased from 15.1% in FY13 to 10.7% in FY20 for Soldiers for all Army components combined (Graph 23). Even so, there was a marginal increase in enlisted Soldier hearing impairment (all Army components combined) in FY20 (10.7%) compared to FY19 (9.1%). This slight reversal in the downward trend of hearing impaired Soldier recruits is present across all components, that is, AD, ARNG, and USAR.

Graph 23. Hearing Impairment Rates by FY – Enlisted Soldier Accessions

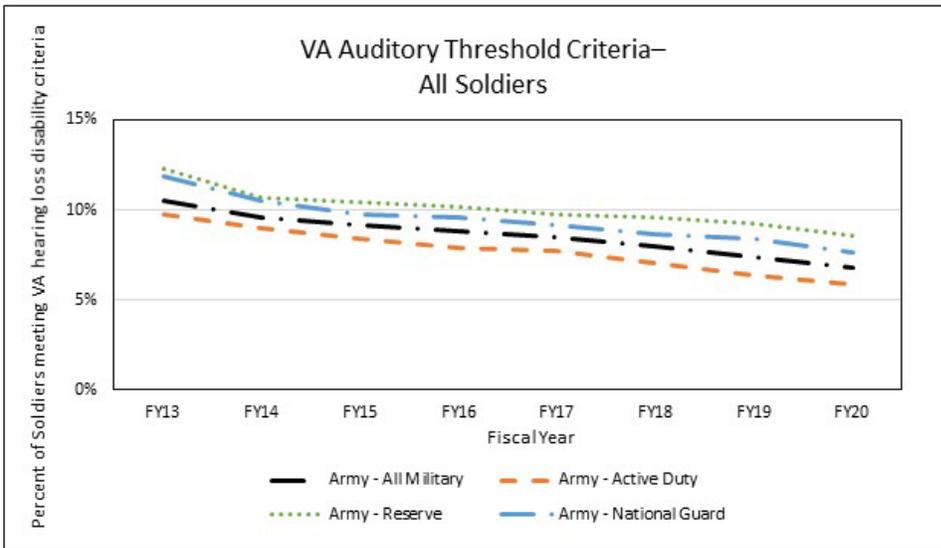


## VA Auditory Threshold Disability Criteria

The percent of Soldiers meeting established VA auditory threshold disability criteria continues to decrease for all Army components. The percentage of Soldiers potentially eligible for VBA service-connected disability compensation for hearing loss decreased from 10.5% in FY13 to 6.8% in FY20 for all Army components combined (Graph 24). The decrease in eligibility for VBA disability benefits for hearing loss based on auditory threshold disability criteria is consistent for all Army components (AD, USAR, ARNG) from FY13 to FY20.z

<sup>2</sup> The military services refer to training at the onset of military service as Basic Combat Training (Army), Basic Training (Navy), Recruit Training (Marine Corps), and Basic Military Training (Air Force). For the purposes of this report the initial training of Service members at entry to military service will be referred to as basic training.

Graph 24. VA Auditory Threshold Disability Criteria – All Soldiers



**Table 3. Data Summary – Army**

Source: DOEHS-HC DR

Service	Chart Title	Category	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
USA	Threshold Shift Rates - All Soldiers	STS	12.9	12.8	13.9	13.7	13.0	12.8	13.1	13.3
		TTS	1.7	1.7	1.4	1.5	2.1	0.2	2.5	2.3
		PTS	10.9	10.9	12.1	11.8	10.3	10.0	10.1	10.6
	Threshold Shift Rates - AD Soldiers	STS	10.4	9.6	9.7	9.7	8.7	8.0	8.3	8.4
		TTS	2.3	2.4	2.5	2.7	3.4	3.4	3.5	3.2
		PTS	7.9	6.9	7.0	6.8	4.7	4.3	4.4	4.9
	Threshold Shift Rates - ARNG Soldiers	STS	16.9	16.9	16.4	16.1	15.5	15.3	15.6	15.8
		TTS	0.5	0.6	0.4	0.6	1.1	1.5	2.0	1.9
		PTS	16.0	15.9	15.6	15.1	13.7	13.2	13.0	13.4
	Threshold Shift Rates - USAR Soldiers	STS	14.8	19.1	19.9	19.6	19.9	20.0	21.2	22.2
		TTS	1.9	0.7	0.4	0.3	0.5	0.6	0.7	0.5
		PTS	12.9	18.2	19.0	18.7	18.7	18.4	19.8	21.1
	Threshold Shift Rates -DA Civilians	STS	18.5	18.3	18.9	18.8	19.1	18.4	18.6	17.7
		TTS	4.1	4.4	4.5	4.7	5.0	5.0	4.9	4.4
		PTS	13.9	13.3	13.8	13.4	13.2	12.9	12.6	12.0
	STS Follow-Up Test Compliance	All Soldiers	22.6	25.0	21.4	24.4	31.4	34.1	38.4	39.8
		AD Soldiers	40.0	47.5	50.0	53.6	70.4	76.1	77.5	76.1
		ARNG Soldiers	4.4	7.2	7.6	10.4	15.3	20.3	27.2	31.5
		USAR Soldiers	16.1	9.2	5.9	7.6	9.2	10.6	12.4	13.2
		DA Civilians	36.7	45.5	48.0	50.8	57.4	60.0	65.8	69.4
	Hearing Impaired	All Soldiers	20.6	19.3	18.5	18.0	17.7	17.5	16.8	16.6
		AD Soldiers	19.0	17.9	17.1	16.2	16.2	16.1	15.1	15.2
		ARNG Soldiers	23.7	21.9	20.0	19.8	19.3	18.6	18.6	17.8
		USAR Soldiers	21.6	20.3	20.4	20.1	19.9	19.9	19.2	19.2
		DA Civilians	45.9	45.6	45.2	45.1	45.7	45.6	44.9	43.8
	Hearing Impaired - Enlisted Soldier Accessions	All Soldiers	15.1	14.8	12.9	11.6	10.9	10.3	9.1	10.7
		AD Soldiers	15.2	14.7	13.0	11.4	10.9	10.4	9.4	10.8
		ARNG Soldiers	15.7	15.5	13.9	12.6	11.4	10.9	9.4	11.2
		USAR Soldiers	13.1	13.2	10.2	9.9	9.7	8.7	7.1	9.1
	VA Auditory Threshold Criteria -All Soldiers	All Soldiers	10.5	9.6	9.2	8.8	8.5	8.0	7.4	6.8
		AD Soldiers	9.7	9.0	8.4	7.9	7.7	7.1	6.3	5.8
		ARNG Soldiers	11.9	10.6	9.7	9.6	9.1	8.6	8.4	7.7
		USAR Soldiers	12.3	10.7	10.4	10.2	9.7	9.6	9.2	8.5

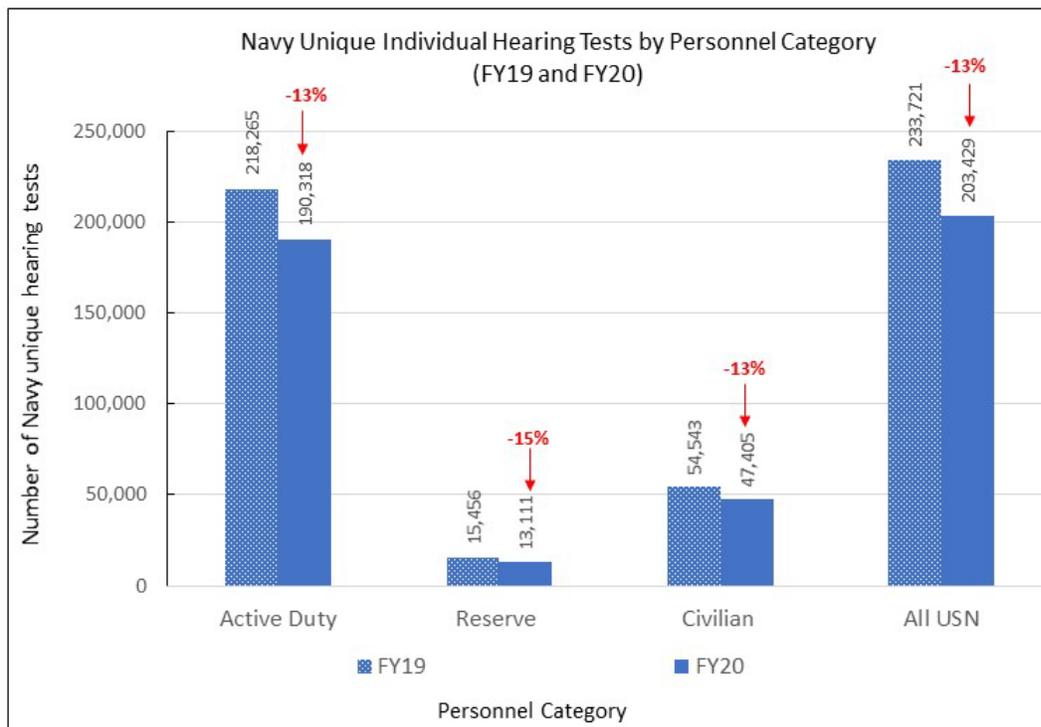
## Appendix B: Hearing Health – Navy

The goal of the Department of Navy’s Hearing Conservation and Noise Abatement initiative is to proactively prevent noise-induced hearing loss and ensure optimal auditory readiness. Sailors and Department of the Navy (DON) noise-exposed civilians are enrolled in the HCP. The following data represent the test results from all Sailors and noise-exposed civilians who received audiometric testing.

### Unique Individual Hearing Tests by Personnel Category

The number of unique hearing tests by the Navy showed a decrease in all Navy components and DON noise-exposed civilians during FY20 compared to FY19. Overall, there was a 13% decrease in testing for all Sailors and a 13% decrease for noise-exposed civilians in FY 20 compared to FY19 (Graph 25). This decrease may be caused by limited access to hearing health services due to COVID-19 pandemic restrictions. Traditional audiometry conducted in test booths was limited by infection control measures for physical distancing, increased cleaning/sanitizing requirements, compliance with CDC guidance (CDC, 2003) regarding room air exchange, and reallocation of resources for pandemic efforts.

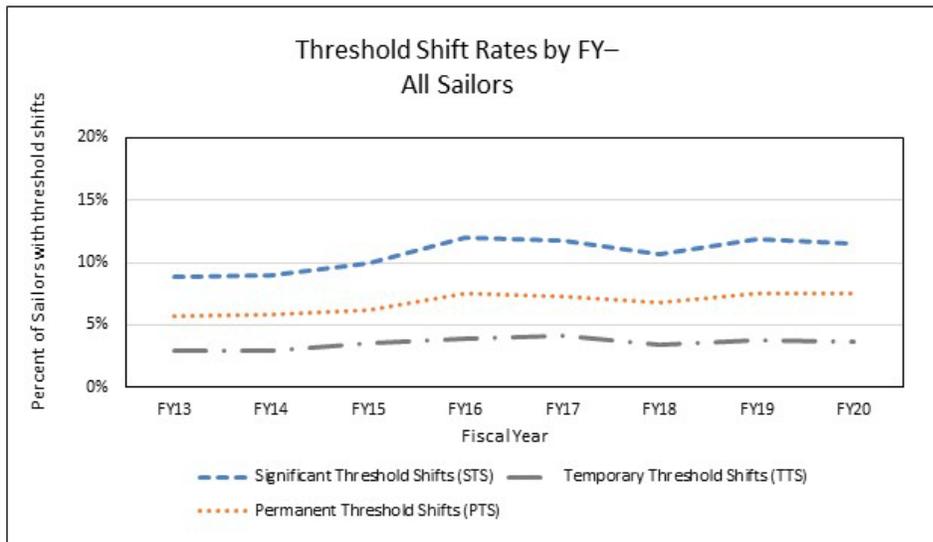
Graph 25. Navy Unique Individual Hearing Tests by Personnel Category (FY19 and FY20)



## Significant Threshold Shift Rates by FY

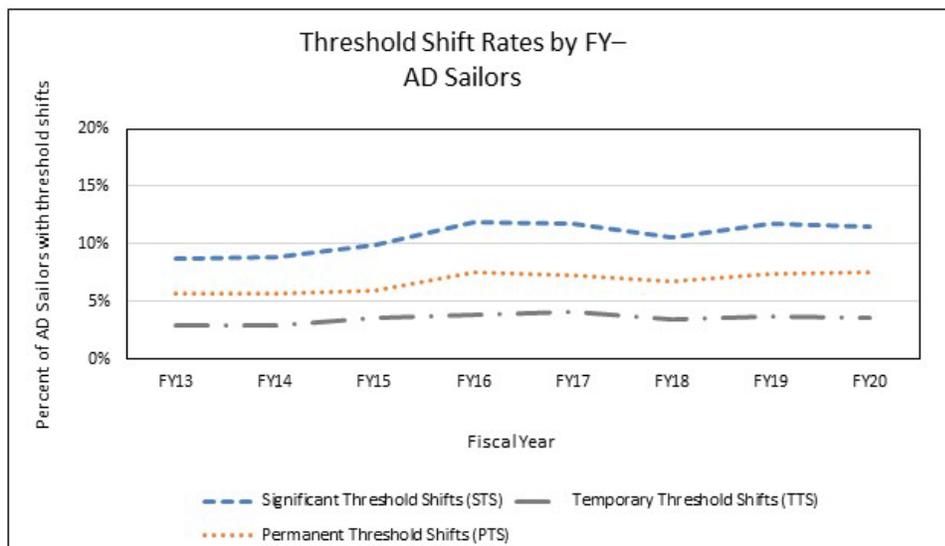
In FY20, Sailor STS, TTS, and PTS rates remained essentially stable when compared to FY19 STS, TTS, and PTS rates for all Navy components. Threshold shift rates for all Sailors show 11.6% STS, 3.7% TTS, and 7.6% PTS rates in FY20 (Graph 26).

Graph 26. Threshold Shift Rates by FY – All Sailors



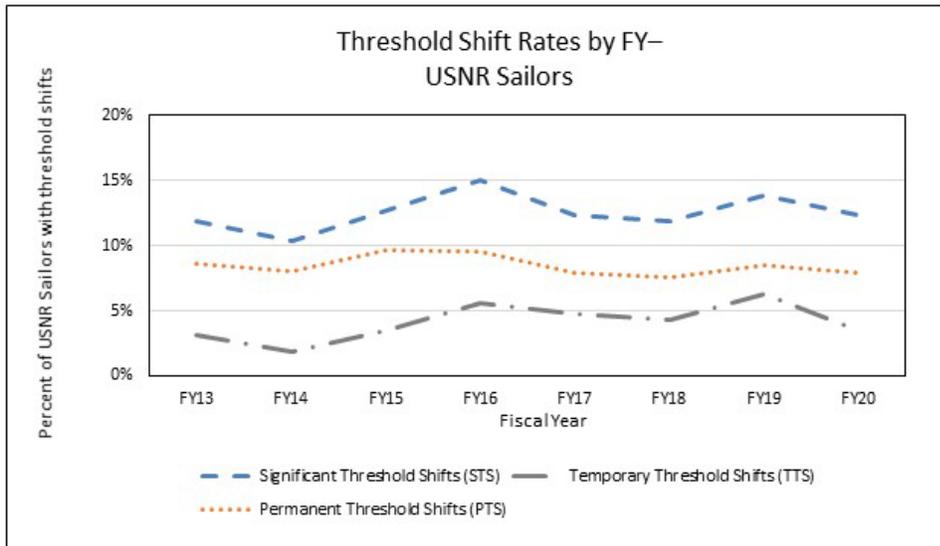
AD Sailor threshold shift rates are generally stable from FY19 to FY20. Threshold shift rates for AD Sailors indicate an 11.5% STS, 3.6% for TTS, and 7.5% PTS rate in FY20 (Graph 27).

Graph 27. Threshold Shift Rates by FY - AD Sailors



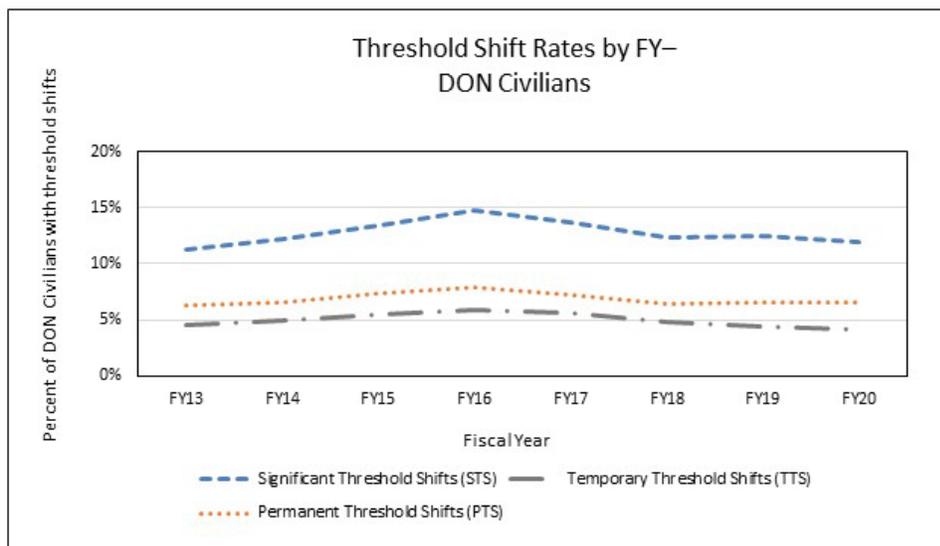
Navy Reserve (USNR) Sailor threshold shift rates for FY20 are: 12.3% STS, 3.5% TTS, and 7.9% PTS. STS rates remain high possibly due to lack of STS follow-up testing. Failure to conduct STS follow-up testing prevents the accurate identification of TTS vs. PTS. It should also be noted that threshold shift rates for USNR Sailors appear to fluctuate from FY13 to FY20. As well, there is a drop in STS and TTS from FY19 to FY20.

Graph 28. Threshold Shift Rates by FY - USNR Sailors



DON noise-exposed civilian STS and PTS rates remain stable in FY20 compared to FY19. DON noise-exposed civilian rates for FY20 are: 12.0% STS, 6.5% TTS, and 4.2% PTS (Graph 29). Improved STS follow-up testing for noise-exposed civilians (Graph 31) shows that about half of all STS identified are found to be PTS.

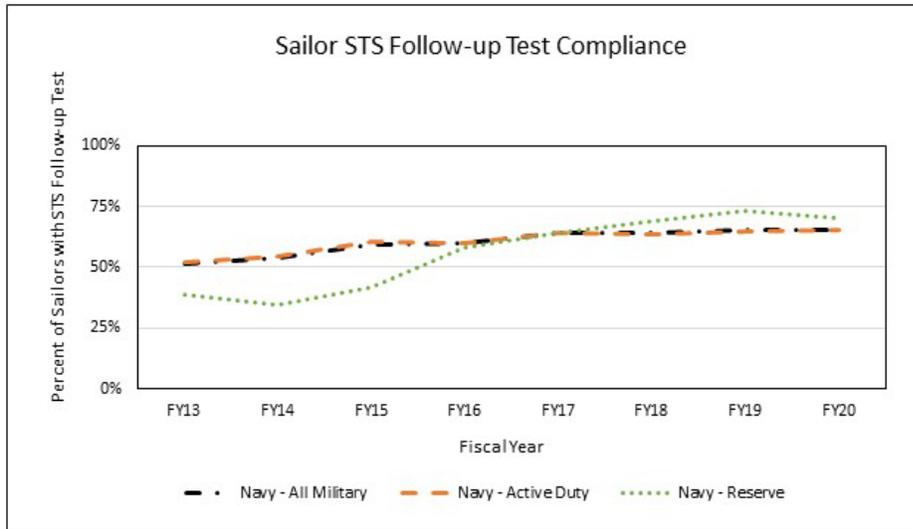
Graph 29. Threshold Shift Rates by FY- DON Civilian



## Significant Threshold Shift Follow-up Compliance

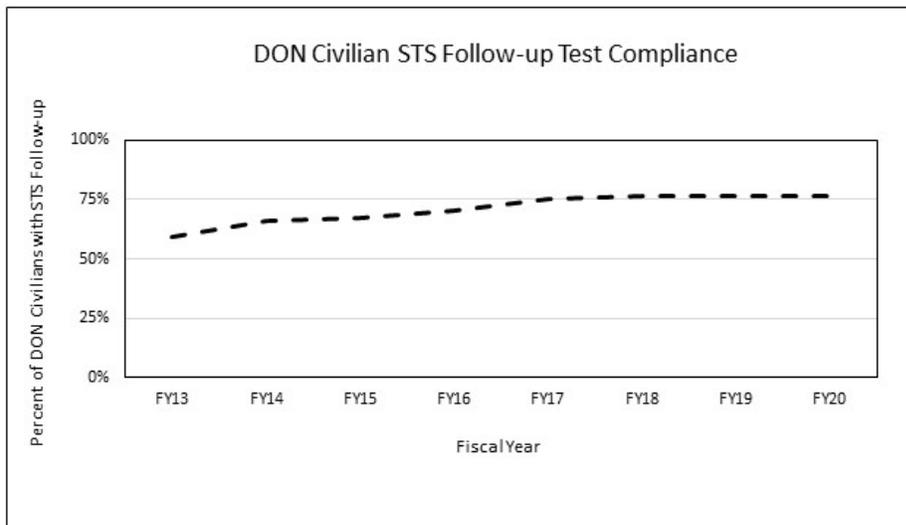
The STS follow-up testing showed marginal improvement in FY20 (Graph 30) when compared to FY19 for Sailors for all components (AD and USNR). Overall compliance for follow-up testing (all components) increased from 51.3% in FY13 to 65.6% in FY20. Compliance in the USNR shows increased compliance from 28.5% in FY13 to 70.2% in FY20. AD compliance remained essentially stable with 64.6% in FY19 compared to 65.3% in FY 20.

Graph 30. Sailor STS Follow-up Test Compliance



DON noise-exposed civilian STS follow-up test compliance is consistent with FY19 STS follow-up test compliance. However, overall compliance improved from 59.1% in FY13 to 76.7% in FY20 (Graph 31).

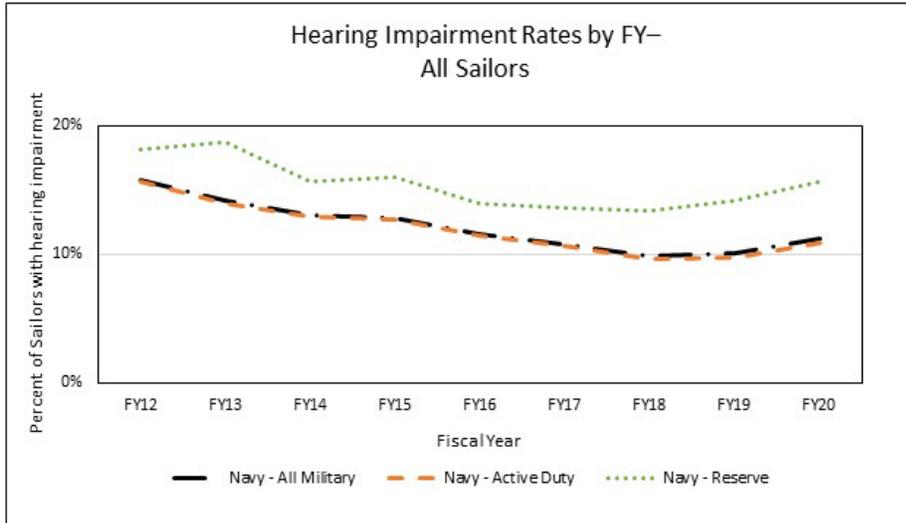
Graph 31. DON Civilian STS Follow-up Test Compliance



## Hearing Impairment

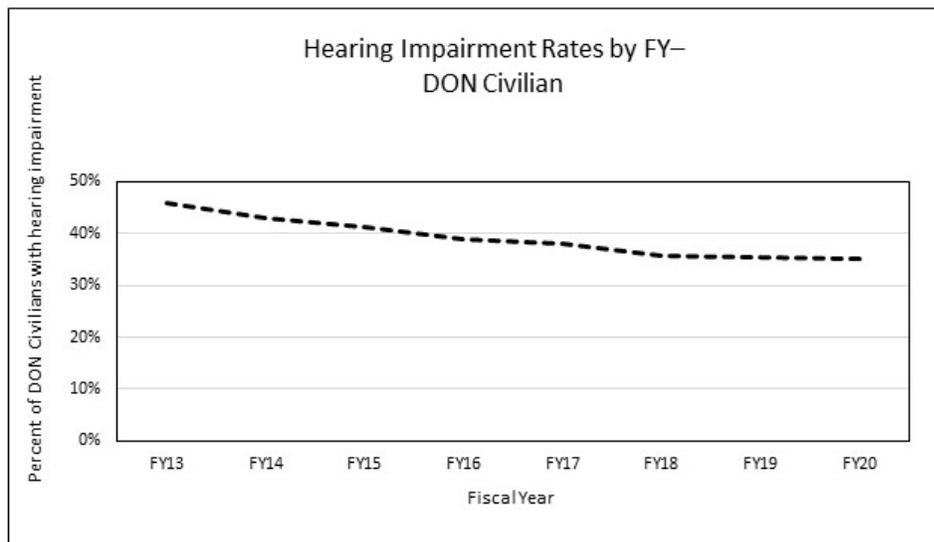
The percent of all Sailors with hearing impairment is 11.2% in FY20 compared to 10.1% in FY19, which is a slight increase. Sailors with hearing impairment decreased from 14.2% in FY13 to 11.2% in FY20 (Graph 32). Sailors with normal hearing thresholds in FY20 was 88.8%.

Graph 32. Hearing Impairment Rates by FY - All Sailors



The percent of DON noise-exposed civilians with hearing impairment is high but has decreased over the past several years. Data indicate that 64.8% of DON noise-exposed civilians have normal hearing in FY20. The percent of DON noise-exposed civilians with hearing impairment decreased from 45.9% in FY13 to 35.2% in FY20 with the percent of DON hearing impaired noise-exposed civilians remaining stable from FY19 to FY20.

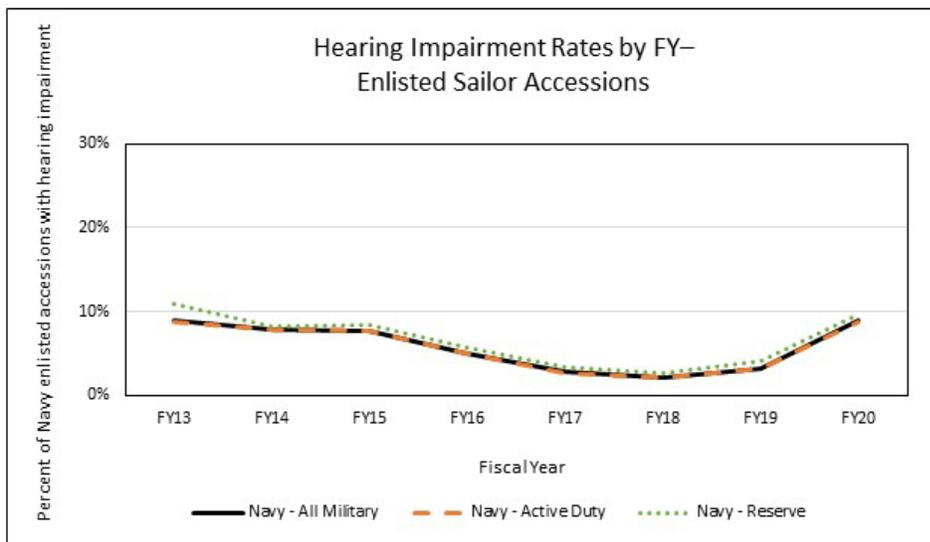
Graph 33. Hearing Impairment Rates by FY – DON Civilian



## Hearing Impairment – Enlisted Accession Data

Department of the Navy (DON) accessions receive a hearing test as part of basic training when they enter military service. Those 'reference audiograms' are used to determine the percent of all new recruits who come into the DON with hearing impairment (hearing worse than 25 dB at any test frequency). The percent of enlisted sailor accessions with hearing impairment for all Navy components, shows a large increase to 8.9% in FY20 compared to 3.1% in FY19 (Graph 34). The percent of USNR enlisted sailor accessions with hearing impairment decreased from 11.0% in FY13 to 9.7% in FY20. In FY20, 91.1% of all enlisted sailor accessions had normal hearing. The increase in FY20 compared to FY19 may be due to a change in guidance allowing for enlistment hearing waivers

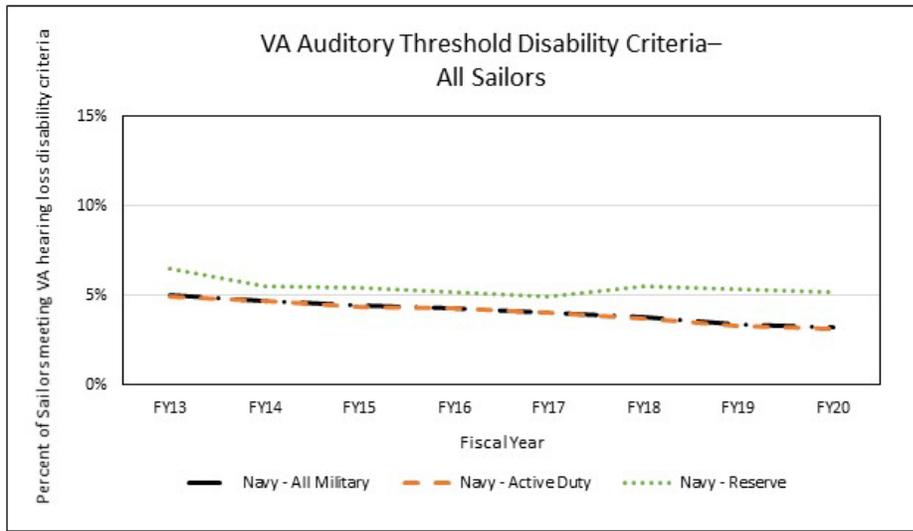
Graph 34. Hearing Impairment Rates by FY - Enlisted Sailor Accessions



## VA Auditory Threshold Disability Criteria

The percent of Sailors meeting established VA auditory threshold disability criteria decreased only a negligible amount for all Navy components combined and separate over the past several years. The percentage of Sailors (all components combined) potentially eligible for VBA service-connected disability compensation for hearing loss decreased from 5.0% in FY13 to 3.3% in FY20 (Graph 35); however, the percent of Sailors remained stable from FY19 to FY20.

Graph 35. VA Auditory Threshold Disability Criteria – All Sailors



[Table 4. Data Summary – Navy](#)

Source: DOEHS-HC DR

Servie	Chart Title	Category	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
USN	Threshold Shift Rates - All Sailors	STS	8.8	9.0	10.0	12.0	11.8	10.7	11.9	11.6
		TTS	2.9	2.9	3.6	3.9	4.1	3.4	3.8	3.7
		PTS	5.7	5.8	6.1	7.6	7.3	6.8	7.5	7.6
	Threshold Shift Rates - AD Sailors	STS	8.7	8.9	9.9	11.9	11.8	10.6	11.7	11.5
		TTS	2.9	2.9	3.6	3.9	4.1	3.4	3.7	3.6
		PTS	5.6	5.7	6.0	7.5	7.3	6.7	7.5	7.5
	Threshold Shift Rates - USNR Sailors	STS	11.9	10.3	12.7	15.0	12.4	11.8	13.8	12.3
		TTS	3.1	1.8	3.5	5.5	4.7	4.3	6.2	3.5
		PTS	8.7	8.1	9.6	9.6	8.0	7.5	8.5	7.9
	Threshold Shift Rates - DON Civilians	STS	11.3	12.2	13.4	114.7	13.6	12.4	12.5	12.0
		TTS	4.6	5.0	5.5	5.9	5.6	4.9	4.4	4.2
		PTS	6.3	6.6	7.4	7.9	7.2	6.4	6.6	6.5
	STS Follow-Up Test Compliance	ALL Sailors	51.3	53.8	59.5	60.0	64.1	64.0	65.2	65.6
		AD Sailors	51.9	54.4	60.3	60.1	64.1	63.8	64.6	65.3
		USNR Sailors	38.5	34.6	41.8	58.0	64.2	68.8	73.5	70.2
		DON Civilians	59.1	65.8	67.2	70.4	75.4	76.4	76.5	76.7
	Hearing Impaired	ALL Sailors	14.2	13.1	12.9	11.6	10.8	9.8	10.1	11.2
		AD Sailors	14.0	12.9	12.7	11.5	10.6	9.6	9.8	10.9
		USNR Sailors	18.7	15.7	15.9	14.0	13.6	13.4	14.2	15.7
		DON Civilians	45.9	43.1	41.1	39.1	37.9	35.9	35.5	35.2
	Hearing Impaired - Enlisted Sailor Accessions	ALL Sailors	8.9	7.9	7.7	5.1	2.8	2.2	3.3	8.9
		AD Sailors	8.8	7.8	7.7	5.0	2.7	2.2	3.2	8.9
		USNR Sailors	11.0	8.2	8.4	5.8	3.4	2.7	4.1	9.7
	VA Auditory Threshold Criteria	ALL Sailors	5.0	4.7	4.5	4.3	4.1	3.8	3.4	3.3
		AD Sailors	5.0	4.7	4.4	4.3	4.0	3.7	3.3	3.1
		USNR Sailors	6.5	5.5	5.4	5.2	4.9	5.5	5.3	5.2

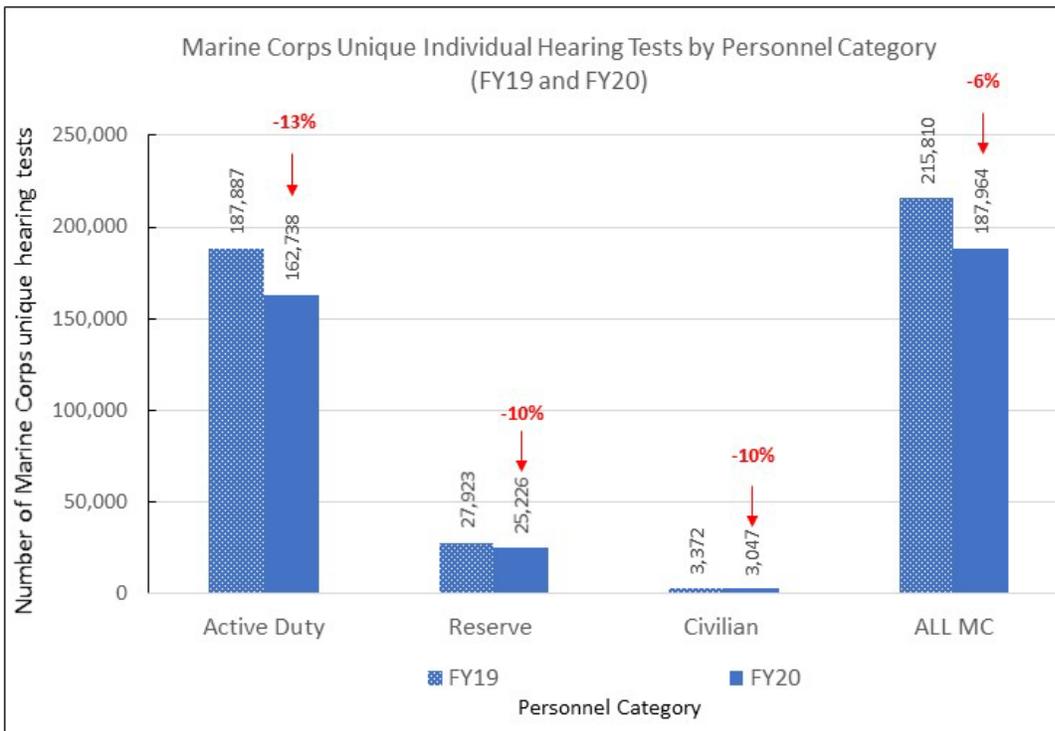
## Appendix C: Hearing Health – Marine Corps

The goal of the Department of Navy’s Hearing Conservation and Noise Abatement initiative is to proactively prevent noise-induced hearing loss and ensure optimal auditory readiness for Marines. The United States Marine Corps (USMC) considers all Marines noise-exposed and are enrolled in the HCP. The USMC civilians are enrolled in the HCP based on their individual noise exposure.

### Unique Hearing Tests by Personnel Category (FY19 and FY20)

The number of USMC unique hearing tests showed a decrease in all components and for USMC civilians during FY20 compared to FY19. Overall, there was a 6% decrease in testing for all Marines and a 10% decrease for USMC noise-exposed civilian personnel in FY20 compared to FY19 (Graph 36). This decrease may be caused by limited access to hearing health services due to COVID-19 pandemic restrictions. Traditional audiometry conducted in test booths was limited by infection control measures for physical distancing, increased cleaning/sanitizing requirements, compliance with CDC guidance (CDC, 2003) regarding room air exchange, and reallocation of resources for pandemic efforts.

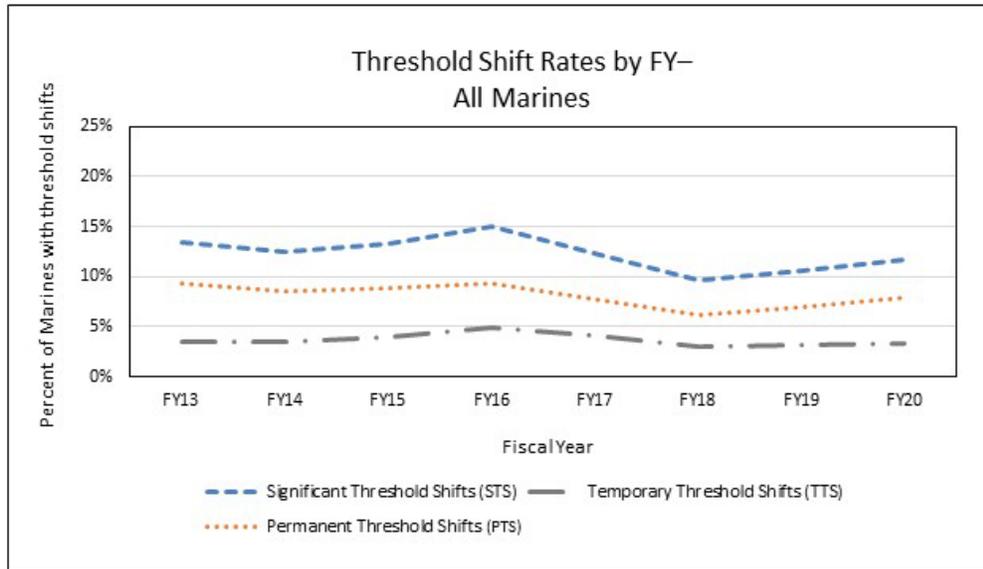
Graph 36. Marine Corps Unique Individual Hearing Tests by Personnel Category (FY19 and FY20)



### Significant Threshold Shift Rates by FY

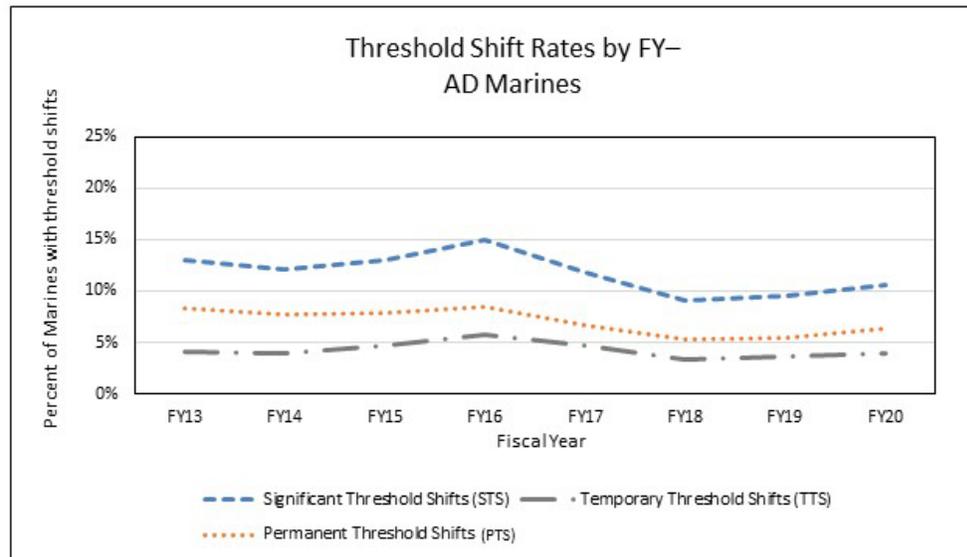
In FY20, USMC STS, TTS, and PTS show a slight increase when compared to FY19 STS, TTS, and PTS rates. Threshold shift rates for all Marines indicate 11.6% STS, 3.4% TTS, and 8.0% PTS rates in FY20 (Graph 37).

Graph 37. Threshold Shift Rates by FY - All Marines



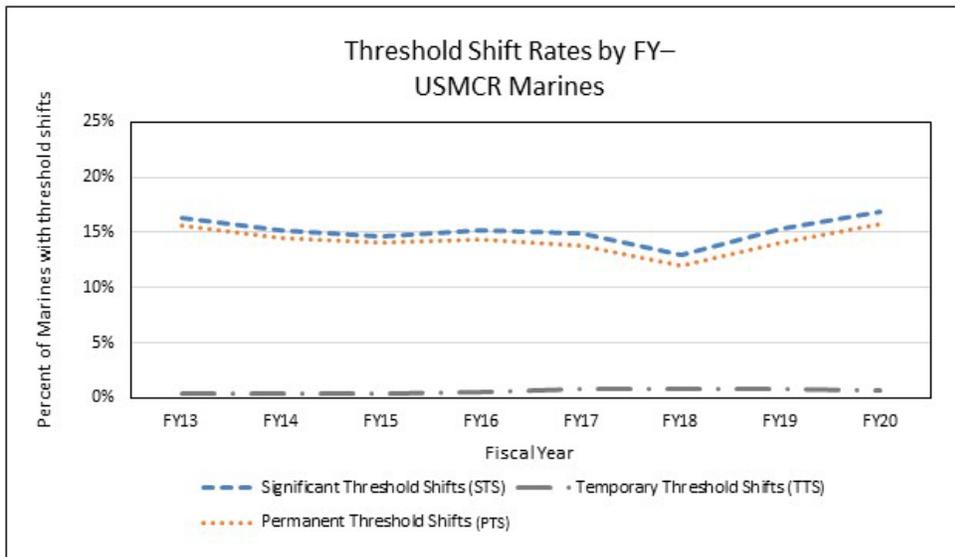
AD Marines have the lowest PTS rates of all USMC components during FY13 - FY20. This may be due to improved follow-up testing compliance as seen in Graph 41 resulting in accurate identification of PTS and TTS. Threshold shift rates for AD Marines indicate 10.5% STS, 4.0% TTS, and 6.3% PTS rates in FY20 (Graph 38).

Graph 38. Threshold Shift Rates by FY - AD Marines



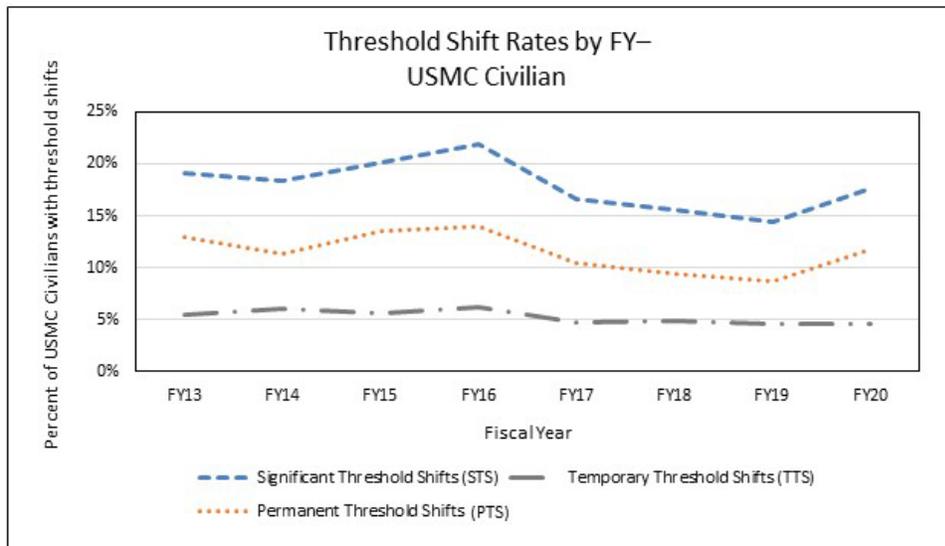
USMC Reserve (USMCR) rates for FY20 are: 16.8% STS, 0.7% TTS, and 15.8% PTS. STS and PTS rates remain high likely due lack of STS follow-up testing shown in Graph 41. Failure to conduct STS follow-up testing prevents the accurate identification of TTS vs. PTS.

Graph 39. Threshold Shift Rates by FY – USMCR Marines



USMC noise-exposed civilian STS and PTS rates show an increase in FY20 compared to FY19. USMC noise-exposed civilian rates for FY20 are: 17.7% STS, 4.75% TTS, and 11.8% PTS (Graph 40).

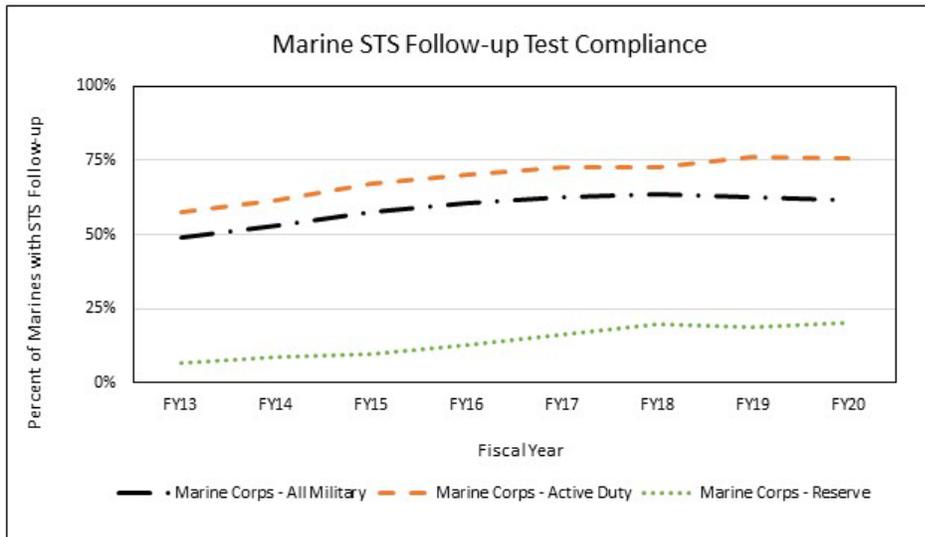
Graph 40. Threshold Shift Rates by FY – USMC Civilian



### Significant Threshold Shift Follow-up Compliance

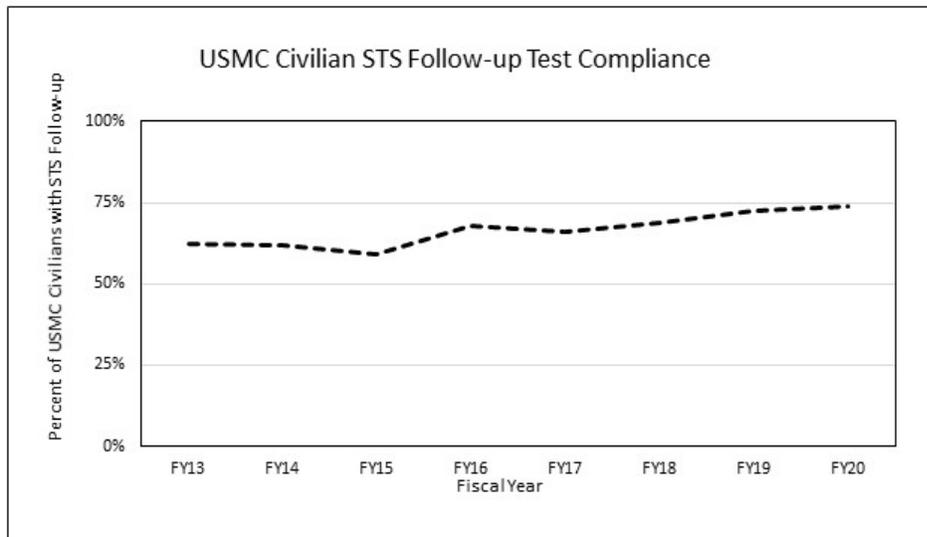
The STS follow-up testing compliance showed marginal improvement from FY19 to FY20 (Graph 41) for all individual Marine components and for all Marine components combined. Overall compliance for follow-up testing for all Marine components combined increased from 49.1% in FY13 to 61.8% in FY20. Follow-up testing compliance in the USMCR shows and increase in compliance from 6.7% in FY13 to 20.3% in FY20. AD Marine compliance increased from 57.8% in FY13 to 75.6% in FY20.

Graph 41. Marine STS Follow-up Test Compliance



USMC noise-exposed civilian STS follow-up testing compliance continued to show improvement from 62.6% in FY13 to 73.8% in FY20 (Graph 42). There was a 1.1% increase in STS follow-up testing compliance from FY19 (72.7%) to FY20 (73.8%).

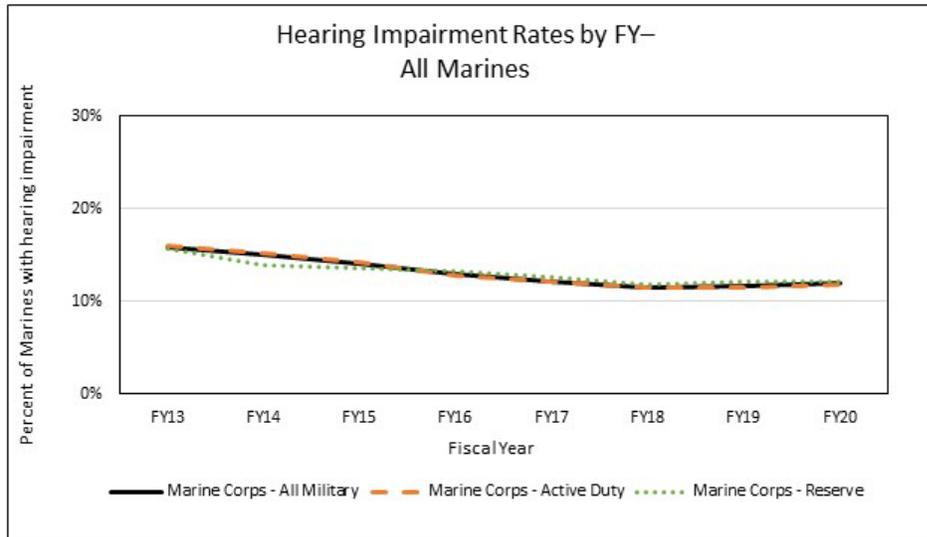
Graph 42. USMC Civilian STS Follow-up Test Compliance



## Hearing Impairment

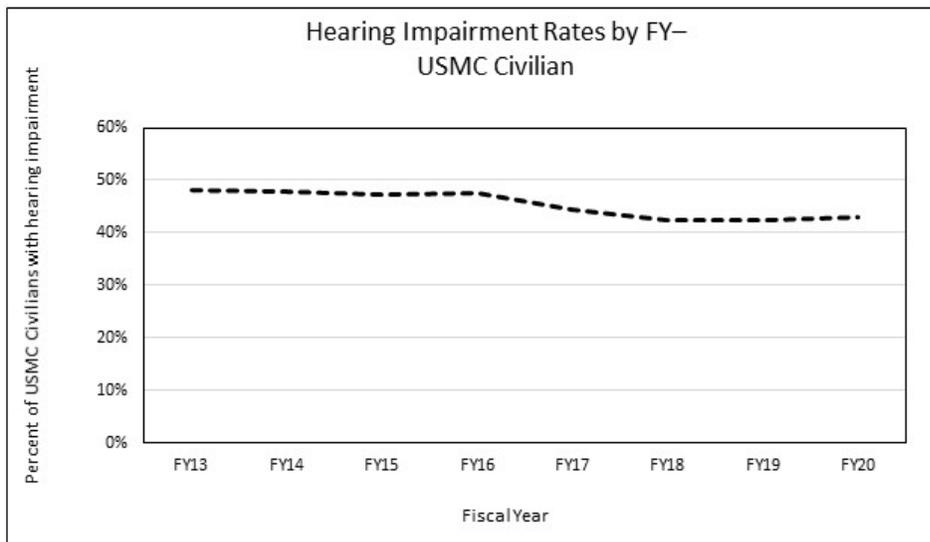
The percent of Marines with hearing impairment (for combined and individual components) remained stable from FY19 to FY20. Marines (combined components) with hearing impairment decreased from 15.9% in FY13 to 11.9% in FY20 (Graph 43). The USMCR and AD Marines, separately, had decreases in hearing impairment from FY13 to FY20. Marines (all components combined) with normal hearing thresholds in FY20 was 88.1%.

Graph 43. Hearing Impairment Rates by FY - All Marines



The percent of noise-exposed USMC noise-exposed civilians with hearing impairment is high but is decreasing. Data indicate that 57.0% of USMC noise-exposed civilians have normal hearing in FY20. The percent of USMC noise-exposed civilians with hearing impairment decreased from 48.2% in FY13 to 43.0% in FY20 (Graph 44). Hearing impairment for these civilians was stable from FY19 to FY20.

Graph 44. Hearing Impairment Rates by FY - USMC Civilian

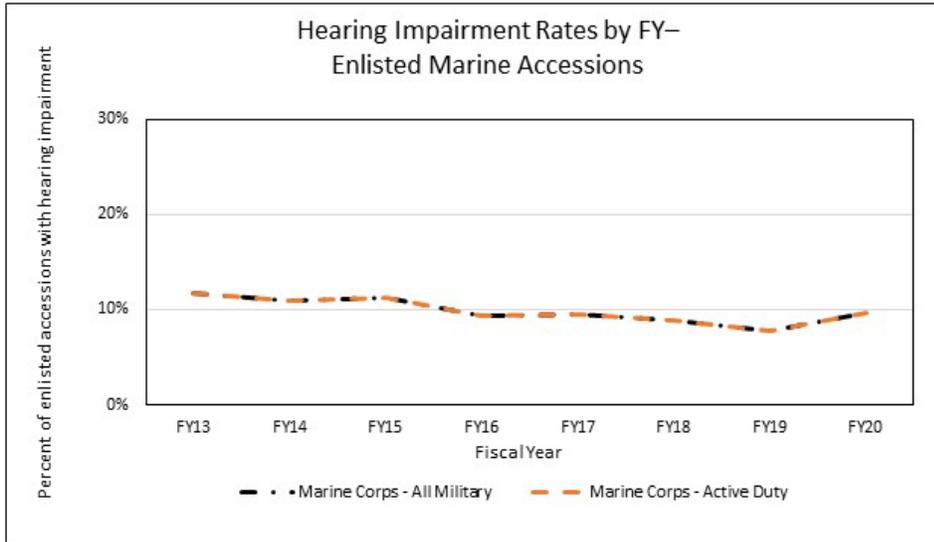


### Hearing Impairment – Enlisted Accession Data

Marines receive a hearing test as part of basic training when they enter military service. Those 'reference audiograms' are used to determine the percent of all new recruits who enter the USMC with hearing impairment (hearing worse than 25 dB at any test frequency). The percent of enlisted USMC

accessions with hearing impairment for AD show a decrease in enlisted hearing impairment of 11.8% in FY13 compared to 9.7% in FY20 (Graph 45). The percent of USMCR enlisted accessions with hearing impairment is lacking for some years and is not reported here. In FY20, 90.3% enlisted Marine accessions had normal hearing.

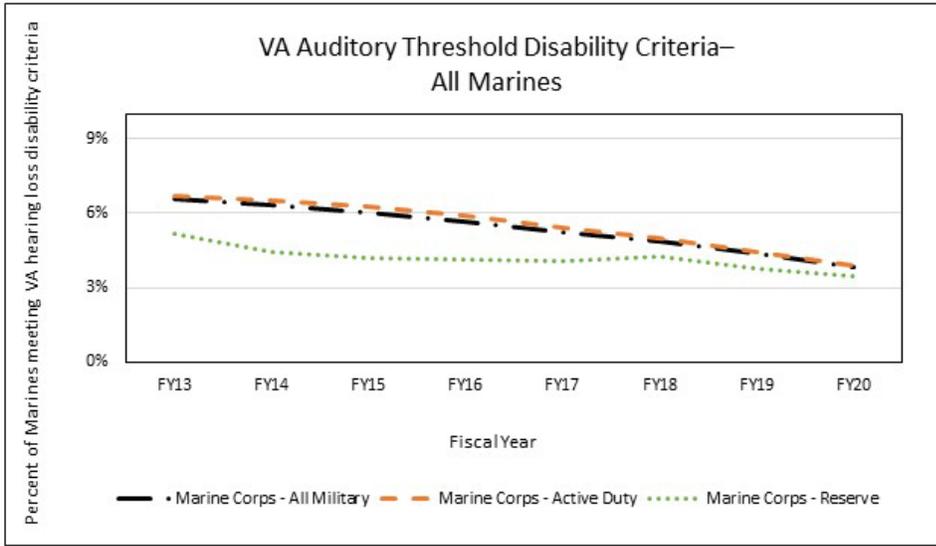
Graph 45. Hearing Impairment Rates by FY - Enlisted Marine Accessions



### [VA Auditory Threshold Disability Criteria](#)

The percent of Marines meeting established VA auditory threshold disability criteria is decreasing for all USMC components. The percentage of Marines (components combined) potentially eligible for VBA service-connected disability compensation for hearing loss decreased from 6.6% in FY13 to 3.9% in FY20 (Graph 46). There is also a trend of decreasing eligibility for VBA hearing loss disability benefits based on auditory thresholds for both AD Marines and Reserve Marines from FY13 to FY20. Also, potential eligibility for VBA disability benefits for hearing loss is stable from FY19 to FY20 for Marines (combined and individual components).

Graph 46. VA Auditory Threshold Disability Criteria - All Marines



**Table 5. Data Summary – Marine Corps**

Source: DOEHRs-HC DR

Service	Chart Title	Category	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
USMC	Threshold Shift Rates - All Marines	STS	13.5	12.5	13.3	15.0	12.2	9.6	10.5	11.6
		TTS	3.5	3.4	4.0	4.9	4.2	3.0	3.1	3.4
		PTS	9.4	8.6	8.8	9.4	7.7	6.1	6.9	8.0
	Threshold Shift Rates - AD Marines	STS	13.0	12.1	13.1	15.0	11.8	9.1	9.6	10.5
		TTS	4.0	3.9	4.7	5.8	4.7	3.4	3.6	4.0
		PTS	8.4	7.7	7.9	8.5	6.7	5.3	5.5	6.3
	Threshold Shift Rates - USMCR Marines	STS	16.3	15.1	14.6	15.2	14.9	13.0	15.3	16.8
		TTS	0.3	0.4	0.4	0.6	0.8	0.8	0.8	0.7
		PTS	15.6	14.5	14.0	14.3	13.9	12.0	14.1	15.8
	Threshold Shift Rates - USMC Civilians	STS	19.1	18.4	20.2	22.0	16.7	15.6	14.4	17.7
		TTS	5.5	6.1	5.6	6.3	4.8	5.0	4.6	4.7
		PTS	12.9	11.4	13.6	14.0	10.5	9.4	8.7	11.8
	STS Follow-Up Test Compliance	All Marines	49.1	53.0	57.4	60.8	62.7	63.7	62.4	61.8
		AD Marines	57.8	61.7	67.0	69.9	72.4	72.4	76.0	75.6
		USMCR Marines	6.7	8.9	9.9	12.7	16.1	19.6	19.0	20.3
		USMC - Civilian	62.6	61.9	59.0	67.9	66.3	68.6	72.6	73.8
	Hearing Impaired	All Marines	15.9	15.1	14.1	12.9	12.2	11.6	11.6	11.9
		AD Marines	16.0	15.2	14.2	12.9	12.2	11.6	11.6	11.9
		USMCR Marines	15.7	13.9	13.5	13.4	12.6	11.9	12.1	12.2
		USMC - Civilian	48.2	47.9	47.3	47.5	44.3	42.5	42.4	43.0
	Hearing Impaired - Enlisted Marine Accessions	All Marines	11.8	11.0	11.2	9.3	9.6	8.9	7.8	9.7
		AD Marines	11.8	11.0	11.2	9.3	9.6	8.9	7.8	9.7
		USMCR Marines	25.0	0.0	0.0	42.9	0.0	7.9	25.0	30.8
	VA Auditory Threshold Criteria	All Marines	6.6	6.3	6.0	5.7	5.3	4.9	4.4	3.9
		AD Marines	6.7	6.5	6.3	5.9	5.4	5.0	4.5	3.9
		USMCR Marines	5.2	4.4	4.2	4.1	4.1	4.2	3.8	3.4

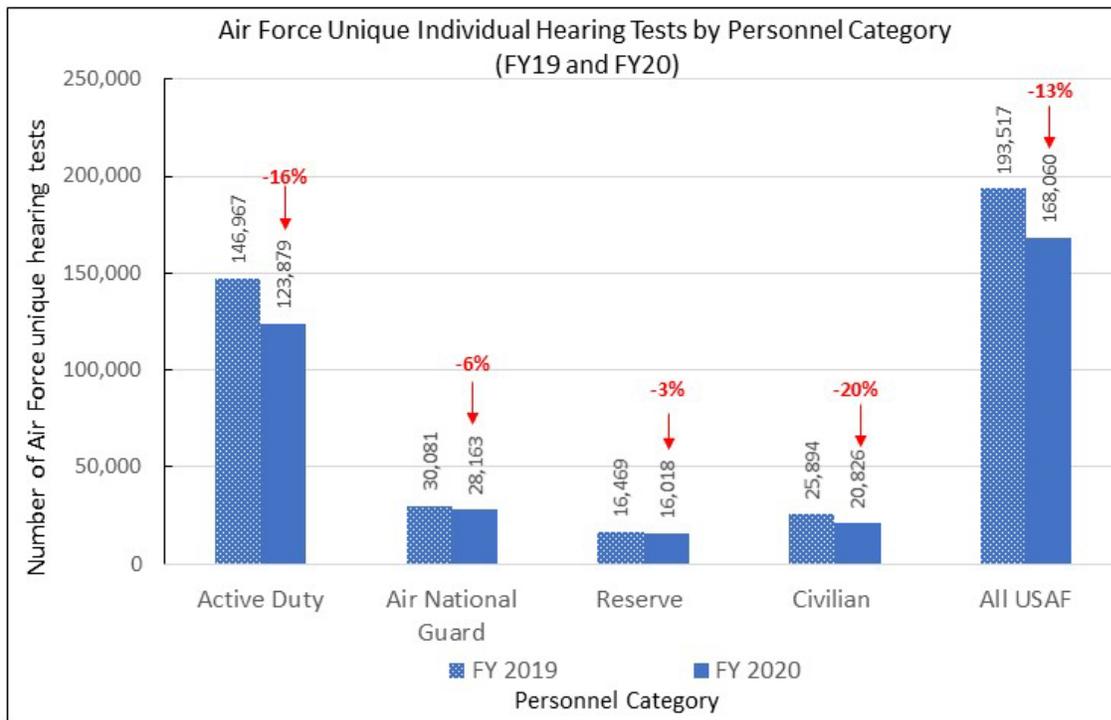
## Appendix D: Hearing Health - Air Force

The Air Force (AF) HCP is a risk-based program, enrolling Airmen and civilians based on occupational exposure to hazardous noise. In 2015, the Air Force started hearing testing at basic training for all enlisted Airmen and officers, regardless of noise exposure risk. Testing in this manner adds a significant number of normal hearing test results to the larger pool of hearing conservation tests within a fiscal year and can affect the data. Likewise, the Air Force completes Separation Health Physical Exams (SHPE) for all Airmen, using the DOEHS-HC system, regardless of HCP enrollment. As a result, hearing tests completed at the beginning and end of military service, regardless of HCP enrollment, shown in the graphs below, are not completely reflective of actual HCP effectiveness or hearing health of the total AF population.

### Air Force Unique Hearing Tests by Personnel Category

The number of unique hearing tests by the Air Force showed a decrease in all components during FY20 compared to FY19. There was a 13% decrease in testing for all Airmen and a 20% decrease for AF noise-exposed civilian personnel in FY20 compared to FY19 (Graph 47). This decrease may be caused by limited access to hearing health services due to COVID-19 pandemic restrictions. Traditional audiometry conducted in test booths was limited by infection control measures for physical distancing, increased cleaning/sanitizing requirements, compliance with CDC guidance (CDC, 2003) regarding room air exchange, and reallocation of resources for pandemic efforts.

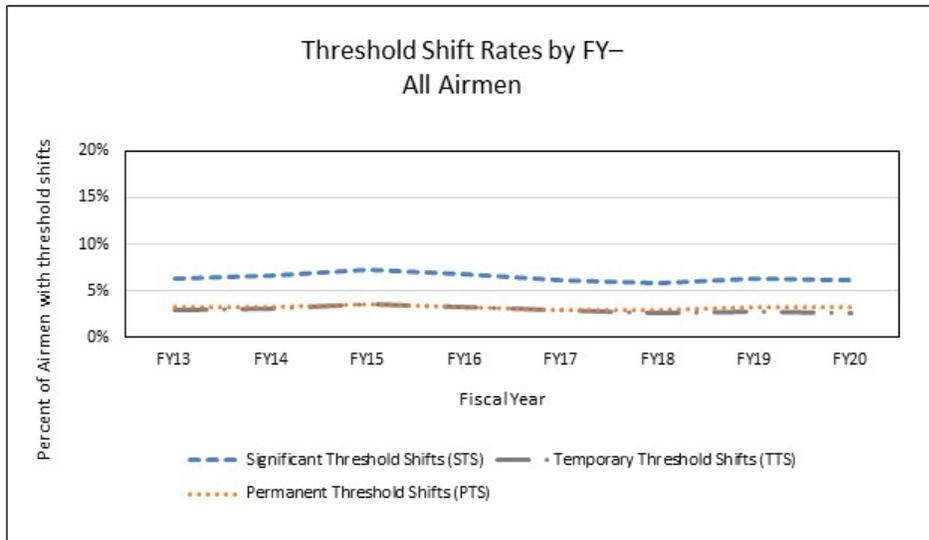
Graph 47. Air Force Unique Individual Hearing Tests by Personnel Category (FY19 and FY20)



### Significant Threshold Shift Rates by FY

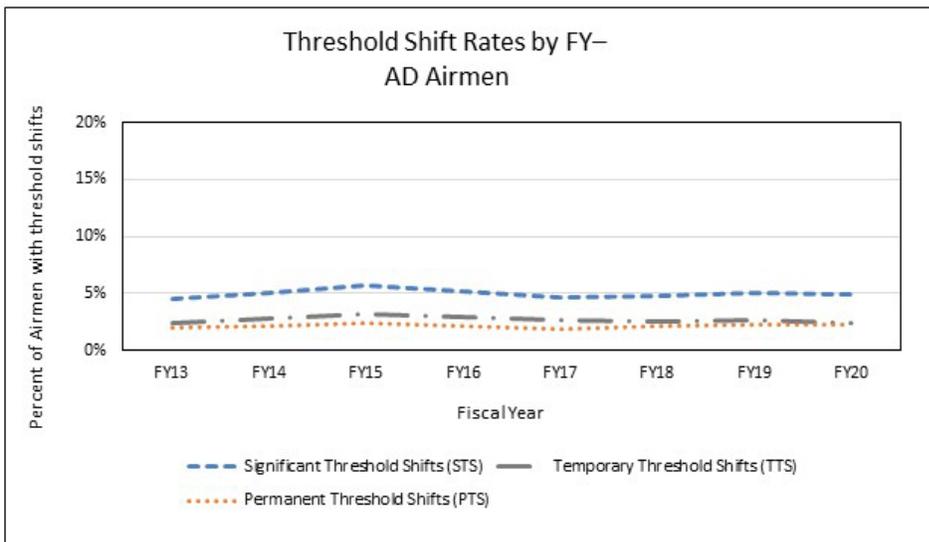
Threshold shift rates for all Airmen indicate 6.1% STS, 2.6% TTS, and 3.3% PTS rates in FY20 (Graph 48).

Graph 48. Threshold Shift Rates by FY - All Airmen



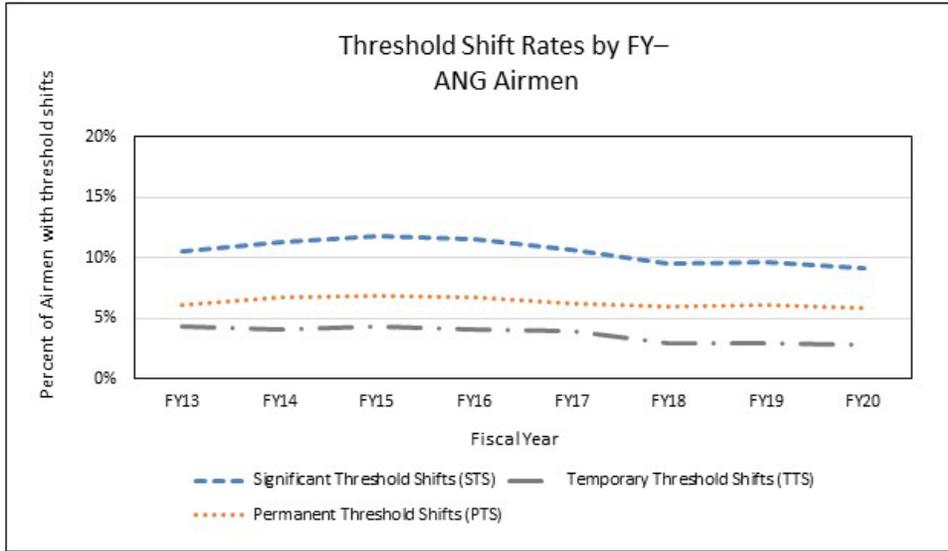
AD Airmen have the lowest PTS rates of all Air Force components during FY13 - FY20. This may be due to improved STS follow-up testing compliance resulting in accurate identification of PTS and TTS as seen in Graph 53. Threshold shift rates for AD Airmen indicate an 4.9% STS, 2.4% for TTS, and 2.2% PTS rate in FY20 (Graph 49). The STS, TTS, and PTS rates are stable from FY19 to FY20 for AD Airmen.

Graph 49. Threshold Shift Rates by FY – AD Airmen



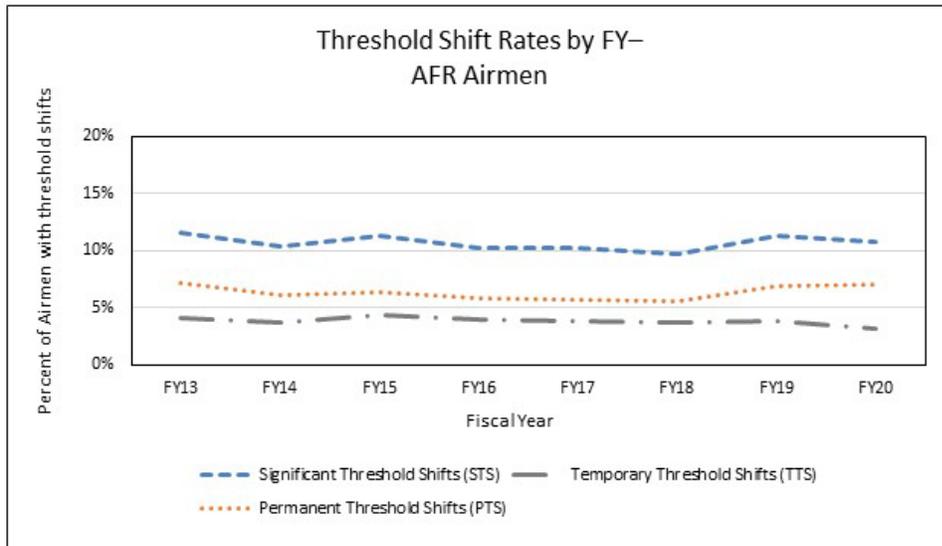
Air National Guard (ANG) threshold shift rates have decreased from FY13 to FY20. Threshold shift rates for FY20 are: 9.1% STS, 2.8% TTS, and 5.8% PTS (Graph 50). The STS, TTS, and PTS rates are stable for AD Airmen from FY19 to FY20.

Graph 50. Threshold Shift Rates by FY – ANG Airmen



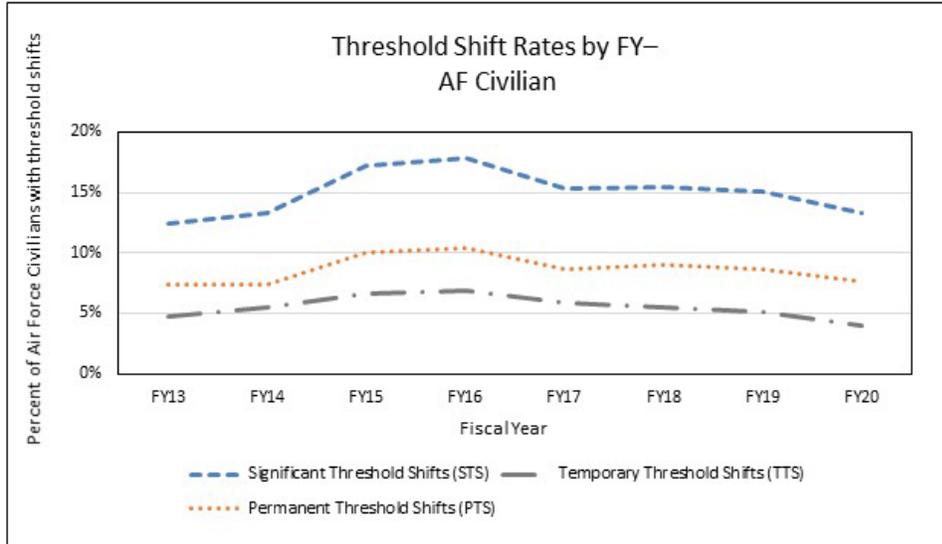
Air Force Reserve (AFR) all threshold shift rates (STS, TTS, and PTS), and stable from FY19 to FY20 (Graph 51). Threshold shift rates for FY20 are: 10.8% STS, 3.1% TTS, and 7.1% PTS. There is negligible to no improvement in STS, TTS, and PTS rates from FY13 to FY20 for AFR Airmen.

Graph 51. Threshold Shift Rates by FY – AFR Airmen



AF noise-exposed civilian STS rates show marginal decreased rates from 15.1% in FY13 to 13.3% in FY20. There are marginal decreases in STS, TTS, and PTS rates for these AF civilians from FY19 to FY20. AF noise-exposed civilian threshold shift rates for FY20 are: 13.3% STS, 3.9% TTS, and 7.6% PTS (Graph 52). AF noise-exposed civilian STS rates are higher than AF military components but show decreased STS rates over the past 4 years.

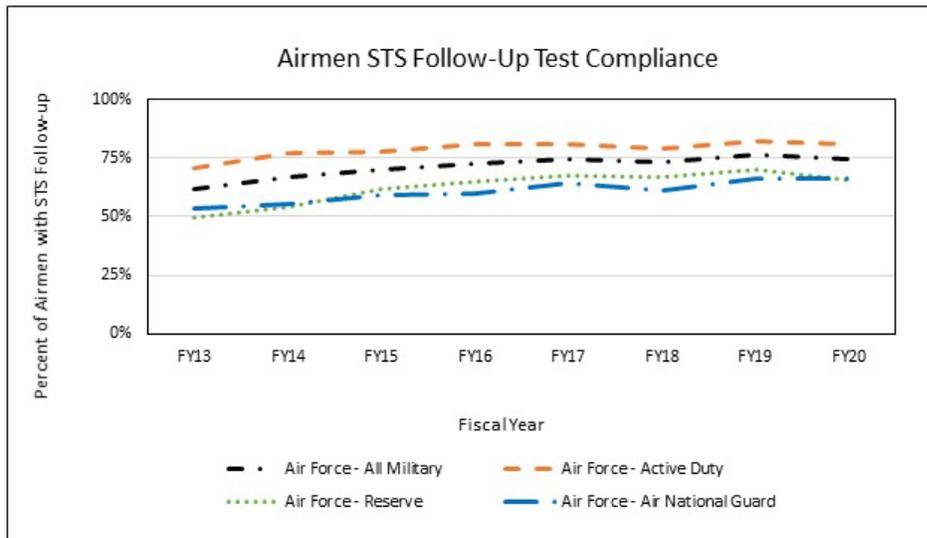
Graph 52. Threshold Shift Rates by FY – AF Civilian



### Significant Threshold Shift Follow-up Compliance

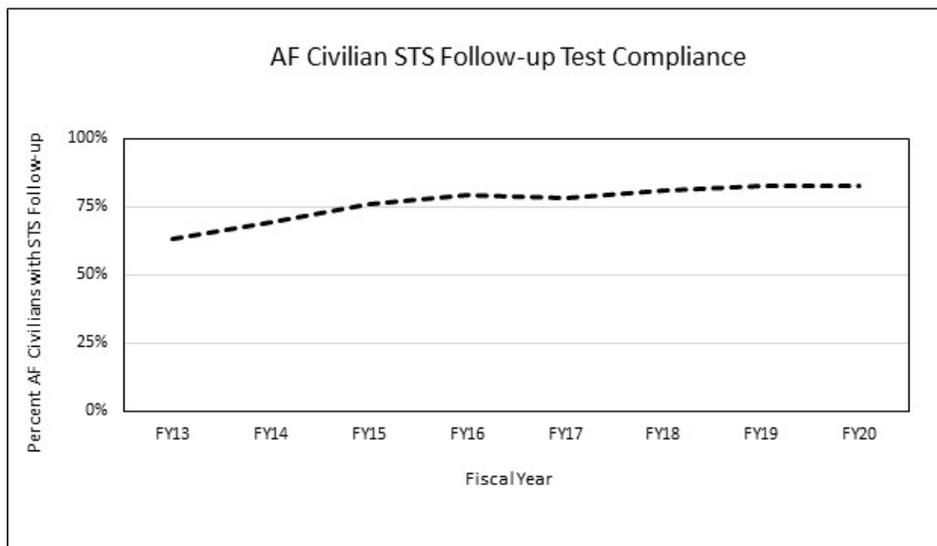
There is increased STS follow-up testing compliance in FY20 when compared to FY13 (Graph 53) for Airmen (combined components and individual components). Overall compliance for STS follow-up testing (all Airmen) increased from 62.0% in FY13 to 74.7% and decreased slightly from FY19 to FY20. Compliance for STS follow-up testing for AD Airmen increased from 71.0% in FY13 to 80.9% in FY20 with a marginal decrease in compliance from FY19 to FY20. Compliance in the ANG increased from 53.3% in FY13 to 66.3% in FY20. Compliance in the AFR increased from 50.0% in FY13 to 65.9% in FY20. The ANG compliance remained stable from FY19 to FY20; however, AFR compliance rate decreased by 4.4% over this same period.

Graph 53. Airmen STS Follow-up Test Compliance



AF noise-exposed civilian STS follow-up testing continues to show increased compliance from 63% in FY13 to 82.5% in FY20 (Graph 54). However, from FY19 to FY20 STS follow-up testing compliance was stable for AF noise-exposed civilians.

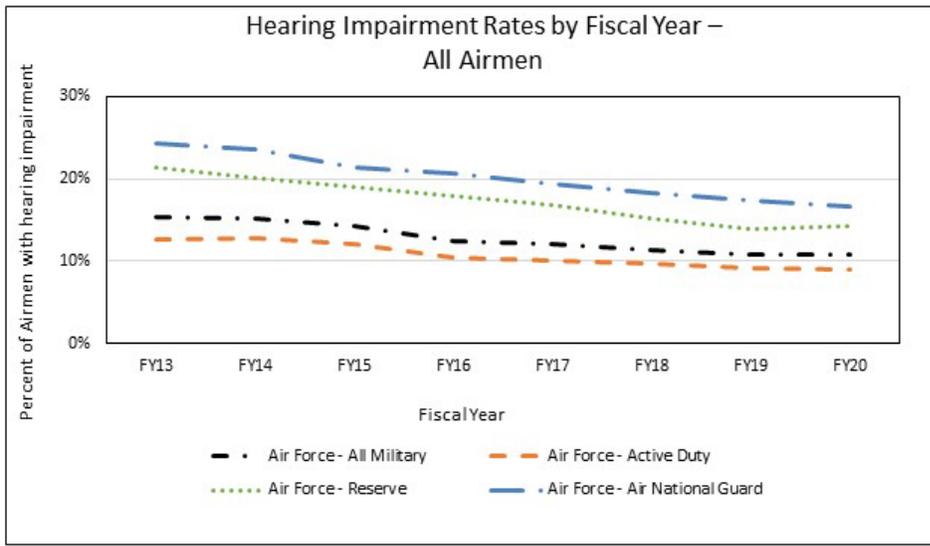
Graph 54. AF Civilian STS Follow-up Test Compliance



## Hearing Impairment

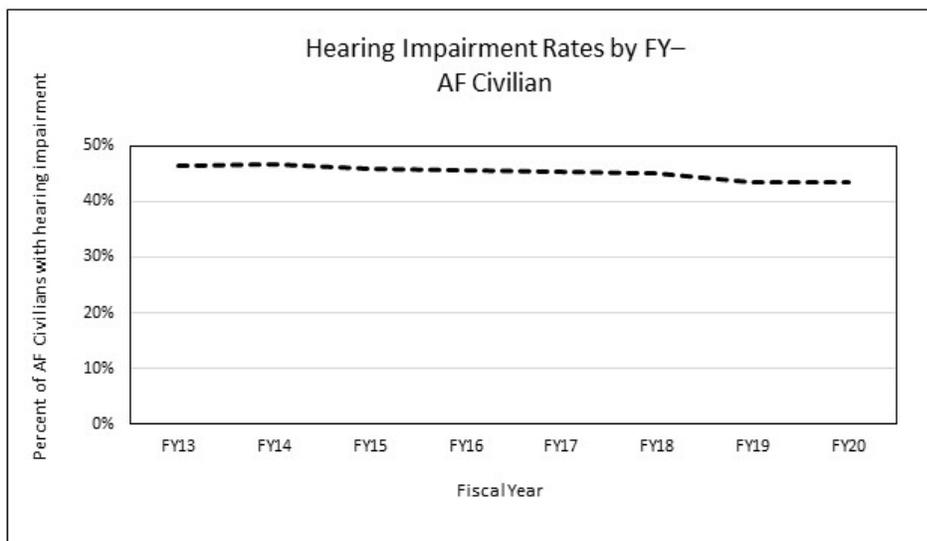
The percent of Airmen with hearing impairment is decreasing for all AF components. All Airmen with hearing impairment decreased from 15.4% in FY13 to 10.7% in FY20 (Graph 55). However, from FY19 to FY20 Airmen hearing impairment remained stable for all AF combined and individual components.

Graph 55. Hearing Impairment Rates by FY - All Airmen



The percent AF noise-exposed civilians with hearing impairment shows a marginal decrease from FY13 to FY20 and remains stable from FY19 and FY20. The percent of AF noise-exposed civilians with hearing impairment decreased from 46.3% in FY13 to 43.4% in FY20. In FY20, 56.6% noise-exposed civilians had normal hearing.

Graph 56. Hearing Impairment Rates by FY – AF Civilian

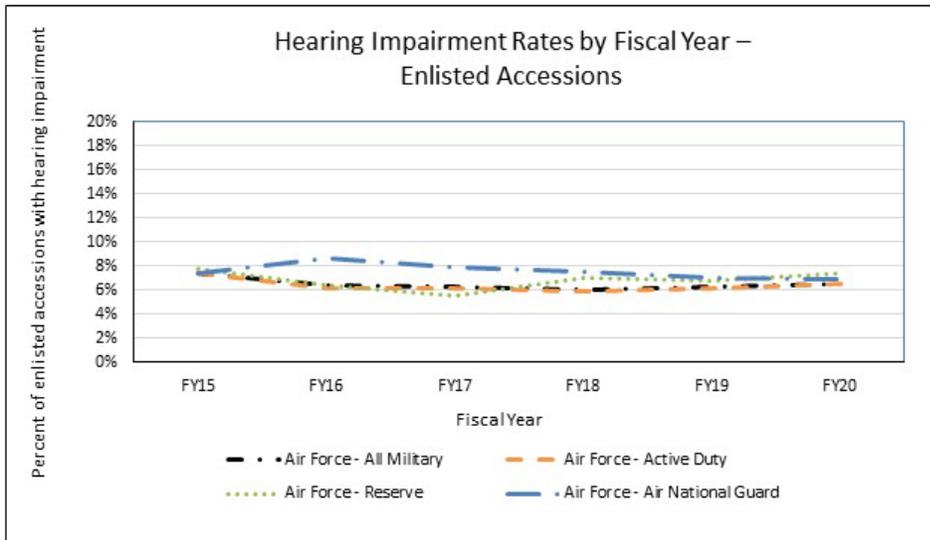


### Hearing Impairment – Enlisted Accession Data

Airmen receive a hearing test as part of basic training when they enter military service. Those ‘reference audiograms’ are used to determine the percent of all new recruits who enter the AF with hearing impairment (hearing worse than 25 dB at any test frequency). Enlisted airmen accessions did not receive audiometric testing prior to FY15. For all enlisted airmen accessions hearing impairment has decreased

marginally from FY15 (7.4%) to FY20 (6.6%) and remained stable from FY19 to FY20. The percent of enlisted AD airmen accessions with hearing impairment had a negligible decrease from 7.4% in FY15 to 6.5% in FY20. The percent of enlisted ANG airmen accessions with hearing impairment was stable with 7.5% in FY15 to 7.0% in FY20. Enlisted AFR airmen accessions with hearing impairment were also stable with 7.7% in FY15 to 7.4% in FY20 (Graph 57).

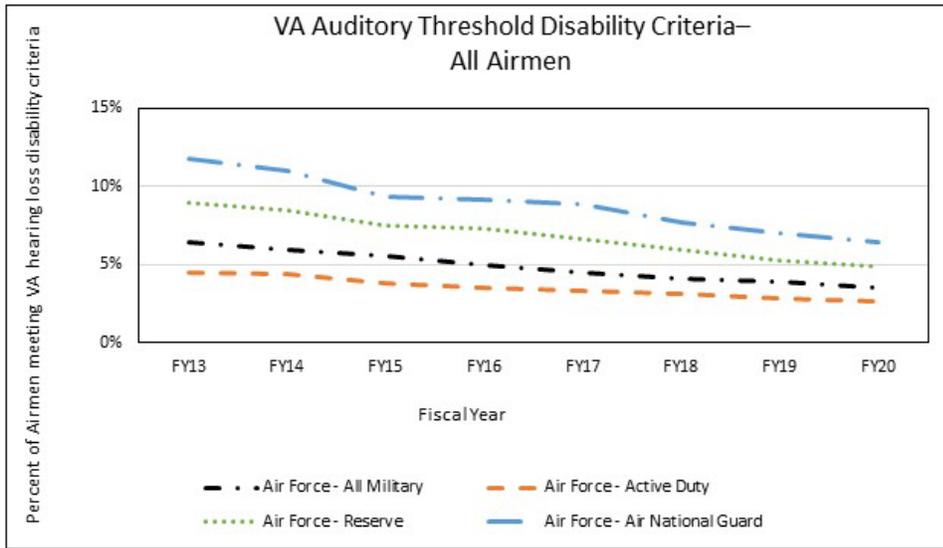
Graph 57. Hearing Impairment Rates by FY - Enlisted Airmen Accessions



### [VA Auditory Threshold Disability Criteria](#)

The percentage of all Airmen potentially eligible for VBA service-connected disability compensation for hearing loss decreased slightly from 5.4% in FY13 to 3.1% in FY20 and remained stable from FY19 to FY20 (Graph 58). All individual AF component Airmen (AD, ANG, and AFR) had slightly decreased eligibility for VBA disability for hearing loss from FY13 to FY20 based on VA auditory threshold disability criteria; however, no change in eligibility was found from FY19 to FY20.

Graph 58. VA Auditory Threshold Disability Criteria – All Airmen



**Table 6. Data Summary – Air Force**

Source: DOEHS-HC DR

Service	Chart Title	Category	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
USAF	Threshold Shift Rates - All Airmen	STS	6.3	6.6	7.3	6.7	6.1	5.9	6.4	6.1
		TTS	2.9	3.1	3.5	3.2	3.0	2.7	2.8	2.6
		PTS	3.2	3.2	3.5	3.2	2.9	3.0	3.3	3.3
	Threshold Shift Rates - AD Airmen	STS	4.5	5.0	5.7	5.2	4.7	4.8	5.1	4.9
		TTS	2.4	2.8	3.2	3.0	2.7	2.5	2.7	2.4
		PTS	2.0	2.1	2.3	2.2	1.9	2.1	2.2	2.2
	Threshold Shift Rates - ANG Airmen	STS	10.5	11.3	11.8	11.6	10.7	9.5	9.7	9.1
		TTS	4.3	4.1	4.4	4.1	3.9	3.0	3.0	2.8
		PTS	6.1	6.7	6.9	6.7	6.2	5.9	6.0	5.8
	Threshold Shift Rates - AFR Airmen	STS	11.6	10.3	11.3	10.2	10.2	9.7	11.4	10.8
		TTS	4.1	3.7	4.3	4.0	3.8	3.6	3.8	3.1
		PTS	7.2	6.1	6.4	5.8	5.7	5.5	6.9	7.1
	Threshold Shift Rates - Civilian	STS	12.4	13.3	17.2	17.9	15.3	15.5	15.1	13.3
		TTS	4.8	5.5	6.6	6.9	5.8	5.5	5.1	3.9
		PTS	7.4	7.4	10.1	10.5	8.7	9.1	8.6	7.6
	STS Follow-Up Test Compliance	All Airmen	62.0	67.1	69.8	72.8	74.0	73.1	76.4	74.7
		AD Airmen	71.0	77.1	77.6	81.1	81.0	79.3	82.3	80.9
		ANG Airmen	53.3	55.1	58.9	59.7	64.5	61.1	66.3	66.3
		AFR Airmen	50.0	54.2	61.6	65.2	67.5	66.8	70.3	65.9
		AF Civilian	63.3	69.4	75.9	79.2	78.0	81.0	82.5	82.5
	Hearing Impaired	All Airmen	15.4	15.2	14.2	12.5	12.0	11.3	10.8	10.7
		AD Airmen	12.7	12.8	12.0	10.4	10.2	9.6	9.2	9.0
		ANG Airmen	24.4	23.6	21.4	20.7	19.5	18.3	17.4	16.7
		AFR Airmen	21.4	20.2	19.0	17.9	16.9	15.2	14.0	14.3
		AF Civilian	46.3	46.8	45.9	45.5	45.4	45.2	43.4	43.4
	Hearing Impaired -	All Airmen	*	*	7.4	6.4	6.2	6.1	6.4	6.6
	Enlisted Airmen Accessions	AD Airmen	*	*	7.4	6.2	6.1	5.9	6.2	6.5
		ANG Airmen	*	*	7.5	8.7	7.9	7.5	7.1	7.0
	<i>* No Basic Training Hearing Test Mission</i>	AFR Airmen	*	*	7.7	6.5	5.5	7.1	6.8	7.4
	VA Auditory Threshold Criteria	All Airmen	5.4	5.1	4.6	4.2	3.9	3.6	3.3	3.1
		AD Airmen	4.5	4.4	3.8	3.5	3.3	3.1	2.8	2.7
		ANG Airmen	11.8	10.9	9.4	9.1	8.8	7.7	7.0	6.4
		AFR Airmen	9.0	8.4	7.5	7.3	6.7	6.0	5.3	4.8

## References

Cfr. (1994). *38 CFR § 3.385 disability due to impaired hearing*. CFR. <https://ecfr.io/Title-38/Section-3.385>. *Disability due to impaired hearing*. 59 FR 60560. Retrieved Jun 20, 2021, from <https://ecfr.io/Title-38/Section-3.385>

[Batchelor, E, Wolff, G, McKenna, E, Williams, D \(2020\) Hearing Conservation Measures of Effectiveness Across the Department of Defense \[Assessed 30 Jun 2021\]. Available from https://health.mil/News/Articles/2020/07/01/Hearing-Conservation-2020](#)

[Centers for Disease Control and Prevention \(2003\). Appendix B. Air, Guidelines for Environmental Infection Control in Health-Care Facilities, Airborne Contaminant Removal, Table B.1. Retrieved Jun 20, 2021, from https://www.cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html#tableb1](#)

Department of Defense; 2019. Department of Defense Instruction 6055.12 [Assessed 20 Jun 2021]. Available from <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/605512p.pdf?ver=2017-10-25-110159-777>

McKenna E, Williams D (2018) U.S. Air Force Hearing Conservation Program, Annual Report for Calendar Year 2016. Wright-Patterson AFB (OH): U.S. Air Force School of Aerospace Medicine; 2018. Report no. AFRL-SA-WP-SR-2018-0005 [Assessed 20 Jun 2021]. Available from [AD1052693.pdf \(dtic.mil\)](#)