



AFRL-SA-WP-SR-2016-0003

**USAF Hearing
Conservation Program,
DOEHRS Data Repository
Annual Report: CY2014**



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February 2016

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REPORT DOCUMENTATION PAGE			<i>Form Approved</i> <i>OMB No. 0704-0188</i>		
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1. REPORT DATE (DD-MM-YYYY) 9 Feb 2016		2. REPORT TYPE Special Report		3. DATES COVERED (From – To) January – December 2014	
4. TITLE AND SUBTITLE USAF Hearing Conservation Program, DOEHRS Data Repository Annual Report: CY2014			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) Quintin Hecht, Au.D., Maj, USAF, BSC Elizabeth McKenna, Au.D.			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) USAF School of Aerospace Medicine Public Health & Preventative Medicine Department Epidemiology Consult Service 2510 Fifth St. Wright-Patterson AFB, OH 45433-791			8. PERFORMING ORGANIZATION REPORT NUMBER AFRL-SA-WP-SR-2016-0003		
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSORING/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION / AVAILABILITY STATEMENT DISTRIBUTION STATEMENT A. Approved for public release.					
13. SUPPLEMENTARY NOTES Cleared, 88PA, Case # 2016-2496.					
14. ABSTRACT The U.S. Air Force School of Aerospace Medicine (USAFSAM), Epidemiology Consult Service (PHR), Hearing Conservation Program (HCP) prepares an annual status report on the USAF HCP in accordance with Air Force Instruction 48-127, <i>Occupational Noise and Hearing Conservation Program</i> , Section 2.9.2.17 and Department of Defense Instruction 6055.12, <i>Hearing Conservation Program</i> . This report covers calendar year 2014. The purpose of this report is to provide a corporate view of the status of the USAF HCP with data reported from the Defense Occupational and Environmental Health Readiness System-Data Repository (DOEHRS-DR). Major command and installation level reports are available quarterly and by request from USAFSAM/PHR, as well as by those who have user-defined roles in the Data Repository. This report covers information regarding software implementation status, HCP effectiveness metrics, to include an overview of a few standard reports currently available in the DOEHRS-DR database, and our recommendations.					
15. SUBJECT TERMS Hearing conservation, permanent threshold shift, threshold shift trends, Defense Occupational and Environmental Health Readiness System-Data Repository (DOEHRS-DR)					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Maj Quentin Hecht
U	U	U	SAR	15	19b. TELEPHONE NUMBER (include area code)

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1.0 SUMMARY

The U.S. Air Force School of Aerospace Medicine (USAFSAM), Epidemiology Consult Service (PHR), Hearing Conservation Program (HCP) prepares an annual status report on the USAF HCP in accordance with Air Force Instruction 48-127, *Occupational Noise and Hearing Conservation Program*, Section 2.9.2.17 and Department of Defense Instruction 6055.12, Hearing Conservation Program. This report covers calendar year 2014. The purpose of this report is to provide a corporate view of the status of the USAF HCP with data reported from the Defense Occupational and Environmental Health Readiness System-Data Repository (DOEHRS-DR). Major command and installation level reports are available quarterly and by request from USAFSAM/PHR, as well as by those who have user-defined roles in the Data Repository. This report covers information regarding software implementation status, HCP effectiveness metrics, to include an overview of a few standard reports currently available in the DOEHRS-DR database, and our recommendations.

2.0 INTRODUCTION

The U.S. Air Force School of Aerospace Medicine (USAFSAM), Epidemiology Consult Service (PHR), Hearing Conservation Program (HCP) Management Office prepares an annual status report on the USAF HCP in accordance with Air Force Instruction (AFI) 48-127, *Occupational Noise and Hearing Conservation Program*, Section 2.9.2.17 [1] and Department of Defense Instruction (DoDI) 6055.12, *Hearing Conservation Program* [2]. This report covers calendar year (CY) 2014. The delay in this report is primarily due to continuous analysis of inconsistencies in the CY2014 Defense Occupational and Environmental Health Readiness System-Hearing Conservation (DOEHRS-HC) data.

The purpose of this report is to provide a corporate view of the status of the USAF HCP with data reported from the DOEHRS-Data Repository (DOEHRS-DR), as well as the functionality of the DOEHRS-DR and how that affects the USAF HCP. Major command (MAJCOM) and installation level reports are available quarterly and by request from USAFSAM/PHR. This report covers information regarding software implementation status, CY2011-CY2014 HCP effectiveness metrics (including an overview of several standard reports currently available in the DOEHRS-DR database), and recommendations for MAJCOM Public Health and installation HCP Managers (HCPMs).

3.0 DISCUSSION

3.1 DOEHRS-HC DR System

3.1.1 Software Implementation Status. During 2014, the DOEHRS Project Office (PO) and the subject matter experts from each service participated in an Agile Defect Resolution events facilitated by NMR Consulting Inc. (NMR) for DOEHRS-HC versions 4.1.1.0 (11 March 2014), 4.1.1.1 (3 June 2014), and 4.1.1.2 (30 September 2014). Detailed information regarding features added, defects corrected, and known defects still unresolved is documented in each software version's "Release Notes" and can be downloaded at <https://doehrswww.apgea.army.mil/>.

The release of version 4.1.1.0 provided enhancements to satisfy DoD security mandates by allowing the Authentication Services filter to permit communication from DOEHRS-HC to DOEHRS-HC DR via Common Access Card. This enhancement, while increasing security, created additional administrative steps with the following features: DOEHRS-HC DR Inquire, data exports to the DOEHRS-HC DR, lookup table updates, and update checks.

Version 4.1.1.1 corrected the follow-up timeframe window for Air Force Reserve and Air National Guard to reflect 60 days. Additionally, this release disallowed printing of any audiogram that did not meet the follow-up window requirements (either 30 or 60 days) and resulted in the following text at the DOEHRS-DR audiogram report screen: "Invalid Test Series: the follow-up # test was not conducted within the allowed date window."

Version 4.1.1.2 standardized some audiometric questions across the DoD, including a hearing health question regarding tinnitus. The goal was to align the DOEHRS-HC DR data with DoD Hearing Conservation and Readiness Working Group initiatives and Government Accountability Office recommendations [3]. The data collected from the standardized tinnitus questions are projected to be mined by the DoD in future studies and reports.

The DOEHRS PO released an updated interim Authority to Connect/Operate (ATC/O) Document from the Defense Health Agency level dated 10 October 2014, as the previous ATO expired 1 October 2014. As of December 2014, a final document and solution had yet to be produced. The DOEHRS PO stated they would work with the AF HCP office to extend support for DOEHRS-HC version 4.1.1.1 for those bases that cannot install version 4.1.1.2 because of the lapsed ATC/O; however, some AF bases accepted the Defense Health Agency ATO as sufficient approval to operate the DOEHRS-HC program. The DOEHRS PO stated they would only extend the support 30 days at a time. As soon as the AF-specific ATO was acquired, all bases were directed to upgrade to version 4.1.1.2.

DOEHRS-HC versions 4.1.1.1 and 4.1.1.2 did not calculate hearing (H-1, H-2, H-3) profiles in accordance with Air Force Instruction 48-123 Table A3.2 [4]. USAFSAM/PHR conducted tests with varying thresholds and found this to be true. Patients were inaccurately categorized as H-1 when their profile was actually H-2 or greater. This defect could have resulted in lack of appropriate follow-up care/appointments for some personnel. Also, this type of error could have potentially caused or contributed to communication and safety concerns for the affected individual and his/her co-workers. Additionally, the error could have led to an adverse auditory health risk if a patient had an otologic pathology unaddressed by medical treatment. Due to this software deficiency, the AF HCP Management Office advised all HC technicians (12 Jan 2015 e-mail) to manually calculate hearing profiles on all audiograms until further notice and to document the correct hearing profile on the audiogram before it was loaded on the electronic health record system.

3.1.2 Data Repository Status. Some features of the DR report builder intermittently demonstrated errors in total test counts, often more than doubling the number. This issue was brought to the attention of the DOEHRS PO with Maintenance Change Request (MCR) 5247 and MCR 5258 on the DOEHRS-HC Collaboration website (maintained by NMR Consulting Inc. and the DOEHRS PO).

MCR 5247 was logged 20 November 2014, ticket #MHSINC002488539, ranked number 15 overall on the Priority 1 list, and described as follows: "There seems to be some data discrepancies in the reports pulled from the DR and the reports queried in Oracle Discoverer. Looking at a specific base, the number of annual tests and STS rates differ between the

Discoverer program and the canned PTS rate report from the DR. The numbers match between the Discoverer report and the Records Received Report from the DR. The PTS rate report from the DR is showing more annual tests and more STS tests than what Discoverer Ad Hoc report has. Attached is a spreadsheet showing the differences between the two. Same time period for all three reports: 1 Jan 14-present.”

MCR 5258 was logged 21 November 2014, ticket #MHSINC002517717, ranked number 11 overall on the Priority 1 list, and described as follows: “When pulling data from the DR for a PTS rate report, current data pulled from a specific time period does not match data previously collected from the same specific time period. For example, the PTS rate report pulled for the first quarter of 2014, for the ACC MAJCOM, was 7,676 periodic exams with a PTS rate of 4.45%. When the data was retrieved from the same time period, it showed 13,012 periodic exams with a PTS rate of 5.06%. This occurred with every MAJCOM or individual unit inquired about and compared to the data previously pulled and included in quarterly reports. Quarterly PTS rates for each MAJCOM for 2013-2014 were pulled in August of this year to show trends over time. Now all those numbers have increased by almost 2 times the previous numbers.”

The intermittent occurrence of these errors in both MCRs 5247 and 5258 was investigated and no known cause or potential fix was identified. The NMR technical team believed these errors may be related to the time delay between the time the DR receives records, the time it takes to process the records at the DR, and the time the report builder/Discoverer query is utilized; however, this did not seem like a plausible explanation that accounted for near-doubling of test counts.

3.1.3 Other System Status Updates. As described in previous annual reports, the DOEHRS-HC DR continued to be affected by baseline errors. During the time period of 2012-2014, many bases attempted to update these records by editing the test type per DOEHRS Tier III instructions. However, the edits made at the local level were not reflected in the DOEHRS-HC DR once the records were uploaded to the DR. For example, when technicians in the field followed the DOEHRS Tier III instructions to edit the audiograms and reestablish them as a type III reference test type, and then upload to the DOEHRS-DR, the DOEHRS-DR continued to reflect only the old record showing a non-type III (type I or II) reference test. DOEHRS Tier III personnel and the NMR technical team confirmed this issue has affected over 53,000 records to date, of which 14,000 records resulted in an administrative permanent threshold shift (PTS). This error was logged as MCR 5105, 6 March 2014, ticket # MHSINC002109365, on the DOEHRS-HC Collaboration website. It was ranked as a Priority 1 MCR and given an overall rank of 2 on the in-queue list by the service functional representatives. The AF HCP Management Office worked with DOEHRS Tier III personnel to correct baseline errors, but the issue remained unresolved in CY2014.

3.2 HCP Effectiveness Metrics

3.2.1 Program Compliance. One measure of effectiveness for any HCP is program compliance. This was defined as the number of people in the HCP (denominator data, number of noise-exposed personnel meeting criteria to be placed in the HCP in accordance with AFI 48-127 [1]) compared to those people who received their annual audiograms (numerator data, people tested). This is one of the metrics specified in DoDI 6055.12 [2]. Although the compliance metric is useful, it does have a significant limitation/caveat in that numbers pulled from the DOEHRS-DR

only reflect a snapshot of the data available on the date the query was made. This can affect the accuracy of the metric and must be utilized appropriately. To illustrate, aggregate data were obtained from the Aerospace Services Information Management System (ASIMS) application for military and civilian personnel, including flyers, who required an audiometric monitoring. USAFSAM/PHR entered these data as the denominator data for each unit. Table 1 represents the compliance data for the USAF for CY2011-2014. The CY2014 compliance rate was over 100% (106.6%) because more individuals received annual audiograms than were reported enrolled in the HCP for CY2014. One likely reason for this rate is the differences between the denominator and numerator datasets and the timing of the data pull. Specifically, the denominator comes from the ASIMS and is obtained as a one-time snapshot of data, meaning only personnel identified at the time of the data query as requiring an annual HCP audiogram were counted. This does not include anyone who may have required an ASIMS annual HCP audiogram at some point during the year but was subsequently removed from the program before the data query was executed. In this instance, the numerator (from the DOEHRS-DR) would contain all unique Social Security numbers of individuals who received an annual audiogram during the entire calendar year, yet the denominator would not reflect personnel eliminated from the HCP program, resulting in a compliance rate of over 100%. Also, technician error (i.e., administering annual audiograms instead of non-HCP audiograms for individuals who were not actually on the HCP) can increase the size of the numerator and further contribute to a higher compliance rate.

Table 1. Compliance Trends, CY2011-2014

Time Period	Noise Exposed		People Tested		Compliance Rate	
	Group	No.	Group	No.	Group	%
CY 2014	Military	159,180	Military	169,805	Military	106.6
	Civilian	27,291	Civilian	23,950	Civilian	87.8
	Total	186,471	Total	194,847	Total	104.5
CY 2013	Military	170,369	Military	164,164	Military	96.4
	Civilian	27,704	Civilian	24,468	Civilian	88.3
	Total	198,073	Total	189,663	Total	95.8
CY 2012	Military	183,249	Military	155,509	Military	84.9
	Civilian	28,749	Civilian	25,521	Civilian	88.8
	Total	211,998	Total	181,916	Total	85.8
CY 2011	Military	160,242	Military	158,703	Military	99.0
	Civilian	26,980	Civilian	26,643	Civilian	98.8
	Total	187,222	Total	186,348	Total	99.5

3.2.2 Threshold Shift Trends. The key metric for any HCP is the significant threshold shift (STS) as specified in DoDI 6055.12 [2] and AFI 48-127 [1]. Permanent threshold shift is defined as any STS that persists after the follow-up audiograms are completed and is a measure of permanent changes in hearing. Temporary threshold shift (TTS) is defined as any STS that resolved after the follow-up audiograms. TTS is a temporary loss of hearing, often due to hazardous noise exposure, and should be used as an opportunity to target intervention efforts for engineering controls, administrative controls, and effective use of hearing protective devices. While PTS can be due to hazardous noise exposure, other factors such as disease (and possibly ototoxic chemicals) can cause permanent hearing changes as well. Care is necessary when reviewing STS rates. Significant threshold shift, PTS, and TTS rates can only be compared to themselves for a given point in time. Therefore, inquiries into the DOEHRS-DR for threshold shift information are best viewed as a “snapshot” of the data in the DOEHRS-DR for a given day. For DOEHRS-DR purposes, TTS and PTS rates are directly influenced by the test sequence completion deadline for civilians and military and for service components, such as active duty or Air Force Reserve components.

The following trend data do not appear to be affected by issues outlined in MCRs 5258 and 5247 as evidenced by the number of periodic exams listed in the DR Aggregate Positive STS Report, which is approximately double the number of periodic exams found in the Oracle Discoverer Report and the DR Records Received Report. It is hypothesized that each of the records uploaded was duplicated within the data processing stages of the DR. This resulted in the same percentage of records demonstrating an STS, TTS, and PTS as was seen in the Oracle Discoverer Report and the DR Records Received Report. Given this level of confidence, it is recommended MAJCOMs review these trends to evaluate the effectiveness and performance of their HCPs.

Table 2 represents the STS/PTS trend data for CY2011 to CY2014 broken down into military and civilian trend rates to determine if there are differences between these groups. A visual comparison of the data shows civilian rates to be higher than military rates every year. Permanent threshold shift rates for both military and civilian personnel decreased slightly from CY2011 through CY2013 and then increased in CY2014. Overall, STS and TTS rates remained fairly stable from CY2011 through CY2014 for military and civilian personnel except for a lower civilian STS rate in CY2012. In some instances, military members retire and may return to the base as civilian employees in the same job. The effects of working in hazardous noise environments for many years will negatively affect the auditory status of many workers, as exposure over time accumulates. Some individuals may be susceptible to a genetic predisposition for age-related hearing loss and/or noise-induced hearing loss. Given this level of confidence, it is recommended MAJCOMs review these trends to evaluate the effectiveness and performance of their HCPs.

Table 3 displays STS rates for the 11 MAJCOMs, Air Force Reserve, and Air National Guard for the time period of CY2011-CY2014. Overall, the MAJCOMs demonstrated lower STS rates in CY2011 and higher STS rates in 2014, with a few exceptions of higher STS rates in CY2012.

Table 2. STS Rates, CY2011-2014

Year	No. of Periodic Audiograms	STS (%)	TTS (%)	PTS (%)
CY 2014				
Military	295,089 ^a	7.70	1.40	6.30
Civilian	48,974 ^a	14.87	2.35	12.52
CY 2013				
Military	143,255	6.57	2.62	3.95
Civilian	23,603	14.68	4.59	10.09
CY 2012				
Military	138,625	7.50	2.99	4.51
Civilian	25,195	10.00	4.56	10.44
CY 2011				
Military	142,885	7.52	2.75	4.77
Civilian	25,097	15.01	4.45	10.55

^aData counts as reflected in DR likely affected by test count error (MCRs 5258, 5247).

Table 3. STS Rates for MAJCOMs, CY2011-2014

MAJCOM	2014 (%)	2013 (%)	2012 (%)	2011 (%)
ACC	7.49	5.42	6.84	3.68
AETC	7.38	8.12	9.21	6.89
AFDW	12.17	9.60	8.87	5.62
AFGSC	6.83	6.48	7.41	4.09
AFMC	10.67	9.02	9.33	5.72
AFRC	11.72	12.13	13.49	10.31
AFSOC	6.52	5.98	6.33	3.04
AFSPC	9.43	7.47	11.37	9.57
AMC	6.17	6.40	7.40	4.89
ANG	12.57	10.80	11.43	9.00
PACAF	6.86	6.51	7.83	3.81
USAFA	4.42	5.80	8.42	7.90
USAFE	4.56	4.17	5.75	2.99

ACC = Air Combat Command; AETC = Air Education & Training Command; AFDW = Air Force District of Washington; AFGSC = Air Force Global Strike Command; AFMC = Air Force Materiel Command; AFRC = Air Force Reserve Command; AFSOC = Air Force Special Operations Command; AFSPC = Air Force Space Command; AMC = Air Mobility Command; ANG = Air National Guard; PACAF = Pacific Air Forces; USAFA = U.S. Air Force Academy; USAFE = U.S. Air Forces in Europe.

3.2.3 Military Hearing Profiles. Table 4 displays H-1, H-2, and H-3 profile levels for military members. The majority (92-94%) of personnel receiving audiograms demonstrated hearing thresholds within the H-1 profile; this finding is consistent with H-1 profile threshold requirements for military entrance processing. Over the course of time, individuals may experience changes in hearing, from a variety of occupational and non-occupational exposures, which can result in an H-2 or even an H-3 profile. A small fraction of the tested population (3.52-5.20%) demonstrated hearing thresholds within the H-2 profile, while an even smaller portion (1.57-2.40%) demonstrated hearing thresholds within the H-3 profile during CY2011 through CY2014. These data changed little from year to year.

Table 4. Military Hearing Profiles, CY2011-2014

Year	No. of Personnel	H-1		H-2		≥ H-3	
		No.	%	No.	%	No.	%
2014							
Enlisted	214,494 ^a	203,225 ^a	94.75	7,665 ^a	3.57	3,604 ^a	1.68
Officer	62,893 ^a	59,695 ^a	94.92	2,213 ^a	3.52	985 ^a	1.57
2013							
Enlisted	120,224	112,170	93.30	5,316	4.42	2,738	2.28
Officer	31,808	29,673	93.29	1,508	4.74	627	1.97
2012							
Enlisted	115,512	107,418	92.99	5,363	4.64	2,731	2.36
Officer	30,810	28,668	93.05	1,474	4.78	668	2.17
2011							
Enlisted	120,737	111,826	92.6	5,930	4.90	2,981	2.40
Officer	32,497	30,041	92.4	1,691	5.20	765	2.30

^aData counts as reflected in DR likely affected by test count error (MCRs 5258, 5247).

4.0 RECOMMENDATIONS

The DOEHS-DR reports and metrics cited in this document reflect the data available in the DR and the AF HCP management website (maintained by USAFSAM/PHR). Local HCP records may reflect a lower PTS rate due to the inability to resolve certain types of PTS cases within the DR, as well as difficulties related to importing/exporting baselines older than 1998. The differences between the locally reported PTS rate and the PTS rate within the DR continue to be addressed by USAFSAM/PHR via quarterly records reviews. This effort is executed for all active duty Air Force exporting locations and by request for the AF Reserve and AF National Guard components. USAFSAM/PHR created a standardized STS tracker in Microsoft Excel to aid bases in recordkeeping of local STS rates and to improve data reporting to higher headquarters. The STS tracker tool is available for download at <https://gumbo2.wpafb.af.mil/epi-consult/index.cfm> or <https://kx2.afms.mil/kj/kx7/PublicHealth/Pages/USAFSAM-HCP.aspx>.

We strongly recommend installation and MAJCOM Public Health personnel continue to review their installation HCPs and compare the metrics given in this report with locally derived metrics. Installation HCPMs are given an installation-level report quarterly. MAJCOM Public Health personnel are given a MAJCOM Executive Summary Report of the HCPs within their

MAJCOM quarterly. MAJCOMs can request access to the DOEHRS-DR to assess trends in their respective MAJCOM. If not already obtained, HCPMs are encouraged to contact the AF HCP Management Office and apply for a DOEHRS-DR account in order gain access to the DOEHRS-DR. We also recommend all local HCPMs ensure their units are running the most current version of DOEHRS-HC software and that all DOEHRS-HC technicians have a valid DOEHRS-DR account, in accordance with AFI 48-127. All are encouraged to contact the AF HCP Management Office at USAFSAM/PHR for assistance and consultation.

5.0 REFERENCES

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LIST OF ABBREVIATIONS AND ACRONYMS

AFI	Air Force Instruction
ASIMS	Aerospace Services Information Management System
ATC/O	Authority to Connect/Operate
CY	calendar year
DoDI	Department of Defense Instruction
DOEHRS-DR	Defense Occupational and Environmental Health Readiness System-Data Repository
DOEHRS-HC	Defense Occupational and Environmental Health Readiness System-Hearing Conservation
HCP	Hearing Conservation Program
HCPM	Hearing Conservation Program Manager
MAJCOM	major command
MCR	Maintenance Change Request
PHR	Epidemiology Consult Service
PO	Project Office
PTS	permanent threshold shift
STS	standard threshold shift
TTS	temporary threshold shift
USAFSAM	U.S. Air Force School of Aerospace Medicine