



AFRL-SA-WP-SR-2013-0014

U.S. Air Force Hearing Conservation Program, Baseline Audiogram Errors



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September 2013

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14. ABSTRACT Inconsistencies between the United States Air Force Hearing Conservation Program's quarterly reports and local base records were generated by rule changes made to the Defense Occupational and Environmental Health Readiness System Hearing Conservation/Data Repository (DOEHRS-HC/DR) in 2009. These changes resulted in the usage of older baseline audiograms to calculate significant threshold shifts if the most current baseline audiogram was incorrectly labeled. Records in DOEHRS-DR between January 2009 and February 2013 were reviewed to determine what percent of all records had the most current baseline audiogram incorrectly labeled. Approximately 15% of the 338,760 individuals had incorrect baseline records; from that 15% with incorrect baseline records, 27% (14,171 individuals) developed a positive shift that could have been the result of the baseline audiogram error. However, since 2009, the prevalence and incidence of incorrect baselines have been decreasing; efforts should continue to educate on proper baseline test management.					
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1.0 SUMMARY

2.0 INTRODUCTION

The United States Air Force School of Aerospace Medicine (USAFSAM), Epidemiology Consult Service, Hearing Conservation Program (HCP) section uses the Defense Occupational and Environmental Health Readiness System Hearing Conservation/Data Repository (DOEHRS-HC/DR) to monitor the hearing of individuals exposed to hazardous noise. Due to new business rules applied in 2009, if the most current baseline audiogram is not labeled correctly in the DOEHRs-DR, an older baseline audiogram for the individual may be used to calculate a significant threshold shift (STS)¹. This leads to diminished accuracy within the DOEHRs-DR database. The purpose of this report is to explore the baseline error and the effect it has on data stored within the DOEHRs-DR.

3.0 DISCUSSION

3.1 Overview of Reference Audiogram Error

New business rules implemented in March 2009 for DOEHRs-HC/DR incorporated major changes to the software that affected the priority of DD Form 2215 Reference Audiograms (baseline tests) used during the annual test. The DOEHRs-HC/DR system will give priority to *reason “3 – Re-established after Follow Up Program”* baselines over any other baseline type. In cases where no previous *reason “3 – Re-established”* exists, the system will use the earliest dated DD Form 2215 baseline audiogram (*reason “1 – Prior to Initial Duty”* or *“2 – Following Exposure to Noise”*) or manually entered pre-DOEHRs baseline audiogram to determine the presence of an STS on an annual audiogram. Some annual audiograms that are “passing” (no shift) when compared with the most current available baseline in the local DOEHRs-HC system may be labeled as an STS once exported to the DOEHRs-DR system.

3.2 Reference Audiogram Issue Influence on HCP Reporting

The data used to monitor the USAF HCP should primarily come from the DOEHRs-DR, as it is the system of record for the Department of Defense on hearing conservation data. Metrics such as STS rates and permanent threshold shift (PTS)² rates that get reported to USAF leadership are obtained from both the local level from flight level recordkeeping of STS cases and from the DOEHRs-DR data. Since the baseline error will create STS and/or PTS cases at the DOEHRs-DR level that do not appear at the local level, STS and PTS rates reported will be inconsistent between the locally reported STS/PTS rates and the automated reports produced at the DOEHRs-DR for the same installation. Typically, the DOEHRs-DR rates are elevated compared to locally reported numbers. Although each installation maintains its own recordkeeping procedures, which may account for some discrepancies in what is considered an STS or PTS case locally versus at the

¹ **Significant Threshold Shift**—A change in hearing thresholds relative to the reference audiogram of an average of 10 dB at 2,000, 3,000, and 4,000 Hz, either ear, according to CFR 1910.95. That is, if the sum of the shifts at 2,000, 3,000, and 4,000 Hz equals or exceeds 30 dB in either ear, an STS has occurred. **Note:** significant threshold shift as defined by OSHA.

² **Permanent Threshold Shift**—Any STS found on monitoring audiometry that is still present after a second 14-hour noise-free audiogram is considered a PTS. An STS on an annual audiogram is considered a PTS if follow-up testing is not conducted in the specified time.

DOEHRS-DR level, it does not wholly account for the large differences between the locally reported STS and PTS rates and the rates as reported centrally.

The records of all individuals active within the DOEHR-DR from 2009 to February 2013 were reviewed. Out of the 338,760 individuals who received at least one hearing exam since 2009, 53,096 were found to have the most current baseline audiogram incorrectly labeled as *reason “1- Prior to Initial Duty”* or *reason “2 – Following Exposure to Noise”* (approx. 15%).

A further assessment was conducted on the 52,849 individuals who had the baseline audiogram error occur between 2009-2012. From that, 14,171 of these individuals had a positive shift occur sometime after their baseline error (approx. 27%). The positive³ shift could have been a result of the baseline error.

Figure 1 and **Figure 2** represent the year-to-year percentage of individuals affected by the baseline issue by military/civilian personnel and by major command (MAJCOM). It is important to note that after a record is found to have the error, it will continue to be counted in the following years until corrected. The percentage of records affected by the baseline error has continued to decrease each year from 2009-2012.



Figure 1. Percentage of Military and Civilian Individuals Affected by the Baseline Error by Year (2009-2012)

³ **Positive Threshold Shift (poorer hearing from the reference)**—Same criteria as STS calculations. Positive shift represents poorer hearing levels. When this occurs, two noise-free follow-up tests are required. The two noise-free tests may be completed on the same day but cannot be completed on the same day as the annual audiogram. The result of the second follow-up test may be used to reestablish the reference audiogram or make appropriate audiologic referral for additional testing, if required.

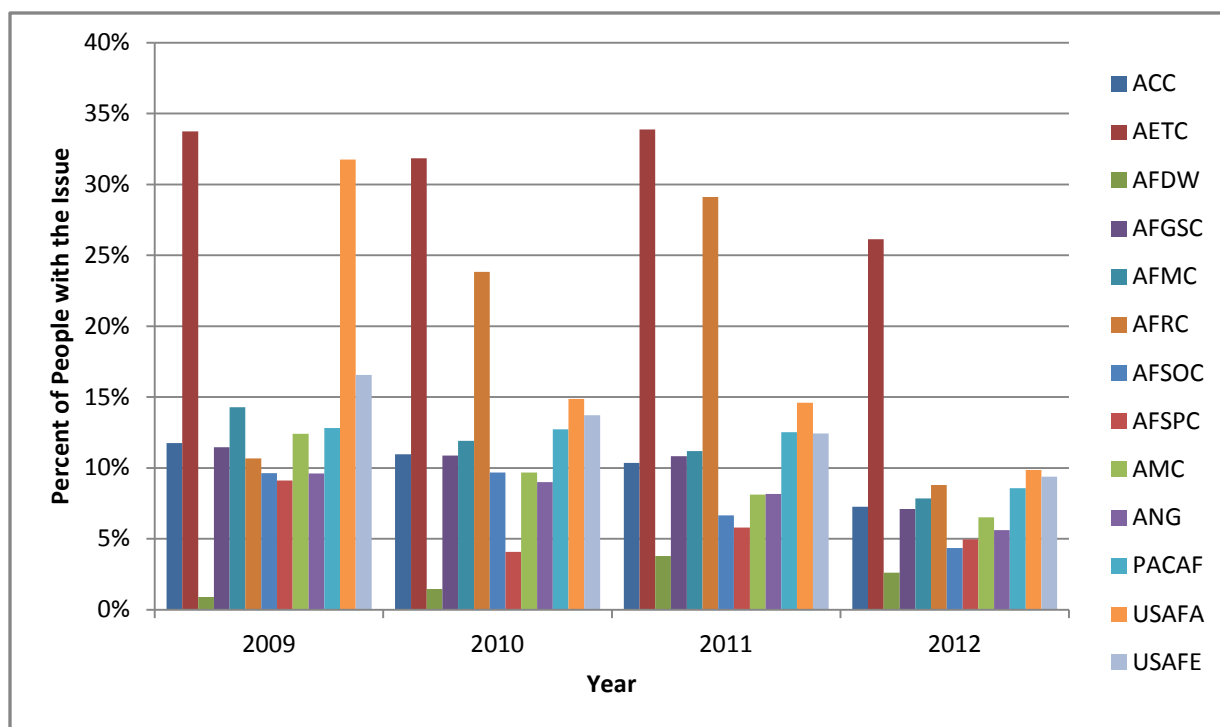


Figure 2. Percentage of Individuals Affected by the Baseline Error by USAF MAJCOM (2009-2012) (see *List of Abbreviations and Acronyms* for definitions of MAJCOMs)

Figure 3 represents the year-to-year prevalence and incidence rates of the baseline error in the USAF. The prevalence rate refers to the current overall percentage of individuals with a baseline error observed. The incidence rate refers to the percentage of individuals newly identified as having a baseline error. Once again, prevalence and incidence rates for the baseline error have continued to decrease each year from 2009-2012.

4.0 CONCLUSION

In July 2013, active duty installations were issued a memo regarding the baseline error (see Appendixes A & B). The memo explained, in detail, the origin of the baseline exam errors and the steps required to correct the records of the individuals who have a baseline issue. Lists of individuals who currently have a baseline issue within the DOEHRs-DR were sent to the installations where these individuals are currently stationed. Each installation was asked to follow the instructions provided to correct the records of these individuals to include a current baseline exam labeled with the correct reason “3 – re-established.”

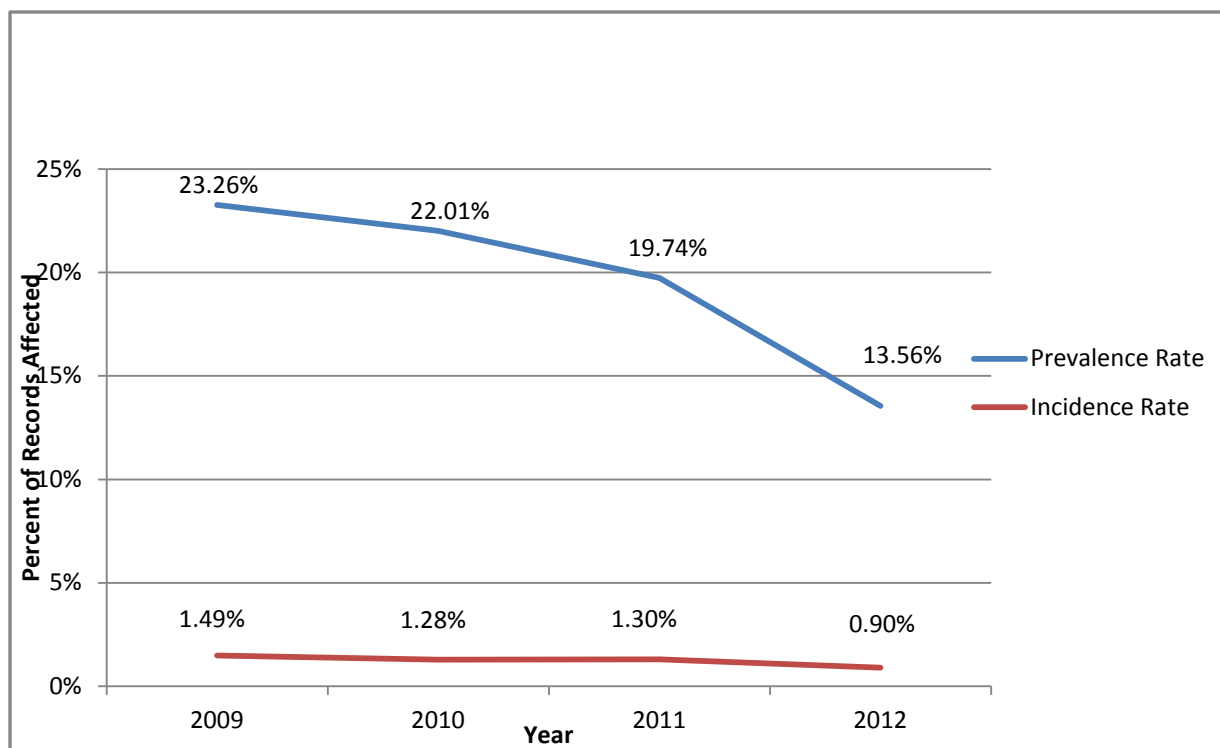


Figure 3. Prevalence and Incidence Rates of Baseline Error by Year (2009-2012)

Along with attempting to correct issues that already exist in the DOEHRS-DR records, the USAFSAM HCP section has been active in trying to prevent new instances of incorrectly labeled reference exams. These efforts include two main branches: training hearing conservation technicians on proper baseline test management through identification of incorrectly labeled tests and sending quarterly hearing conservation reports to MAJCOM and base-level public health flights (see Appendixes C & D).

As seen from the data presented above, the USAFSAM hearing conservation section has detected a decrease in the number of individuals with the baseline error from 2009 to 2012. While the reason for the decrease cannot be readily identified, increased awareness through training and modifications to the DOEHRS-HC software to avoid incorrect labeling of baseline exams may have influenced the improvement in data reporting.

APPENDIX A

Original Baseline Error Memo



DEPARTMENT OF THE AIR FORCE
USAF SCHOOL OF AEROSPACE MEDICINE (AFMC)
WRIGHT-PATTERSON AFB OH

9 July 2013

MEMORANDUM

FROM: USAFSAM/PHR
2510 Fifth St.
Wright Patterson AFB, OH 45440

SUBJECT: DOEHRS-HC DR Baseline Errors

PROBLEM

1. New business rules implemented in March 2009 for DOEHRS-HC/DR incorporated major changes to the software which affected the priority of DD Form 2215 baseline exams used during the annual exam. The DOEHRS-HC DR system will give priority to *reason "3 – Re-established after Follow Up Program"* baselines over any other baseline type. In cases where no previous *reason 3* exists, the system will use the earliest dated DD Form 2215 baseline audiogram (*reason "1- Prior to Initial Duty" or "2 – Following Exposure to Noise"*) to determine the presence of a STS on an annual audiogram. Improper coding of the baseline test in relation to the annual test may cause a false positive shift.

FACTORS BEARING ON THE PROBLEM

2. The new business rules have not been communicated effectively at base level programs. Additionally, legacy data (prior to 1997) that exists in the DR are affected by these business rules. Some annual audiograms which are "passing" (No Shift) when compared with their most current baseline in the local DOEHRS-HC system may be labeled as a STS once exported to the DOEHRS-DR system. Once records reach the DR, they are re-calculated if additional baselines exist in the central database. Because this is legacy data, the technician may not realize the baseline error is occurring.

DISCUSSION

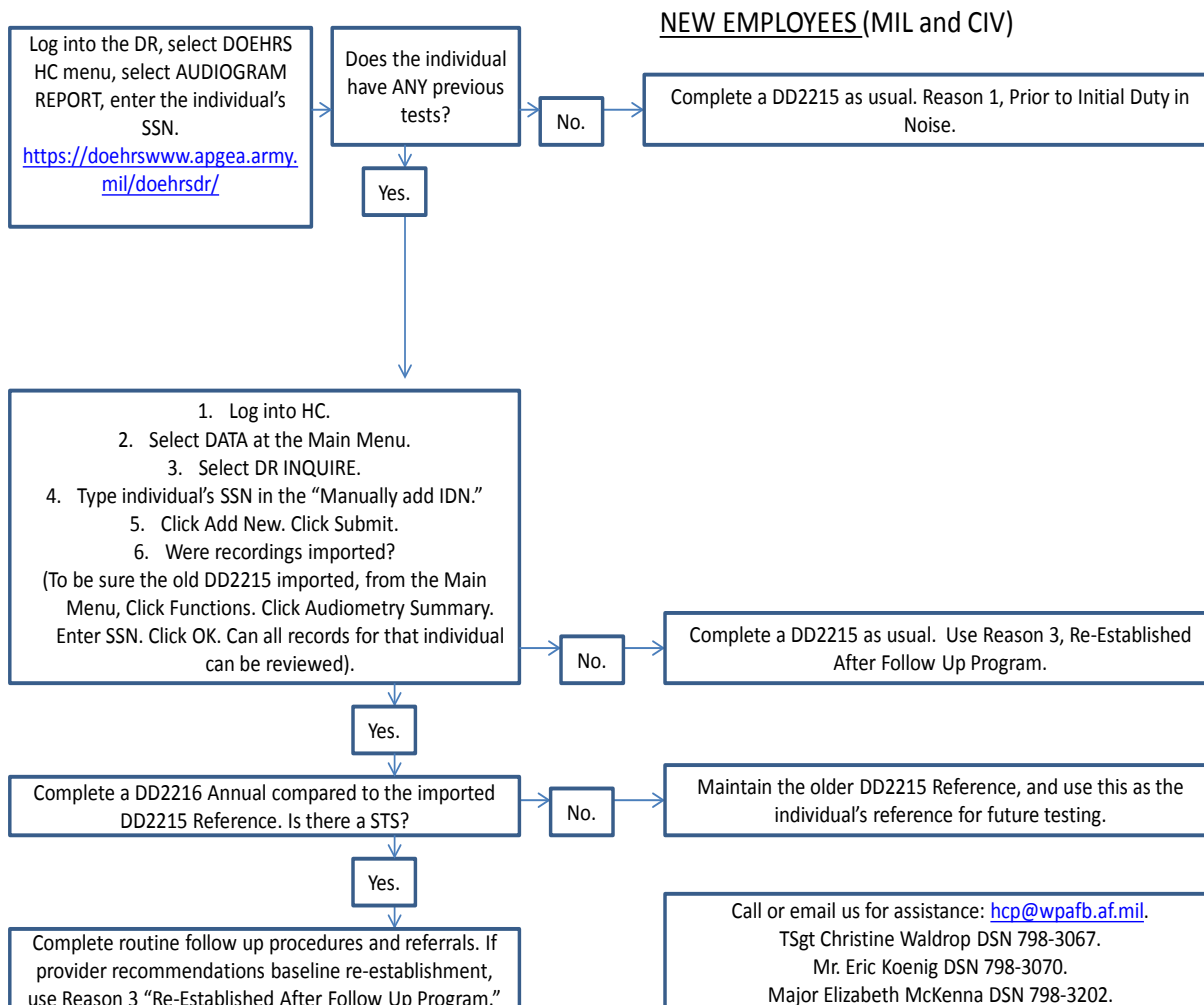
3. STS and PTS rates across the Air Force are affected at the DR level. DD Form 2215/2216 forms are misleading when printed from the DR, affecting the accuracy of medical records during military service and when received by Veterans Affairs. Air Force members working in hearing conservation need improved adherence and understanding of proper baseline creation and re-establishment.

4. USAFSAM completed an analysis on all Air Force records in the DR to capture the scope of the error (see attachments). Please note: There were 52,849 individuals across the AF who had a baseline error from 2009-2012. Out of these, 14,171 had a positive shift occur sometime after their baseline error (approx. 27%) The positive shift could have been a result of the baseline error.

ACTION RECOMMENDED

5. Train all members actively working in hearing conservation how to properly manage baselines. A list of individuals with baseline errors will be sent to each installation from USAFSAM/PHR. Fix the individual records at base level by referencing the attached instructions.

ELIZABETH MCKENNA, Maj, USAF, BSC
USAF Hearing Conservation Program Manager



Instructions to Fix DOEHRS-HC/DR Baseline Errors:

a. If the individual's most recent DD2215 baseline audiogram was created in your local DOEHRS-HC system, you should be able to edit the reason for audiogram from a "*1- Prior to Initial Duty*" or "*2 – Following Exposure to Noise*" to a "*3 – Re-established*" by doing the following:

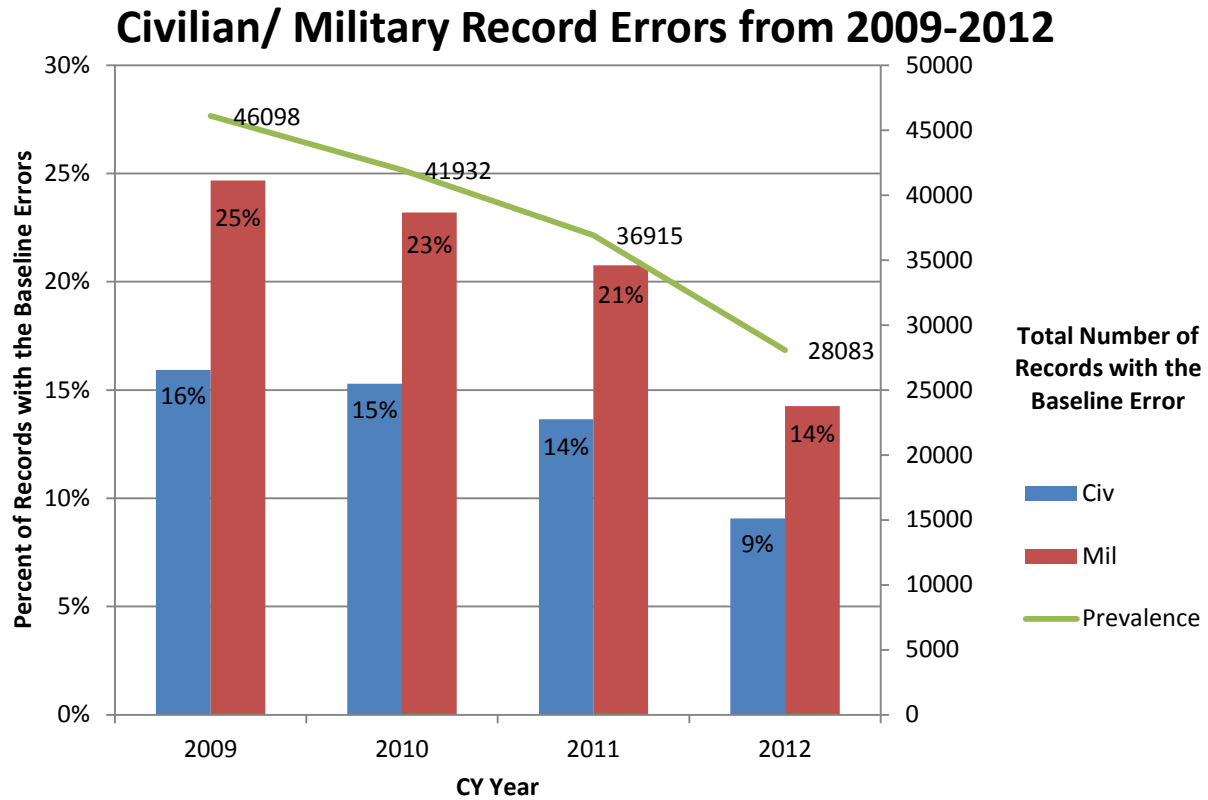
1. From the DOEHRS-HC "Edit" menu, select "Audiogram Edit."
2. Type in the individual's Social Security Number (SSN). From the list of evaluations available in the local database, select the most recent reference exam.
3. Click the "Edit" button and change the reason for audiogram to a "*3 – Re-established*" and click "Save."

b. If the individual's most recent baseline was created before 1997 (legacy data) or the most recent DD2215 baseline audiogram was created at a different location, you will not be able to edit the information. If the audiogram cannot be edited due to one of these reasons, complete the following:

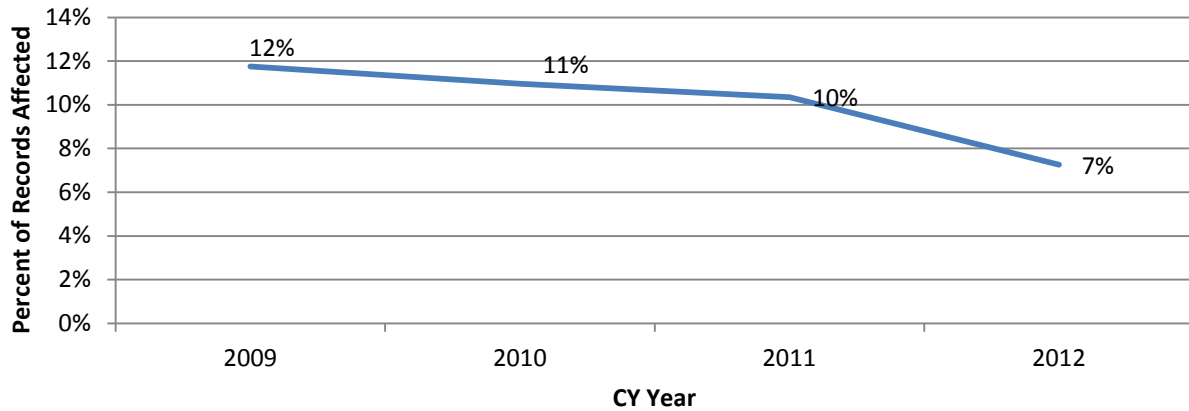
1. Have a health care provider (flight doctor or audiologist) review the individual's hearing records.
2. With the health care provider's permission, edit the last annual DD2216 exam done at your local database to a DD2215 reference exam.
3. From the DOEHRS-HC "Edit" menu, select "Audiogram Edit."
4. Type in the individual's SSN. From the list of evaluations available in the local database, select the most recent annual exam done at your location.
5. Click the "Edit" button and change the audiogram type from a DD2216 to a DD2215 with a "*3 – Re-established*" and click "Save."

4. If you have any questions or concerns please contact the Hearing Conservation Office at USAFSAM, hcp@wpafb.af.mil or DSN 798-3202.

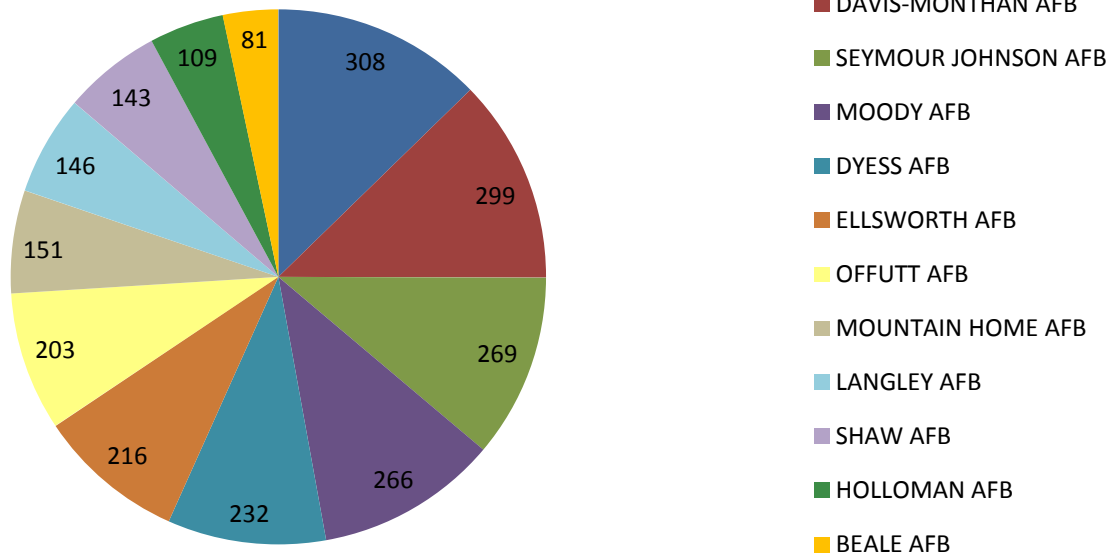
APPENDIX B
Baseline Error Graphs (MAJCOM by Year)



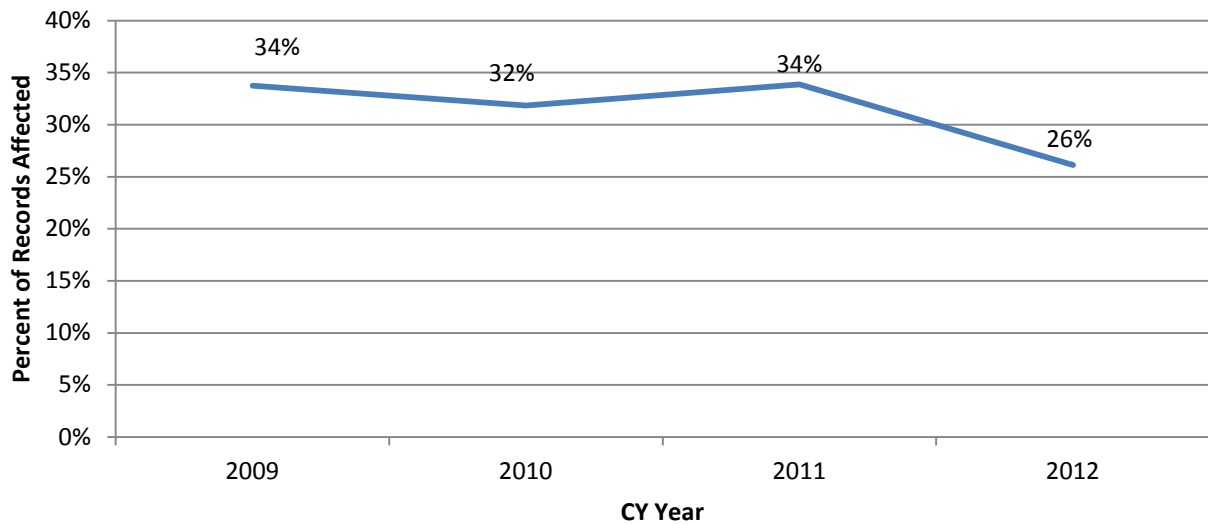
ACC



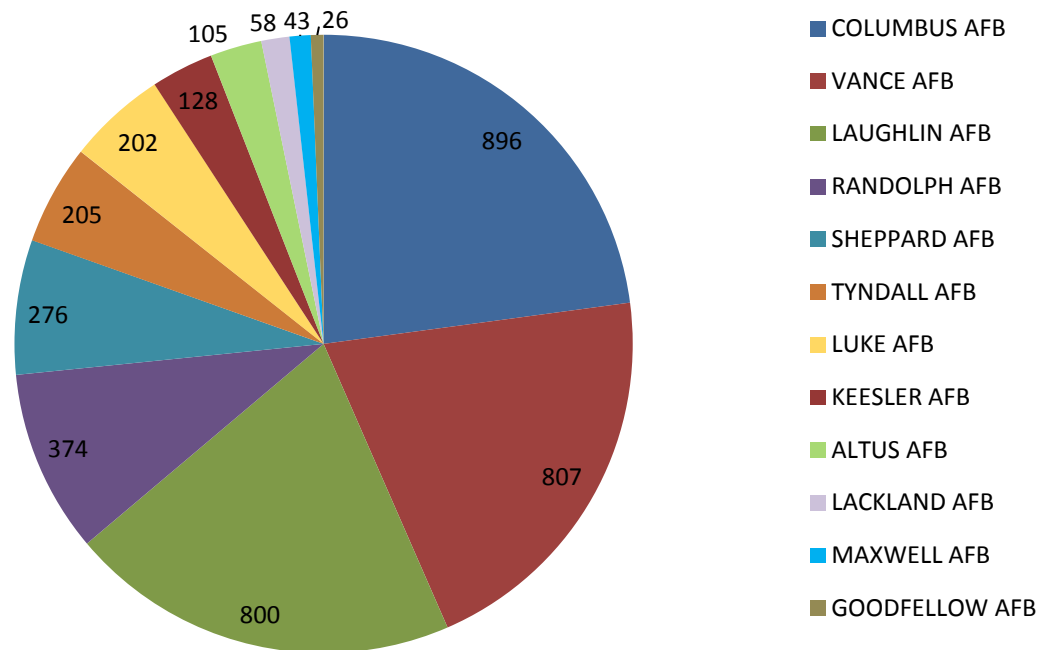
CY 2012 ACC: Number of Baseline Errors by Base



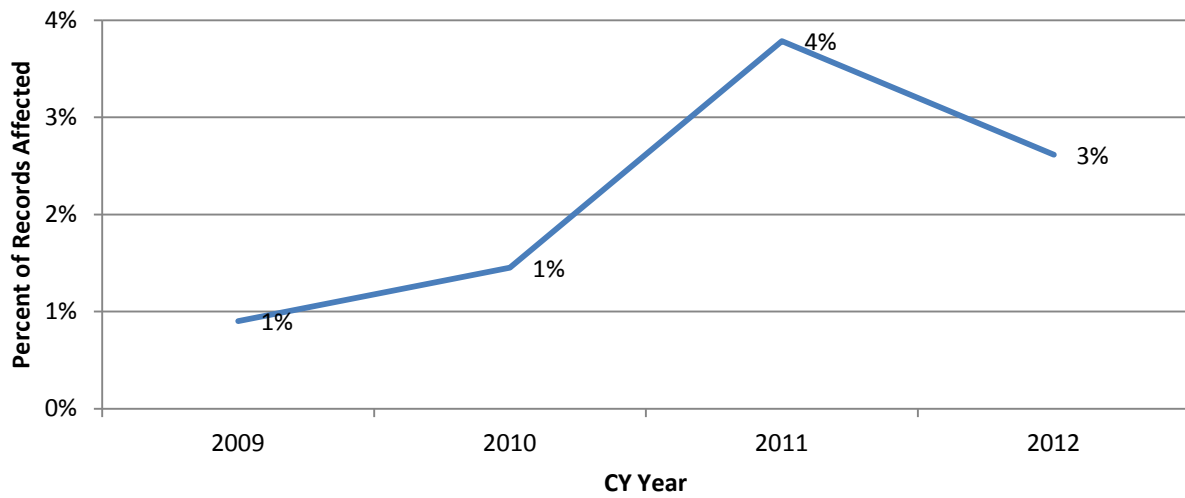
AETC



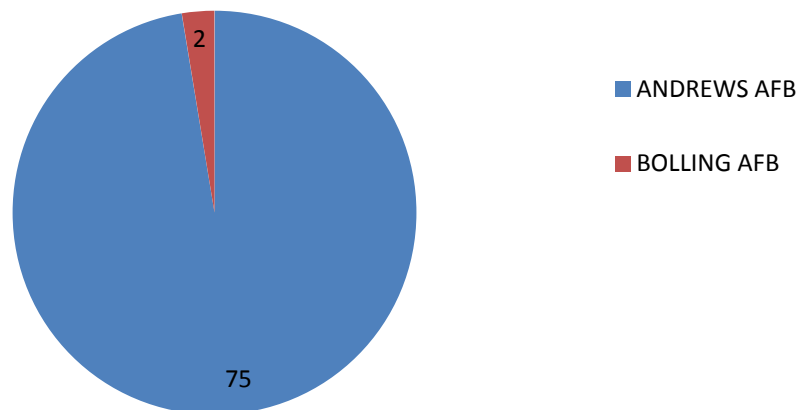
CY 2012 AETC: Number of Baseline Errors by Base



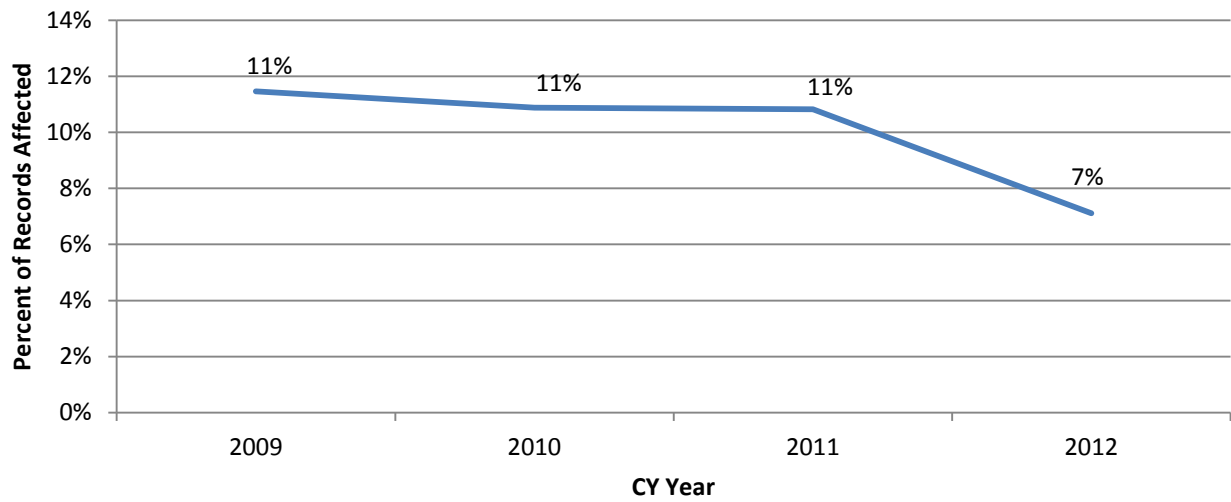
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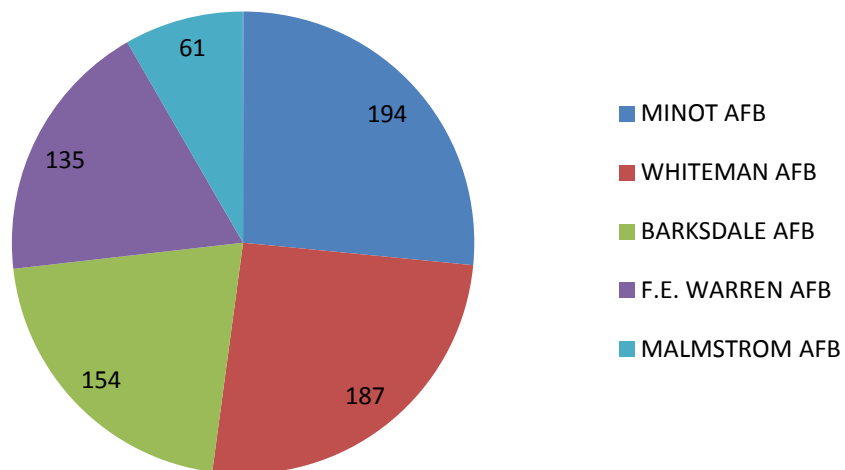
CY 2012 AFDW: Number of Baseline Errors by Base



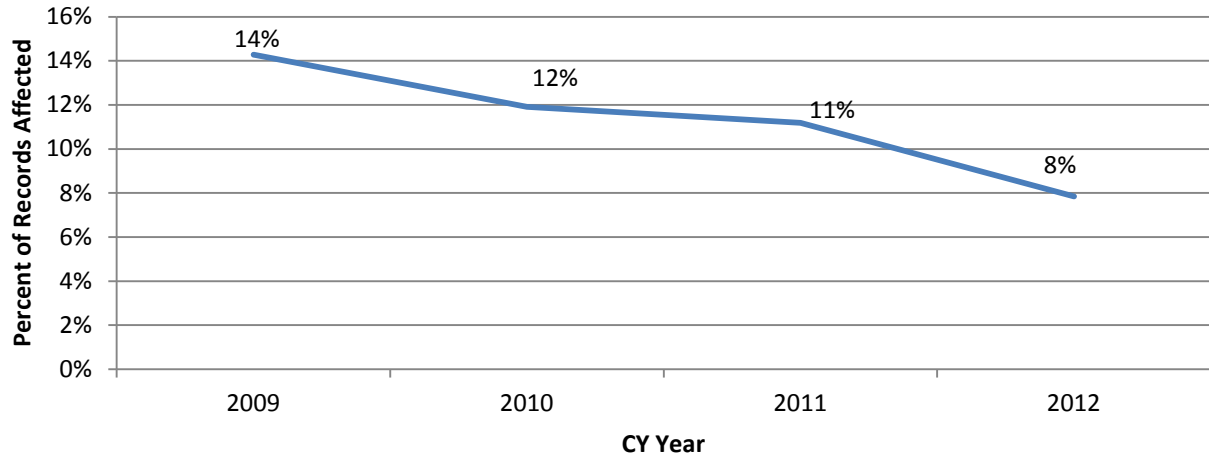
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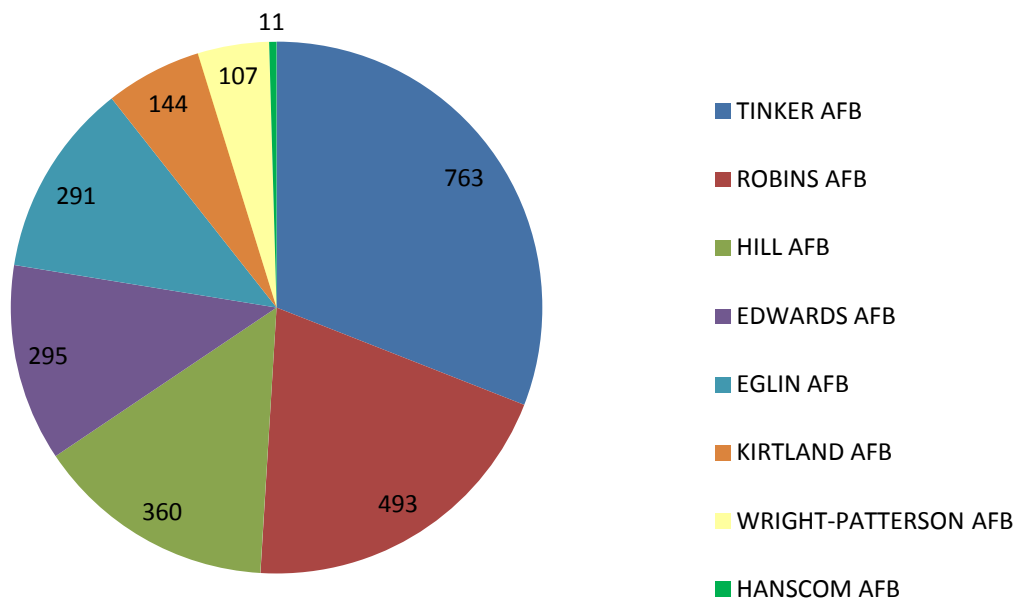
CY 2012 AFGSC: Number of Baseline Errors by Base



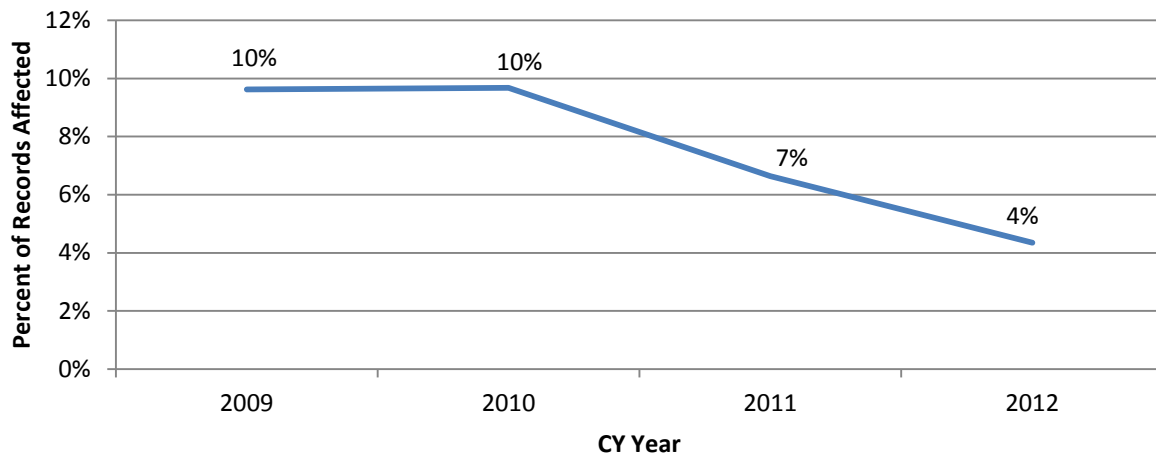
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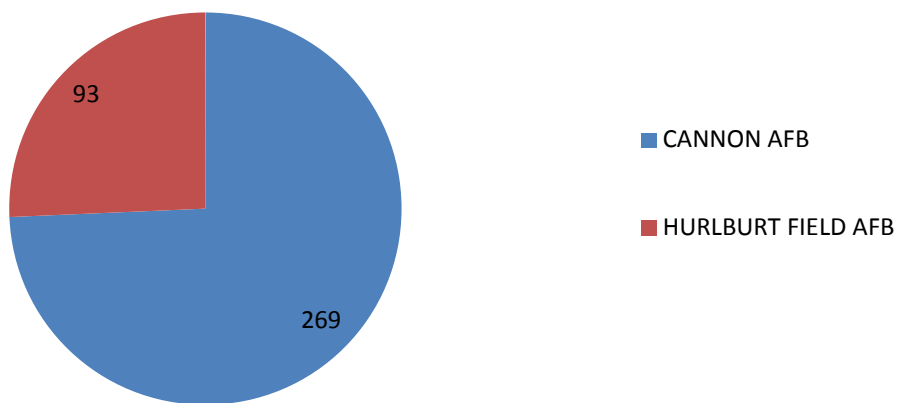
CY 2012 AFMC: Number of Baseline Problems by Base



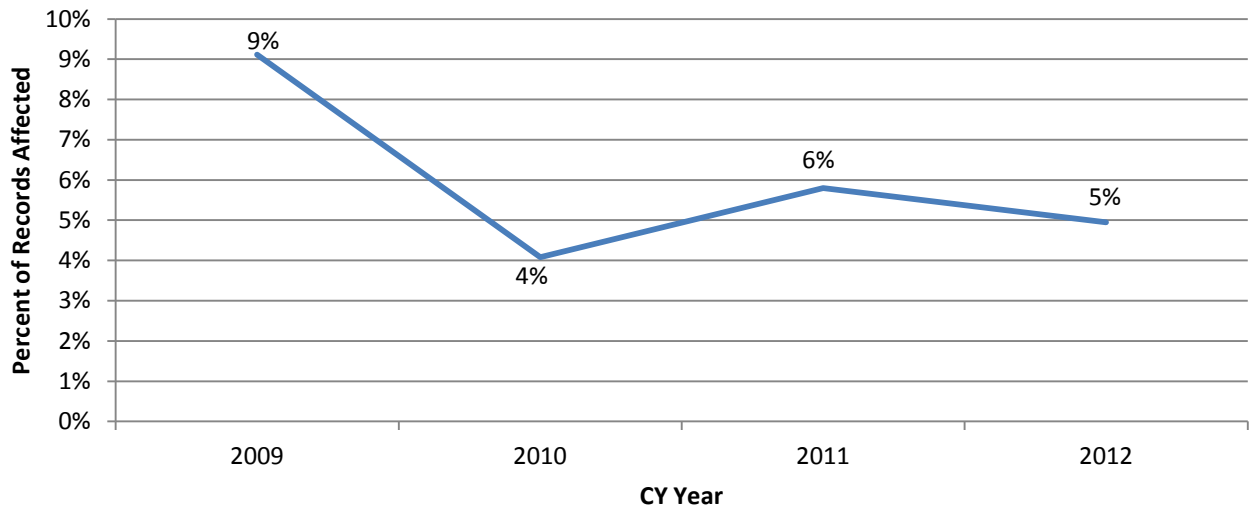
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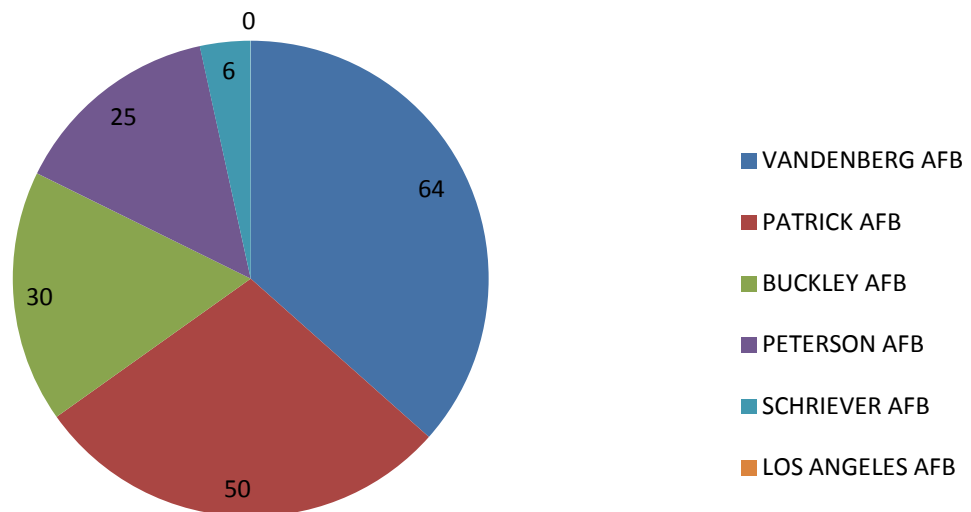
CY 2012 AFSOC: Number of Baseline Errors by Base



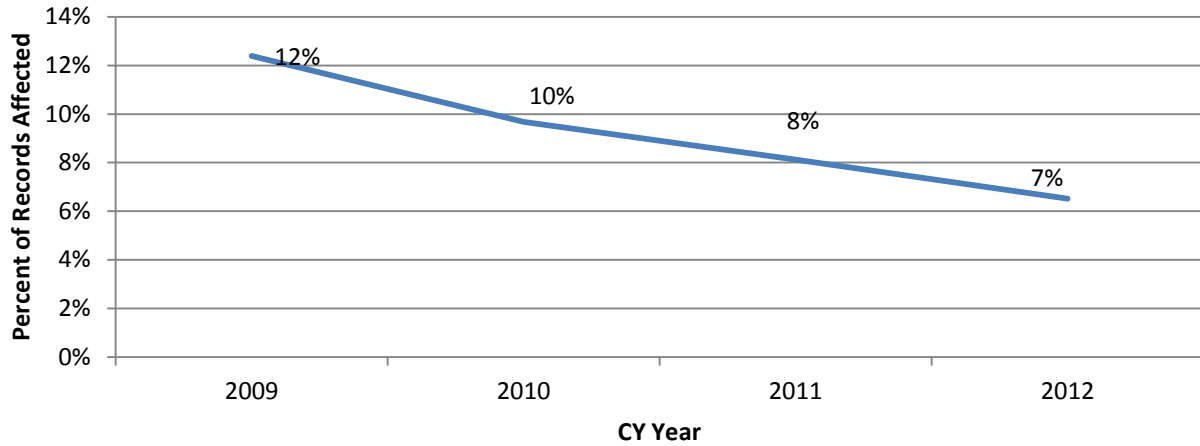
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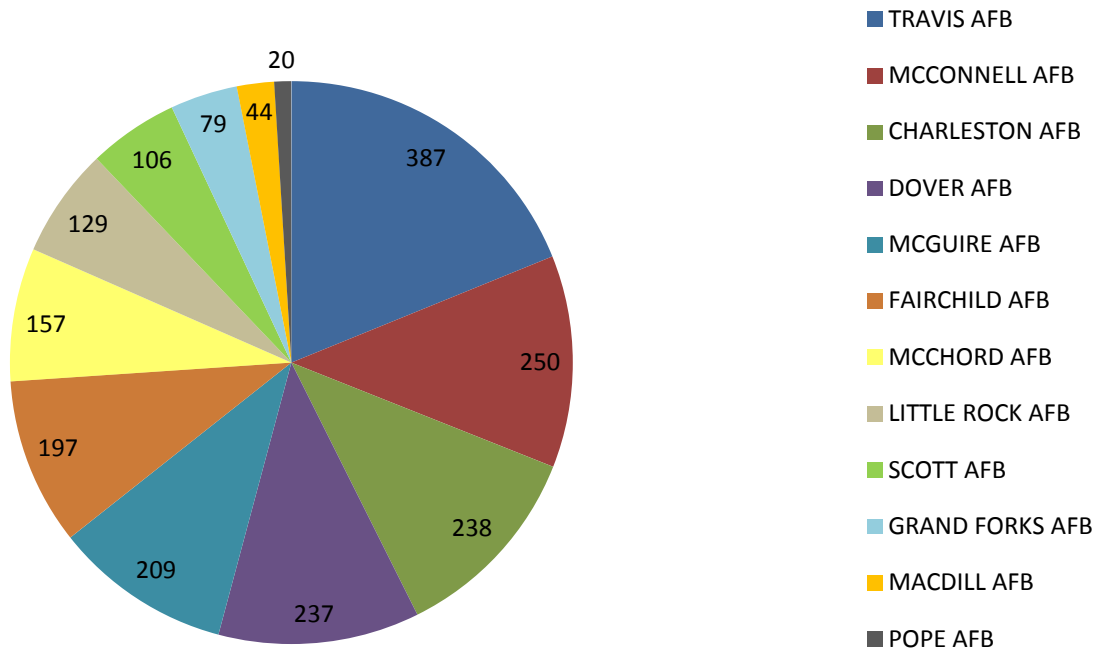
CY 2012 AFSPC: Number of Baseline Errors by Base



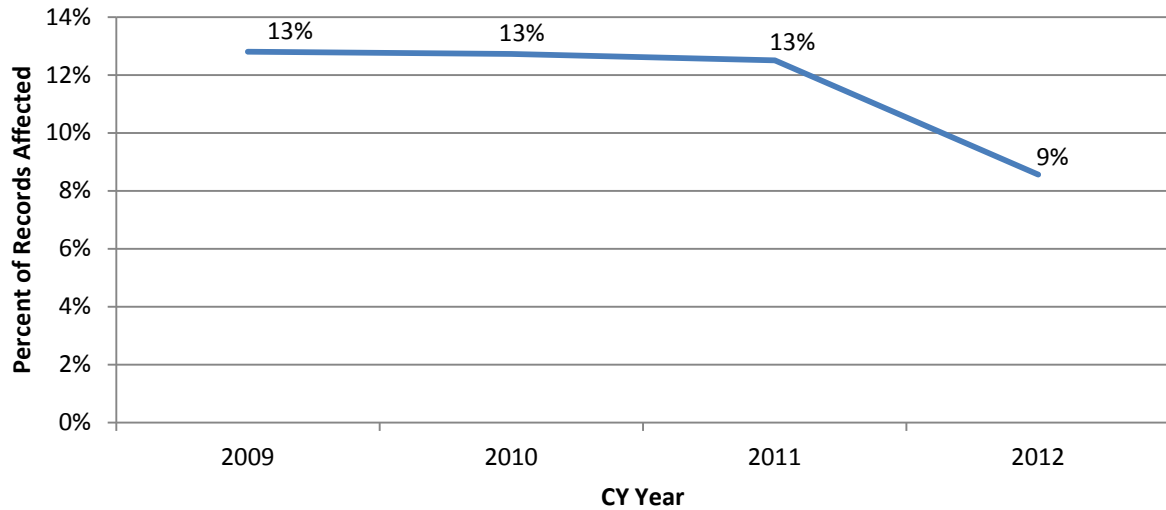
AMC



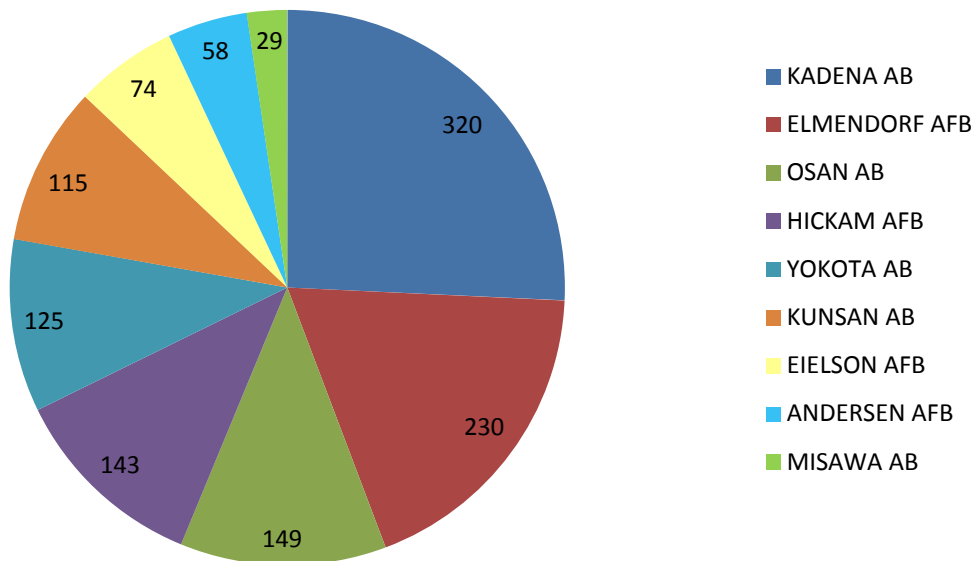
CY 2012 AMC: Number of Baseline Errors by Base



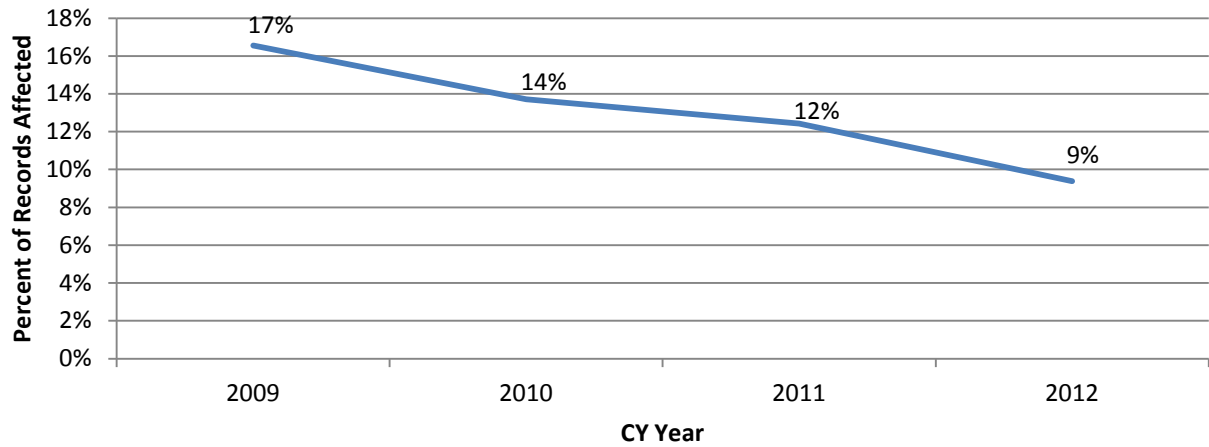
PACAF



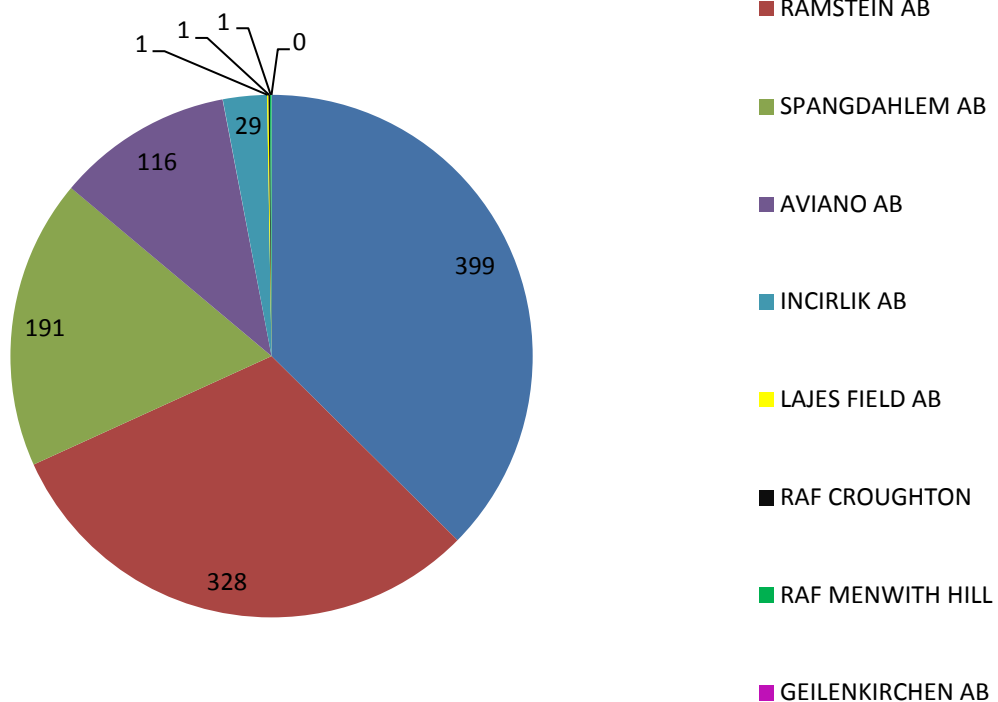
CY 2012 PACAF: Number of Baseline Errors by Base



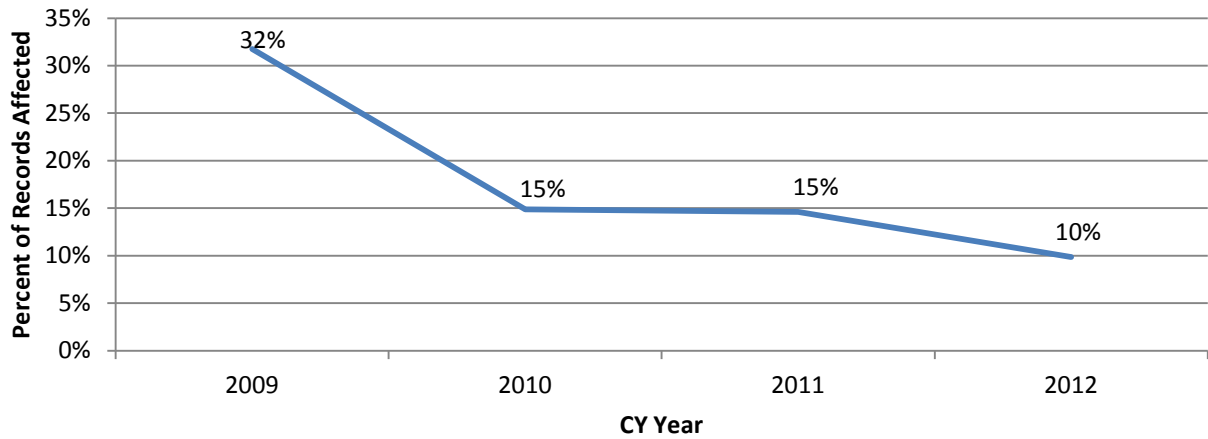
USAFE



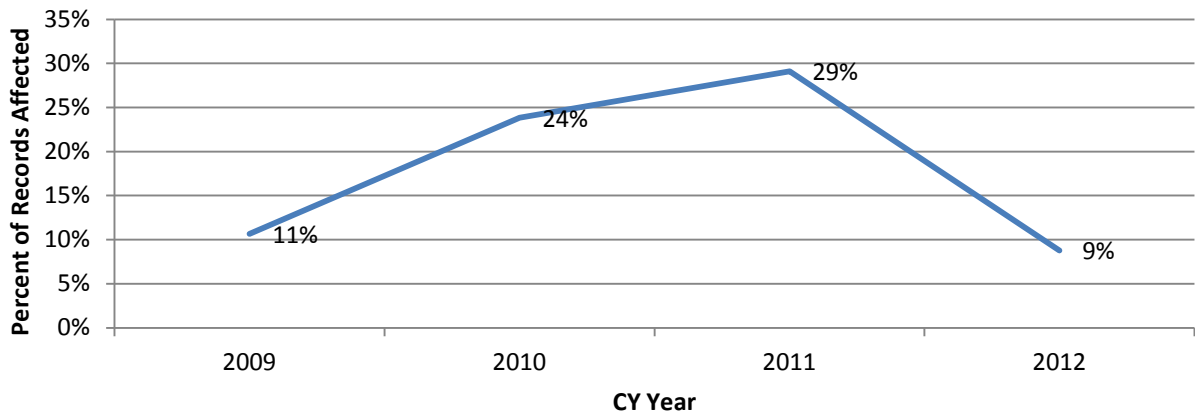
CY 2012 USAFE: Number of Baseline Errors by Base



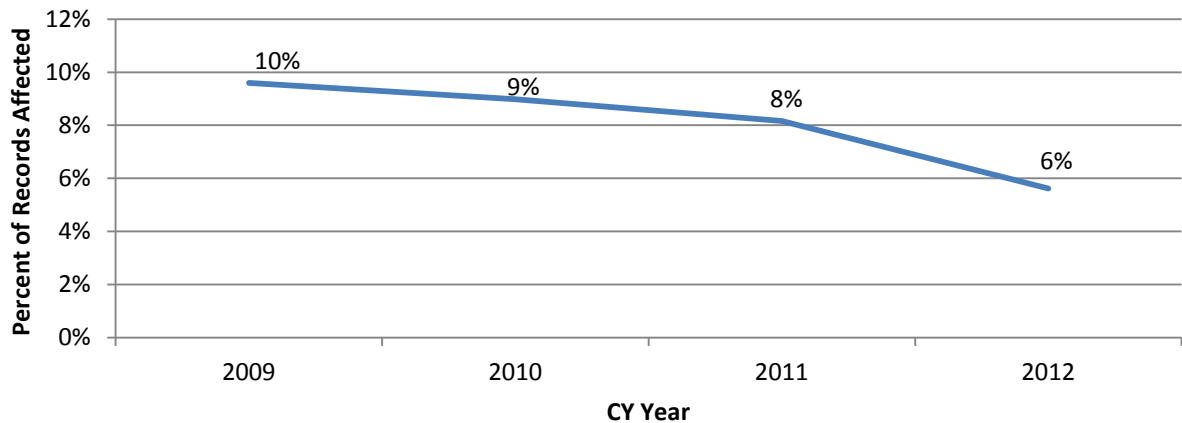
USAFA



AFRC



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APPENDIX C
Excerpt from Fall 2011 Public Health Newsletter

Fall 2011 Public Health Newsletter, page 3
Hearing Conservation Program: New Tools!

The USAF School of Aerospace Medicine Epidemiology Consult Service has developed two new tools that units can use to help monitor their Hearing Conservation Program! New reports have been developed that are base-specific and contain real individual data with actionable items. These reports are intended to provide direct feedback on testing behavior and program compliance from each unit. The data are retrieved through the DOEHSR Data Repository, utilizing the Oracle Discoverer Ad Hoc Reporting tool. Historically, PTS reports were generated directly from the data repository website but only provided a small snapshot of hearing conservation activity with aggregate data; they do not allow for monitoring PTS trends over time or provide useful feedback for examiners and program managers. Look for these reports starting mid-October 2011 on a quarterly basis.

Other detailed reports are available upon request and can be generated for a specific time period for items including, but not limited to, test date, test type, test results, AF component, by SSN, AFSC, WIC, and examiner information. Additionally, a new STS log is available that incorporates the data call numbers that are requested through the MAJCOMs biannually. Units can use this STS log, which also meets HSI requirements, to track each individual's follow-up history and disposition. The log automatically generates running tallies of the needed data call numbers for each time period. Use of this STS log is highly encouraged and will improve accurate reporting of PTS rates. The STS log may be downloaded from our website [available to those with access], under Hearing Conservation Program, Regulations and Tools: <https://gumbo2.wpafb.af.mil/epi-consult/>. Please contact us with any questions, comments, or report requests: <mailto:hcp@wpafb.af.mil>; SSgt LeMond DSN 798-3201; Capt McKenna DSN 798-3202.

APPENDIX D

Example of Quarterly Executive Summary to MAJCOM ACC Spring 2013

ACC PTS Rate – 2.71 %

Base PTS Rate:

Green: <5%; Yellow: 5-6%; Red: >6%

Beale	Davis-Monthan	Dyess	Ellsworth	Holloman	JB Langley-Eustis	Moody	Mountain Home	Nellis	Offutt	Seymour Johnson	Shaw
0.96%	3.24%	3.33%	3.40%	2.25%	2.64%	4.56%	3.68%	2.07%	4.10%	1.41%	4.29%

Percent of Cases that Were Not Followed Up Within 30 Days:

Type	Beale	Davis-Monthan	Dyess	Ellsworth	Holloman	JB Langley-Eustis	Moody	Mountain Home	Nellis	Offutt	Seymour Johnson	Shaw
F/U 1	20.00%	38.10%	50.00%	30.56%	33.33%	29.17%	46.43%	36.84%	37.93%	53.49%	17.24%	100.00 %
F/U 2	0.00%	14.29%	20.00%	18.18%	0.00%	0.00%	14.29%	0.00%	0.00%	12.50%	28.57%	0.00%

Base Export Status: (highlighted if issue)

Beale	Davis-Monthan	Dyess	Ellsworth	Holloman	JB Langley-Eustis	Moody	Mountain Home	Nellis	Offutt	Seymour Johnson	Shaw

of Incorrectly Labeled References:

Beale	Davis-Monthan	Dyess	Ellsworth	Holloman	JB Langley-Eustis	Moody	Mountain Home	Nellis	Offutt	Seymour Johnson	Shaw
0	0	0	0	0	0	0	1	1	0	0	0

*Baseline issue attributes to approximately 15% of the PTS rate among the Air Force. Refer to full report for details.

*DOEHRS-DR website is currently experiencing minor exporting issues Department of Defense-wide due to the new software from August 2012.

*Quarterly-by-base reports provide detailed explanations for each topic including patient information. Data provided allow for the Public Health technician to investigate, and correct, as required.

LIST OF ABBREVIATIONS AND ACRONYMS

ACC	Air Combat Command
AETC	Air Education and 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
DOEHRS-HC/DR	Defense Occupational and Environmental Health Readiness System Hearing Conservation/Data Repository
HCP	Hearing Conservation Program
MAJCOM	major command
PACAF	Pacific Air Forces
PTS	permanent threshold shift
SSN	Social Security Number
STS	significant threshold shift
USAFA	United States Air Force Academy
USAFE	United States Air Forces in Europe
USAFSAM	United States Air Force School of Aerospace Medicine