

Noise Induced Hearing Injury &
Comorbidities Among Soldiers
Returning from CENTCOM AO Deployment:
Apr 2003-thru June 2009



UNITED STATES ARMY PUBLIC HEALTH COMMAND (Provisional)

Institute of Public Health

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Joint Defense VA Audiology Conference,
San Diego CA, Mar 2011

UNCLASSIFIED

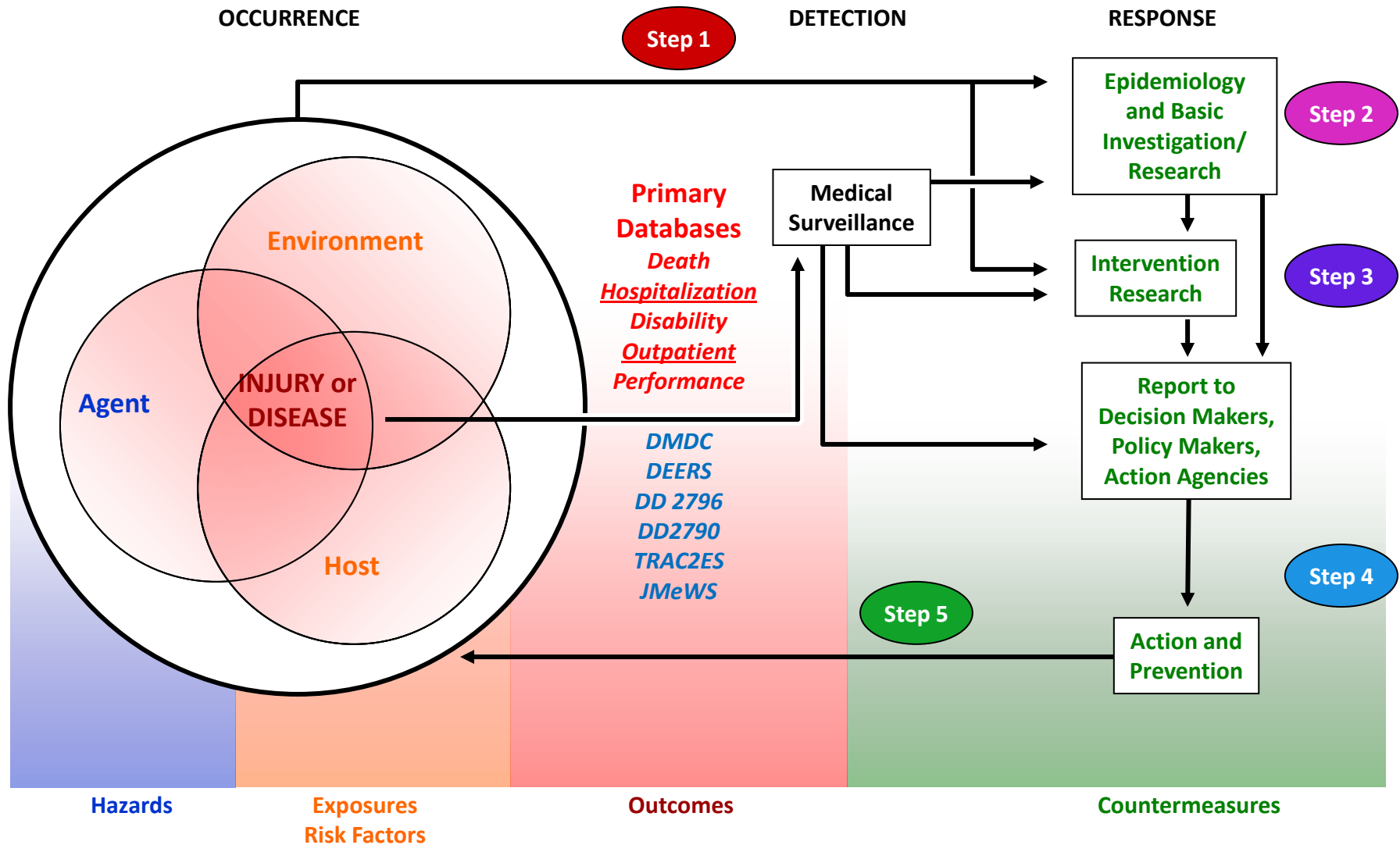
Acknowledgements

- Nikki Jordan, MPH
- Robyn Lee, MS
- Paul Pietrusiak, MPH
- CPT Kara Cave, PhD
- Dr. Kim Schairer, PhD

IPH Partnership for Public Health Analysis -
Post-deployment NIHI & comorbidities team

Overview

- ICD-9 data quality objectives (coding standards & semantic mappings)
- Demographics of Army active duty return deployers
- Epidemiological trends of postdeployment NIHI & comorbidities
- Conclusions



The Risk Management Process	
Step 1.	Identify Hazards
Step 2.	Assess Hazards
Step 3.	Develop Controls and Make Decisions
Step 4.	Implement Controls
Step 5.	Supervise and Evaluate

Steps 1-5 = Steps of the Public Health Process	
Step 1.	Identification of Problems
Step 2.	Determination of Causes
Step 3.	Determination of What Works to Prevent the problem
Step 4.	Implementation of Programs
Step 5.	Monitoring/Surveillance and Evaluation of Program/Strategy Effectiveness

Data Flows

Study 1 & 2
(2004-2007)

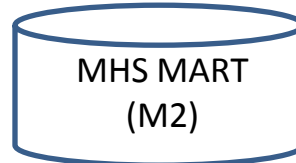
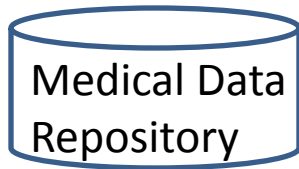
USAPHC
NIHI Analysis
Cell

Defense Manpower
Data Center



Study 2 (2006-7)
Deployment Status

ICD-9/CPT

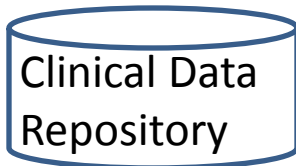


Study 1 ICD-9 &
Deployment
Status Source

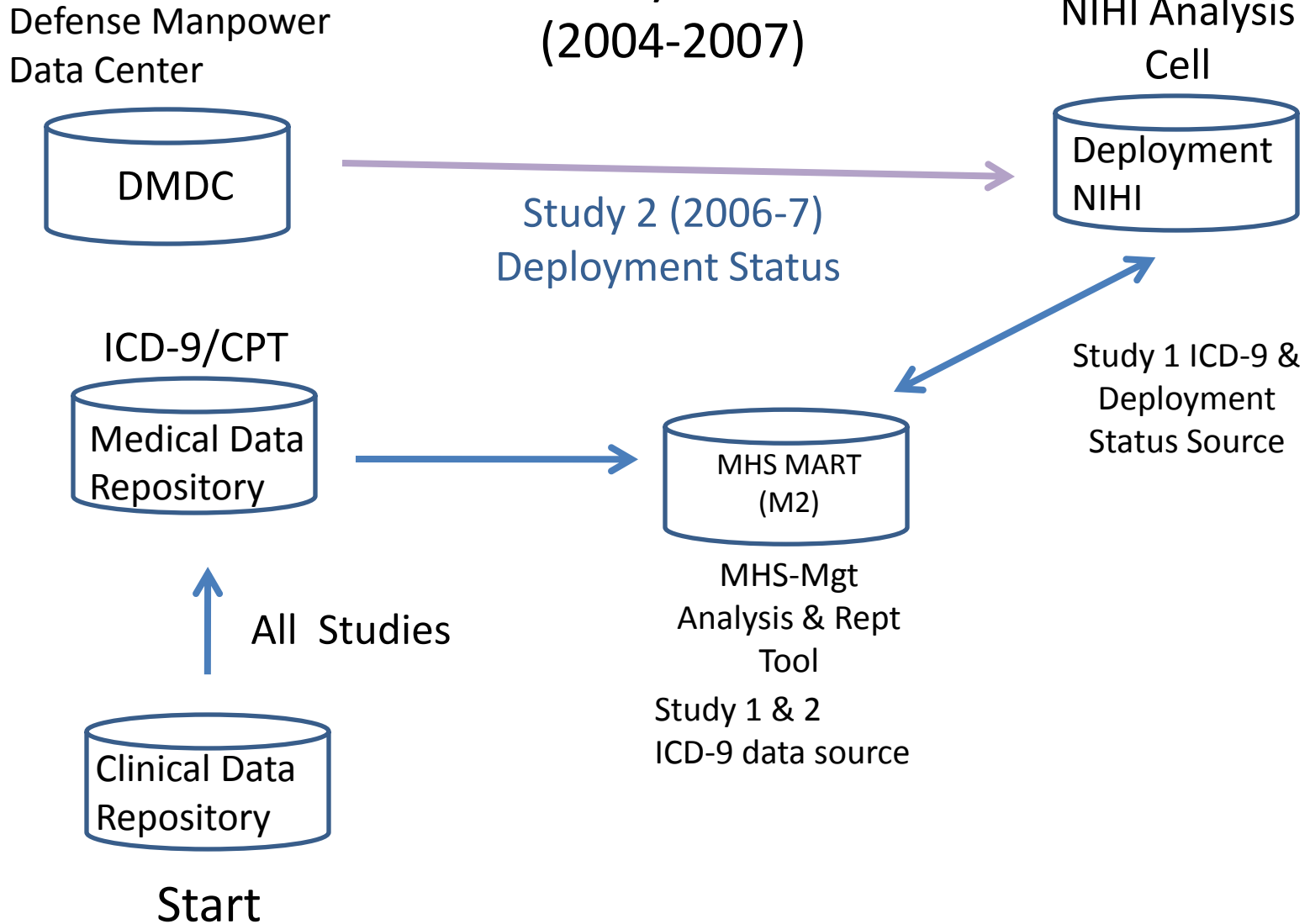
MHS-Mgt
Analysis & Rept
Tool

Study 1 & 2
ICD-9 data source

All Studies



Start



Data Flows

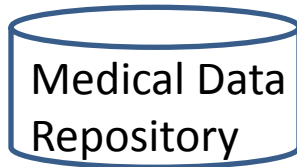
Study 3
(2008-10)

Defense Manpower
Data Center

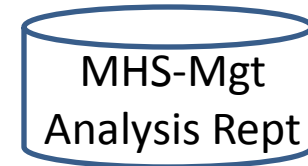


Deployment status

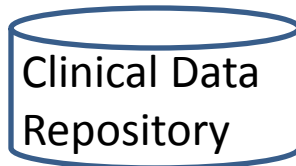
IPH NIHI
Analysis
Cell



ICD-9
42 codes
9 dx groups

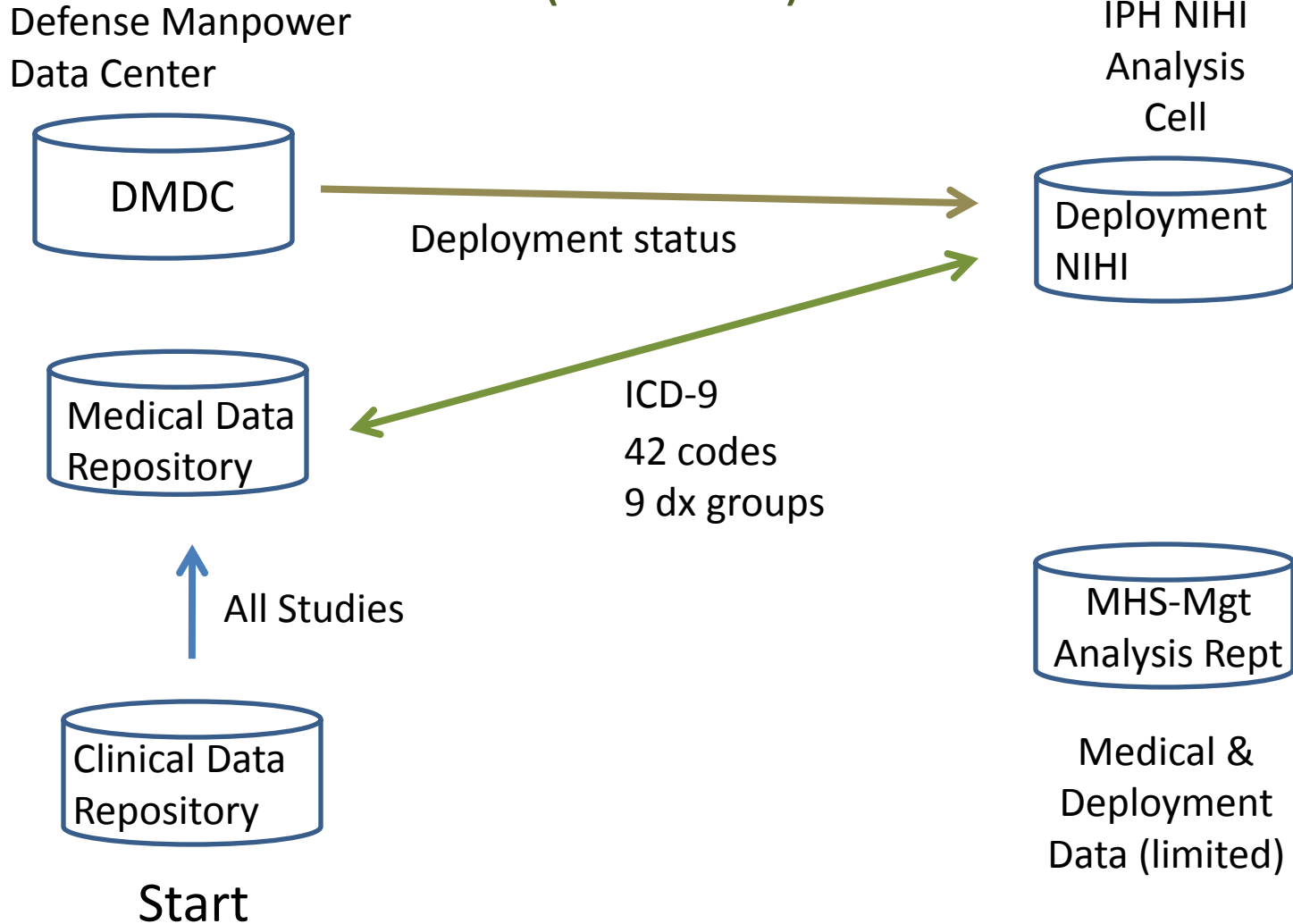


All Studies



Medical &
Deployment
Data (limited)

Start



NIHL and comorbidity watch list of ICD-9-CM major diagnostic groups

<i>ICD-9-CM</i>	<i>Condition diagnosed</i>
388.10-.12	Noise Induced Hearing Loss (NIHL)
794.15	Significant Threshold Shift (STS): (MHS Coding Guidelines since January , 2005) *
389.10-.11, 389.15-.18	Sensorineural Hearing Loss (SNHL)
850.0, 850.11-.12 850.2-.3, -.5, -.9, 959.01, V15.52	Mild Traumatic Brain Injury (mTBI) (MHS Coding Guidelines) *
388.30-.32	Tinnitus
386.1-.2; 386.8-.9, -.19; 780.4	Dizziness
384.20-.5, -.81, -.9, 385.23, 389.2	Tympanic Membrane Perforation (TMP)
784.60-.61, -.69; 787.20	Speech Language Pathologies Disorders of Interest re: Head Trauma
309.81	Post Traumatic Stress Disorder (PTSD)

NIHI ICD-9 Watch List Codes Example

code	Class	ICD-9CM root definition	Notes/MHS definition	Study Yrs
38810	NIHL	noise effects on inner ear -unspecified	NIHL	2008+
38811	NIHL	Acoustic trauma	Acoustic trauma injury	all
38812	NIHL	Noise-induced hearing loss	PTS: sensory, permanent, noise caused; <i>acoustic trauma trumps it 1st visit</i>	all
79415	Significant threshold shift	abnormal auditory function	STS (MHS coding manual Since Jan 2005)	2008+
38830	Tinnitus	Tinnitus unspecified	Question "ringing in ears"	all
38831	Tinnitus	Subjective tinnitus	"ringing in ears"	all
38832	Tinnitus	Objective tinnitus	"ringing in ears"	all

SNHL ICD-9 Watch List Codes Example

code	Class	ICD-9CM root definition	Notes/MHS definition	Study Yrs
38910	SNHL	Sensorineural hearing loss unspecified	SNHL	2009
38911	SNHL	SNHL bilateral	SNHL both ears	2009
38915	SNHL	SNHL unilateral	SNHL one ear	2009
38916	SNHL	SNHL asymmetrical	different HL's between ears	2009
38917	SNHL	Senory HL unilateral	one ear unspecified	2009
38918	SNHL	SNHL combined types bilateral	VA uses for most SNHL's	2009

Spreadsheet data combined into separate “long column” spreadsheet

code **Class**

38810 NIHL

38811 NIHL

38812 NIHL

79415 Significant
threshold
shift

38830 Tinnitus

38831 Tinnitus

38832 Tinnitus

code **Class**

38910 SNHL

38911 SNHL

38915 SNHL

38916 SNHL

38917 SNHL

38918 SNHL



Copy/Paste
Selected Codes
for Analysis

code **Class**

38810 NIHL

38811 NIHL

38812 NIHL

79415 Significant
threshold
shift

38830 Tinnitus

38831 Tinnitus

38832 Tinnitus

38910 SNHL

38911 SNHL

38915 SNHL

38916 SNHL

38917 SNHL

38918 SNHL

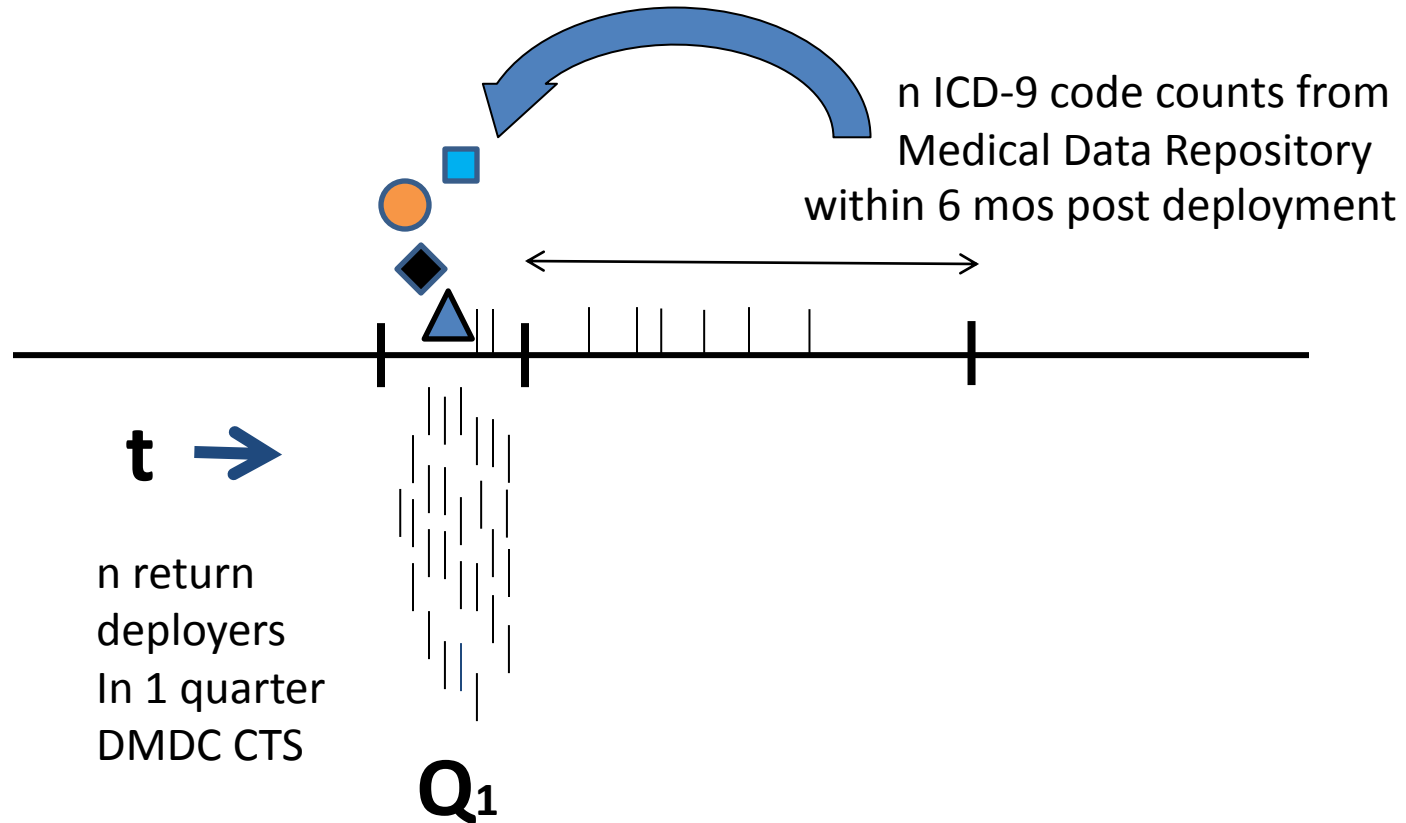


**Demographics of Army active duty population returning from deployment(s)
April 2003-June 2009 (N = 804, 535).**

**Note. This includes all deployments for the study period, therefore,
there are multiple counts for individuals with repeat deployments.**

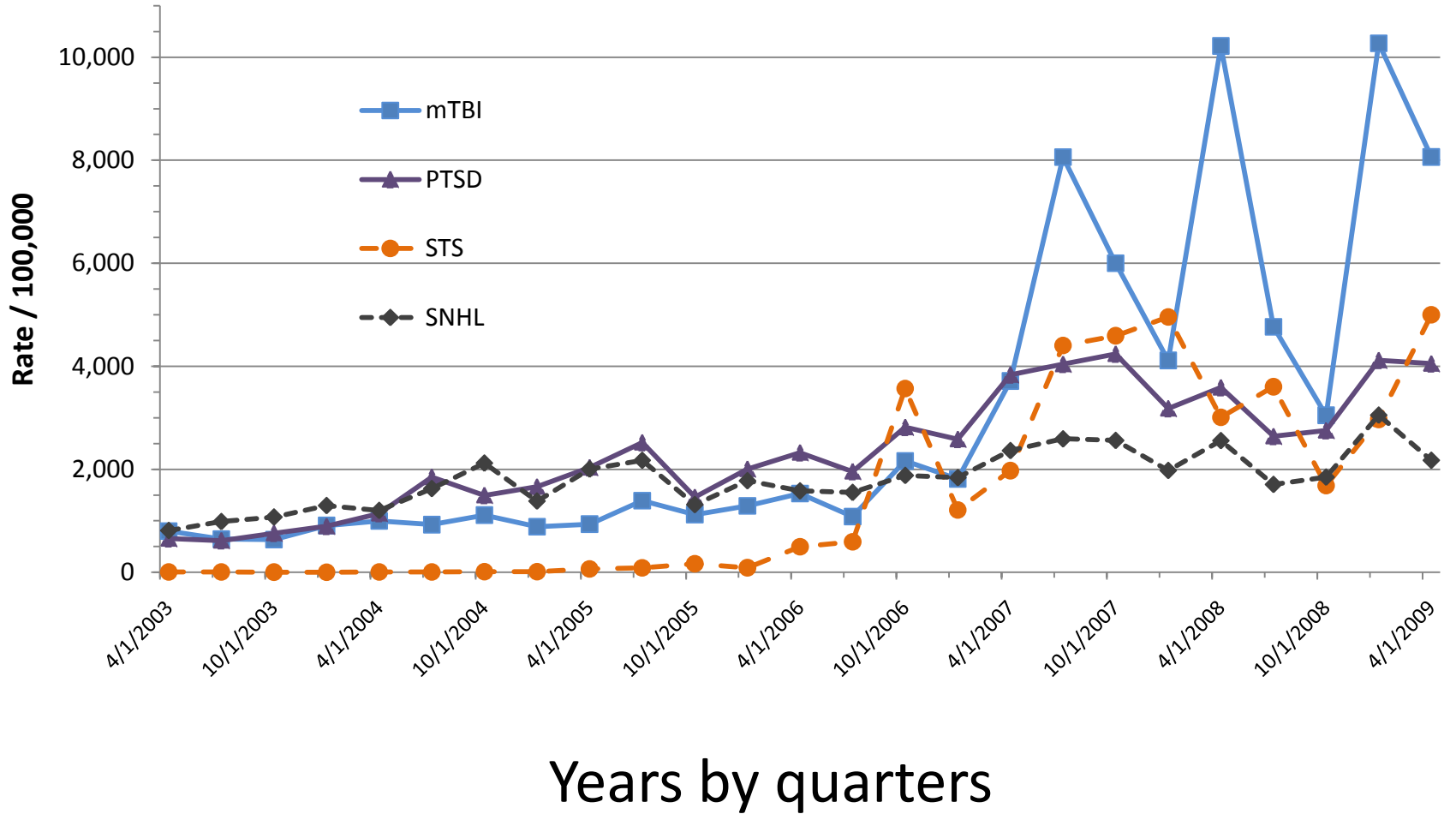
Demographics	All		Pre-Oct06		Post-Oct06	
	Frequency		Frequency		Frequency	
Age	n	%	n	%	n	%
17-24	311931	38.8%	178111	40.5%	133820	36.7%
25-34	331528	41.2%	178556	40.6%	152972	41.9%
35-44	141426	17.6%	73454	16.7%	67972	18.6%
45-54	18830	2.3%	9210	2.1%	9620	2.6%
55+	820	0.1%	334	0.1%	486	0.1%
Gender						
Male	725103	90.1%	394844	89.8%	330259	90.5%
Female	79432	9.9%	44821	10.2%	34611	9.5%
Officer status						
Enlisted	682476	84.8%	375019	85.3%	307457	84.3%
Officer	122059	15.2%	64646	14.7%	57413	15.7%

Time Series Rates: Study Design



$$\frac{\text{n ICD codes}}{\text{n returnees}} = \frac{\bar{X}}{100,000} \quad \text{Person yrs population estimate}$$

Rates per quarter

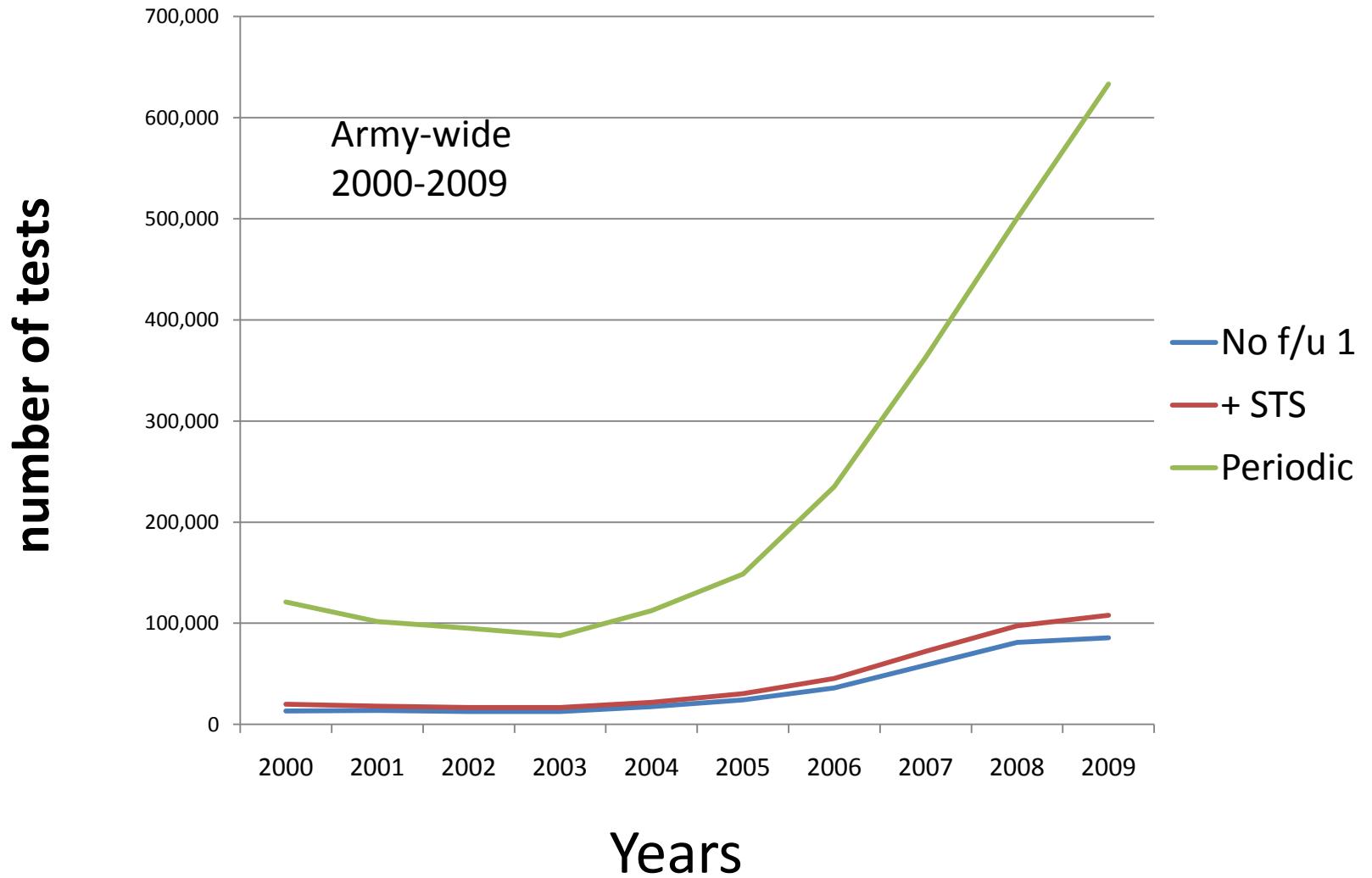


Linear Regression Estimated Slopes and 95% Confidence Intervals (CI) by Diagnostic Code Group

*** Significantly increasing slope, $p < .05$**

Diagnostic Code Group	Slope	95% CI
Tinnitus	75.2 *	[57.6, 92.7]
Tympanic Membrane Perforation	8.4 *	[4.3, 12.4]
Speech and Language Disorders	14.7 *	[11.2, 18.2]
Dizziness	33.5 *	[25.5, 41.6]
SNHL	56.9*	[35.2, 78.5]
Noise Induced Hearing Loss (NIHL)	0.6	[-9.3, 10.5]
PTSD	140*	[110, 171]
STS	206*	[143, 269]
mTBI	329*	[217, 441]

DOEHRS-HC STS from Periodic Tests 2000-09



**Demographics of Army active duty population returning from deployment(s)
April 2003-June 2009 (N = 1,206,922).**

**Note. This includes all deployments for the study period, therefore,
there are multiple counts for individuals with repeat deployments.**

Demographics	All		Before October 2006		After October 2006	
	Frequency					
	n	%	n	%	n	%
Age						
17-24	417,168	34.6	244,902	35.3	172,276	33.6
25-34	463,837	38.4	262,102	37.7	201,735	39.4
35-44	252,084	20.9	145,086	20.9	106,998	20.9
45-54	63,861	5.3	36,392	5.2	27,469	5.4
55+	9,972	0.8	6,171	0.9	3,801	0.7
Gender						
Female	122,683	10.2	72,788	10.5	49,895	9.7
Male	1,084,239	89.8	621,865	89.5	462,374	90.3
Rank Category						
Enlisted	1,025,332	85.0	594,876	85.6	430,456	84.0
Officer	181,590	15.0	99,777	14.4	81,813	16.0

Next Steps

- What percent of Soldiers with NIHI have one or more co-occurring morbidities including mTBI, PTSD, SLP disorders, etc.?
- What are the most frequently co-occurring dx groups?
- What is the temporal pattern of postdeployment diagnoses?
- NG/R estimates deployment related NIHI

Discussion

- NIHI estimates very conservative
- STS increase after 2006 due to readiness monitoring enforcement
- mTBI increase after July 2006, Army TBI message likely source of increase
- 8 of 9 dx groups show significant increase after 2006

Conclusions

- Annual recurrent reports post-deployment NIHI & comorbidities to MHS & VA starting this year
- Maintain “morbidity burden” statistics
- More detailed follow up epi reports/studies developed from refinements of study 3
- Inform research community of suggested studies needed to improve hearing services

To Replicate Army IPH Surveillance Procedures

Here are the Mission Essentials

- Maximum use of multidisciplinary SME analysis teams
- Think “learning communities’ knowledge bases”
- Transform actionable data into practice
- Apply Public Health process to deliver evidence based prevention