Burn Pit Exposures and Auditory Dysfunction Among US Military Personnel

Samrita Thapa, MPH [1,2], Wendy Helt, MA[1], Kelly M. Reavis, MPH, PhD[1,3], Sarah M. Theodoroff, PhD[1,2], Kathleen Carlson, PhD[1,4,5], Anneka Sonstroem, BA[1,2], M. Samantha Lewis, PhD[1,2,3], Carlos Esquivel, MD[6], James A. Henry, PhD[1,2]

[1]National Center for Rehabilitative Auditory Research, Portland, OR; [2]Oregon Health & Science University, Department of Otolaryngology/Head & Neck Surgery, Portland, OR; [3]School of Audiology, Pacific University, Hillsboro, OR; [4]Oregon Health & Science University, OHSU-PSU School of Public Health, Portland, OR; [5]Center to Improve Veteran Involvement in Care, Veterans Affairs Portland Health Care System, Portland, OR; [6]DoD Hearing Center of Excellence, Defense Health Agency, San Antonio, TX

U.S. Department of Veterans Affairs
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Introduction

- Hearing loss (HL) and tinnitus are common among military Service members and Veterans
- Often associated with occupational exposures
- Burn pits are a unique military exposure
  - Ignited with jet fuel – a potential ototoxic chemical[1]
  - Emit potentially harmful toxic substances and chemicals
- **AIM: To examine the association between burn pit exposure and auditory dysfunction (hearing loss, tinnitus, and subjective hearing difficulties) among Post-9/11 Service members and Veterans**

Methods

Study Sample:

- Data are from the Noise Outcomes in Service members Epidemiology (NOISE) study[2]
- Service members and Veterans deployed to Iraq or Afghanistan

Exposures:

- Burn pits (yes/no)
  - Lifetime Exposure to Noise and Solvents Questionnaire (LENS-Q)[3]

Outcomes:

- Hearing loss (yes/no): Pure tone average ≥ 20 dB HL, both ears
  - Low frequency (Freq.) HL: 0.25, 0.5, 1, 2 kHz
  - High frequency (Freq.) HL: 3, 4, 6, 8 kHz
- Tinnitus (yes/no):
  - Tinnitus Screener[4]
- Hearing Handicap Inventory for Adults[5] (yes/no):
  - Hearing difficulty = score >18
- Speech, Spatial and Qualities of Hearing Scale 12[6]

Statistical Analysis:

- Logistic regression to estimate odds ratios (OR) and 95% confidence intervals (CI)
- Linear regression to estimate mean differences and 95% CI

Results

Table 1. Sample demographics by burn pits exposure. Sex and service branch reported as n(%) and age, service duration, and deployment duration as mean (standard deviation).

	Burn Pit = Yes	Burn Pit = No
Age in years	35.1 (9.2)	33.9 (8.6)
Sex		
Male	297 (78.0)	189 (75.0)
Female	83 (21.8)	64 (25.3)
Service duration	14.0 (7.9)	13.0 (8.0)
Service Branch		
Army	180 (47.4)	95 (38.0)
Air Force	127 (33.4)	88 (35.0)
Navy/Marine Corps	73 (19.2)	70 (28.0)
Deployment duration	2.8 (3.3)	1.6 (2.5)
Service Component		
Active	297 (78.2)	186 (74.0)
Reserve/Guard	83 (22.0)	67 (26.4)

Photo credit: Reuters

Table 2. Burn pits exposure and outcomes by military status.

	Low Freq. HL (n%)	High Freq. HL (n%)	Tinnitus (n%)	HHIA (n%)	SSQ12 (mean(SD))
Service members (n=255)					
Yes (n=145)	12 (8.3)	32 (22.1)	72 (50.0)	59 (40.7)	6.7 (1.8)
No (n=110)	8 (7.3)	21 (19.1)	44 (40.0)	24 (21.8)	7.1 (1.9)
Veterans (n=378)					
Yes (n=235)	35 (15.0)	73 (31.1)	155 (66.0)	115 (49.1)	6.2 (2.0)
No (n=143)	18 (13.0)	28 (20.0)	81 (57.0)	60 (42.3)	6.6 (1.9)

Figure 1. Multivariable* logistic regression results, regressing auditory outcomes on burn pits exposure.

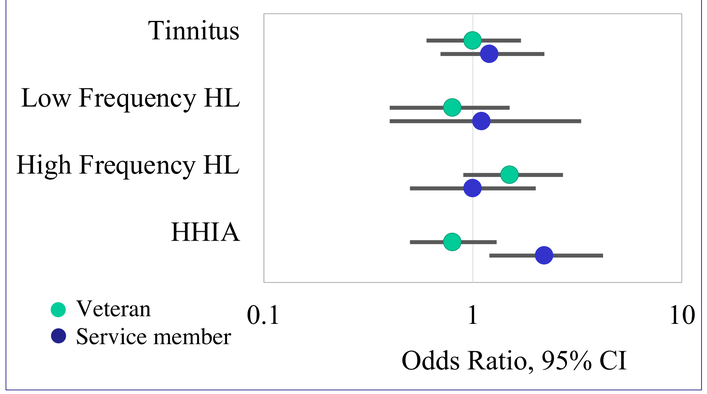

Table 3. Multiple* linear regression results, regressing SSQ12 on burn pits exposure. Mean difference and 95% CI.

	Service Members	Veterans
SSQ12	-0.2 (-0.7-0.2)	-0.1 (-0.5-0.3)

**Adjusted for age, sex, service branch, service component, service duration, deployment duration, noise exposure and TBI*

Discussion

- We didn't find evidence of associations between burn pits and auditory outcomes
- Our data do suggest that Service members have **increased odds** of subjective hearing difficulty (HHIA score) among those exposed to burn pits (OR=2.2, 95% CI: 1.2-4.2)
- Limitations:
  - burn pit exposure duration
    - measurement error
  - residual confounding
- Future directions:
  - link exposure data to DoD and VA burn pits registry
  - examine longitudinal data to assess the stability of associations over time
  - evaluate the associations between burn pits exposure and measures of hearing that are more likely to reflect central auditory structures

References

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