

# Noise Outcomes in Service Members Epidemiology (NOISE) Study: Understanding Changes in Tinnitus Using Markov Probabilities

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## Introduction

- The **Noise Outcomes in Service Members Epidemiology (NOISE) study** examines the prevalence and progression of **early-onset tinnitus** in active-duty Service members (ADSMs) and recently separated Veterans.<sup>1</sup>
- ADSMs and Veterans have a **higher prevalence of tinnitus** and hearing loss compared to the general population, likely due to noise exposure and other factors related to military service.<sup>2</sup>
- In military personnel, **tinnitus adversely affects** job performance, concentration, anxiety, depression, and sleep.<sup>3</sup>
- This analysis describes the **transitions between tinnitus states** (occurrence of tinnitus) in a sample of ADSMs and Veterans enrolled in the NOISE study.
- Understanding the longitudinal trajectory and progression of tinnitus will **inform prevention strategies**.

## Methods

### Participants:

- ADSMs (n=148)
- Veterans (n=299)

### Outcomes:

- Presence of tinnitus was determined using the Tinnitus Screener (TS).<sup>4</sup>
  - TS also captured tinnitus onset and transitions across tinnitus states.
  - Participants were categorized as having:
    - No tinnitus
    - Temporary/occasional tinnitus
    - Intermittent tinnitus
    - Constant tinnitus
- } *Tinnitus negative*  
} *Tinnitus positive*

### Analysis:

- A Markov transition matrix was used to examine transitions between tinnitus states using data from baseline and at three-years follow-up.

## Results

**Table 1.** Demographic characteristics of study sample. N(%) displayed unless otherwise indicated.

	ADSMs n(%)	Veterans n(%)
Age in years, mean (SD)	35(8.4)	37(10.2)
Sex		
Male	89(60%)	243(81%)
Female	59(40%)	56(19%)
Race		
Race other than White	23(16%)	41(14%)
White	110(74%)	230(77%)
More than one race	12(8%)	18(6%)
Prefer not to answer	3(2%)	3(3%)
Ethnicity		
Non-Hispanic/Latino/Spanish	120(81%)	274(92%)
Hispanic/Latino/Spanish	27(18%)	21(7%)
Prefer not to answer	1(1%)	4(1%)
Service in years, mean (SD)	12.4(7.7)	13.8(9.2)

**Table 2.** Markov matrix. Percentage of ADSMs and Veterans that reported tinnitus or no tinnitus, 3 years following baseline administration of the Tinnitus Screener.

Tinnitus at Baseline	Tinnitus 3 Years Later		Total
	Negative*	Positive†	
Negative*	186 (80.5%)	45 (19.5%)	231
Positive†	35 (16.2%)	181 (83.8%)	216
<b>Total</b>	<b>221</b>	<b>226</b>	<b>447</b>

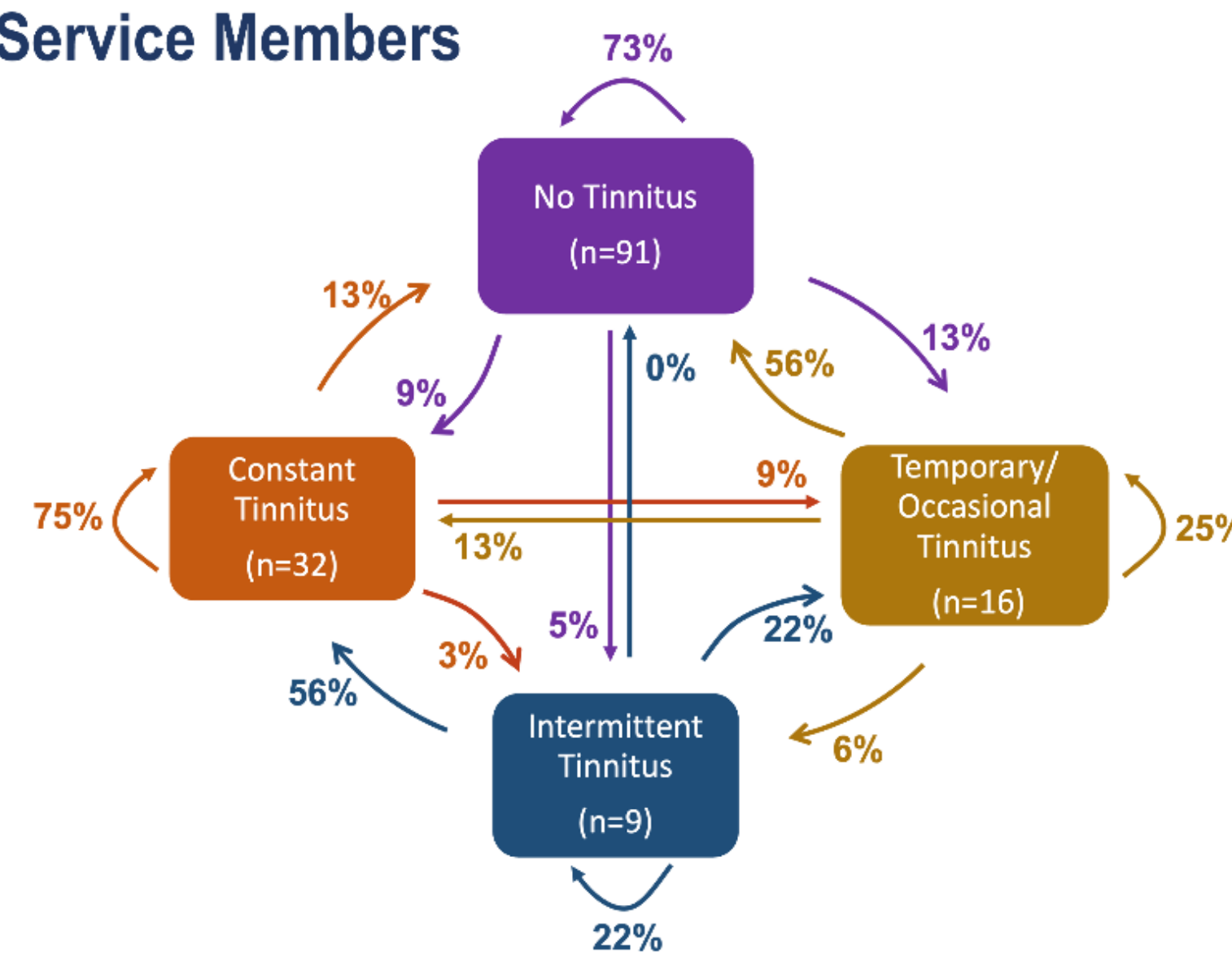
\*Tinnitus negative includes No tinnitus and temporary/occasional tinnitus  
†Tinnitus positive includes intermittent and constant tinnitus

*Approximately 20% of the entire sample (ADSMs and Veterans) without tinnitus had developed tinnitus within 3 years (either intermittent or constant)*

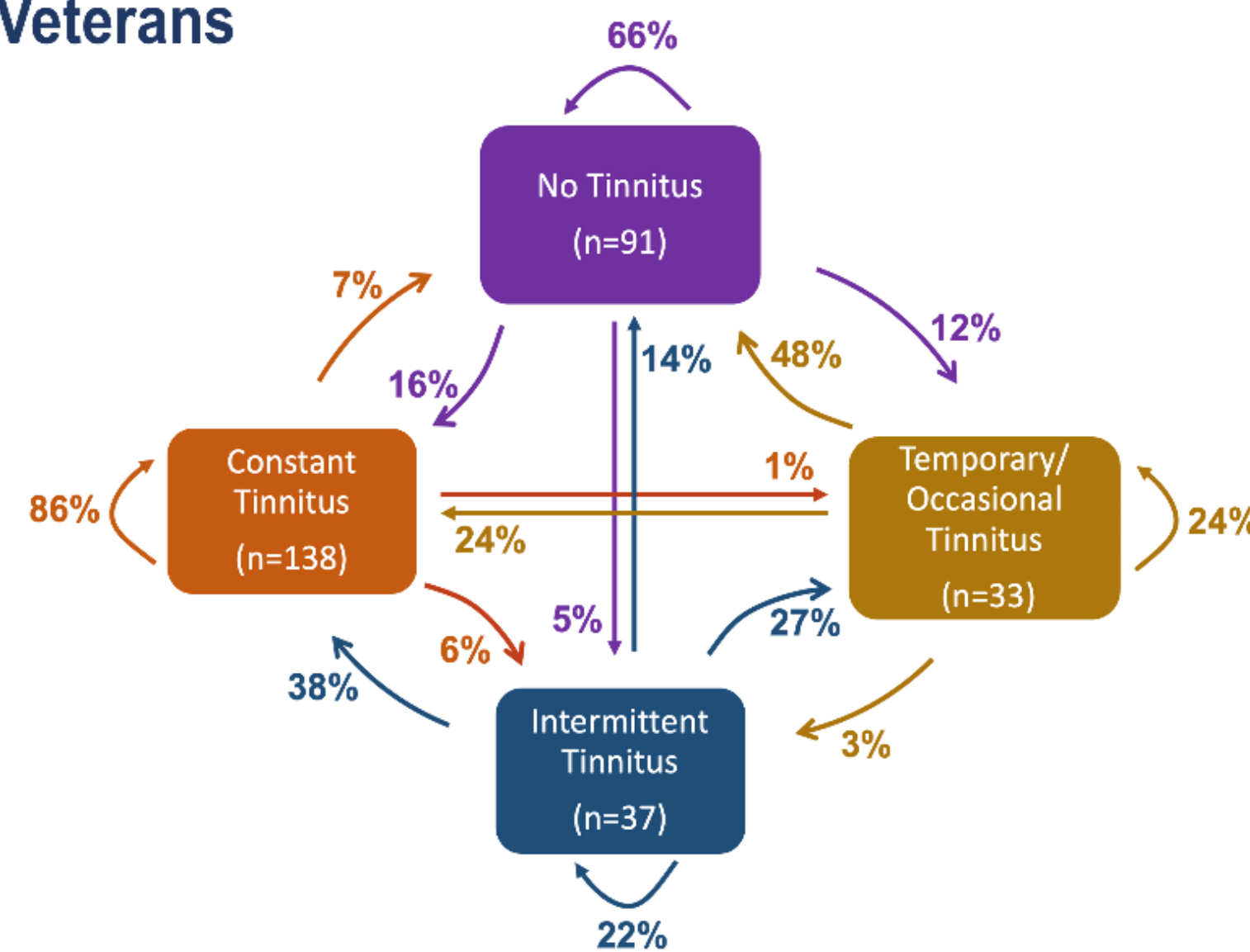
## Results

**Figure.** Transitions to different tinnitus states 3 years following baseline test. Each node notes the number of study participants within that state at baseline. Arrows highlight the transitions and their probability to other tinnitus states given their state at baseline. Figure paneled by military status at baseline.

### Service Members



### Veterans



*Approximately 56% of Service Members and 38% of Veterans, who initially reported "intermittent tinnitus", transitioned to "constant tinnitus" within 3 years*

## Conclusions

- Suggested revision: Among ADSMs and Veterans of similar age and years of service, more Veterans (16%) than ADSMs (9%) transitioned from no tinnitus at baseline to constant tinnitus 3 years later.
- Participants who reported intermittent tinnitus (vs. no tinnitus or temporary/occasional tinnitus) at baseline had a greater likelihood of later developing constant tinnitus.
  - A high percentage of participants with baseline intermittent tinnitus reported constant tinnitus 3 years later (ADSM 56%, Veterans 38%).
  - About half of those with temporary/occasional tinnitus at baseline subsequently reported no tinnitus at 3 years.
  - The transition between tinnitus states over time can be combined with information about military service exposures to determine how these transitions may be associated with such exposures.
- These findings may offer opportunities for hearing health care personnel to intervene and potentially prevent tinnitus onset and progression.

## References

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For more information about the NOISE Study, please scan the QR code:

