



# Diagnostic Differences of Hearing Loss and Central Auditory Processing Disorder Following Varying Frequency of Temporary Auditory Threshold Shift on a Global Scale: A Comparative, Retrospective Real-World Data Analysis

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## OBJECTIVES

Through loud volume in headphones, live music events, or traumatic events, noise-induced hearing loss is experienced globally, with approximately 13% of adults in America affected in some capacity by hearing loss. Specifically with short term bursts of loud volume at or above 120 decibels, Temporary Auditory Threshold Shift (TATS) occurs when hairs within the ear are displaced due to large amounts of auditory input, but do not immediately return to their stationary position, resulting in briefly obstructed hearing but may result in permanent hearing loss if frequently experienced. One condition that may be attributed to repeated hearing loss is Central Auditory Processing Disorder, where there is a delay or deficit in the brain’s ability to preserve, refine, analyze, modify, organize, and interpret information from the auditory peripheral system<sup>2</sup>. This study aims to ascertain the difference in diagnosis of hearing loss and Central Auditory Processing Disorder (CAPD) in patients with recurrent TATS (rTATS) and patients with a single instance of TATS.

## METHODS

The TriNetX Global federated network of deidentified patient data was used to identify patients diagnosed with TATS<sub>a</sub>, whom had no prior diagnosis of unspecified hearing loss<sub>b</sub>. Cohorts were then separated based on recurrence or nonrecurrence of TATS, with Cohort 1 requiring patients have at least two instances of TATS diagnosis in their record and Cohort 2 maintaining no additional TATS diagnosis beyond one instance. Patients were propensity score matched on age, sex, race, and ethnicity to prevent confounding by demographic factors, then followed and analyzed for the outcomes of unspecified hearing loss<sub>c</sub> and CAPD<sub>d</sub> at any point following first diagnosis in Cohort 1 or only diagnosis in Cohort 2.

Figure 1. Cohort Criteria flowchart

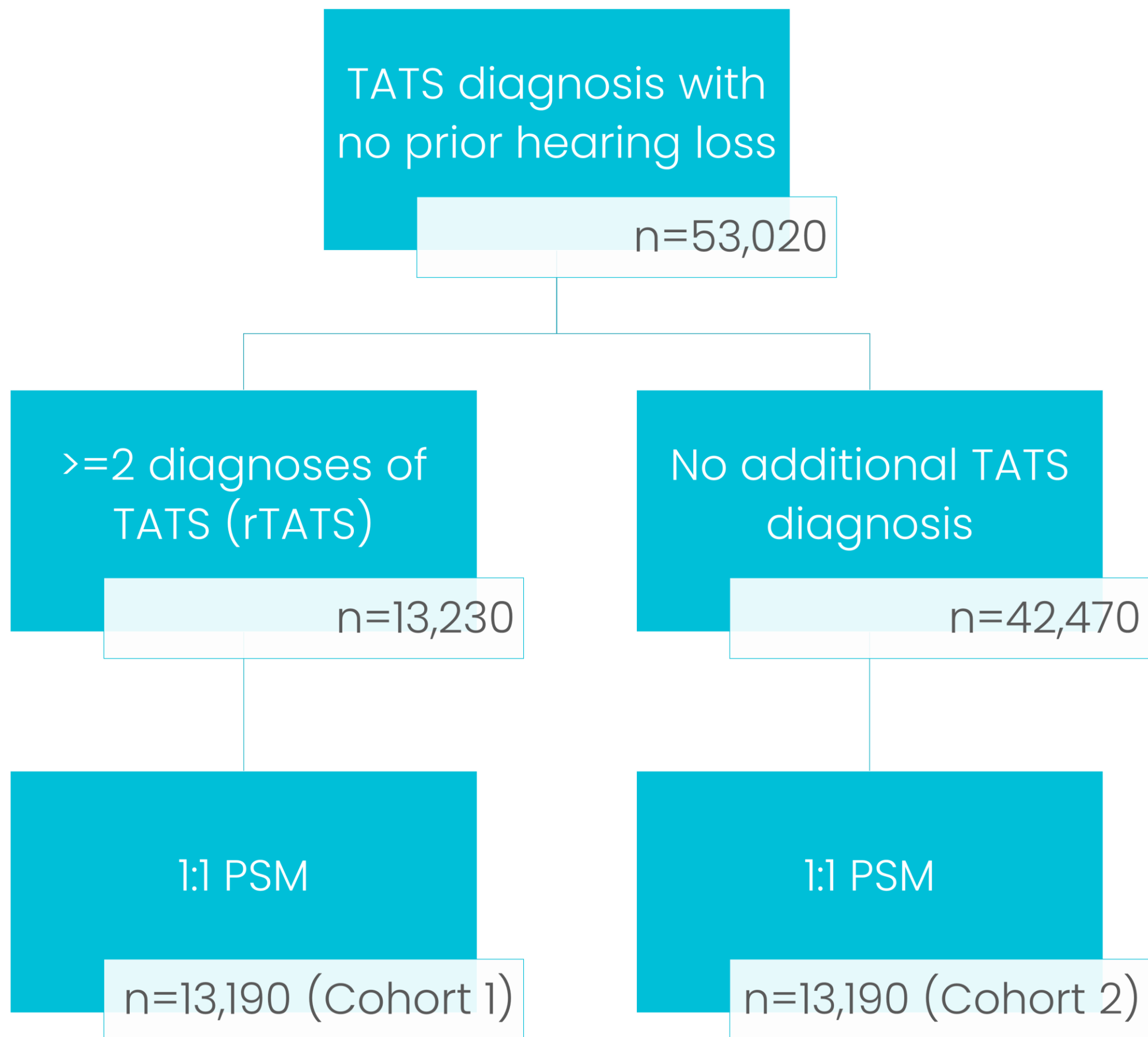


Figure 2. Cohort Characteristics

	Age at Index	Male	Female
Cohort 1	35.8 +/- 27.6	6,190 (46.8%)	6,490 (49.1%)
Cohort 2	34.3 +/- 25.8	24,350 (43.1%)	28,760 (50.9%)

	White	Black or African American	Asian	American Indian or Alaska Native	Native Hawaiian or Other Pacific Islander	Other or Unknown
Cohort 1	4,570 (34.6%)	1,430 (10.8%)	350 (2.6%)	40 (0.3%)	40 (0.3%)	6,820 (51.5%)
Cohort 2	27,030 (47.9%)	6,080 (10.8%)	1,920 (3.4%)	140 (0.2%)	160 (0.3%)	21,150 (37.5%)

Figure 3. Cohort Statistics for outcome of hearing loss

	Patients in Cohort	Hearing Loss at some point after first TATS diagnosis	Risk (%)
Cohort 1	13,180	3,090	23.4%
Cohort 2	13,180	1,750	13.3%

Risk Ratio	P-value
1.77 (1.67, 1.86)	<0.0001

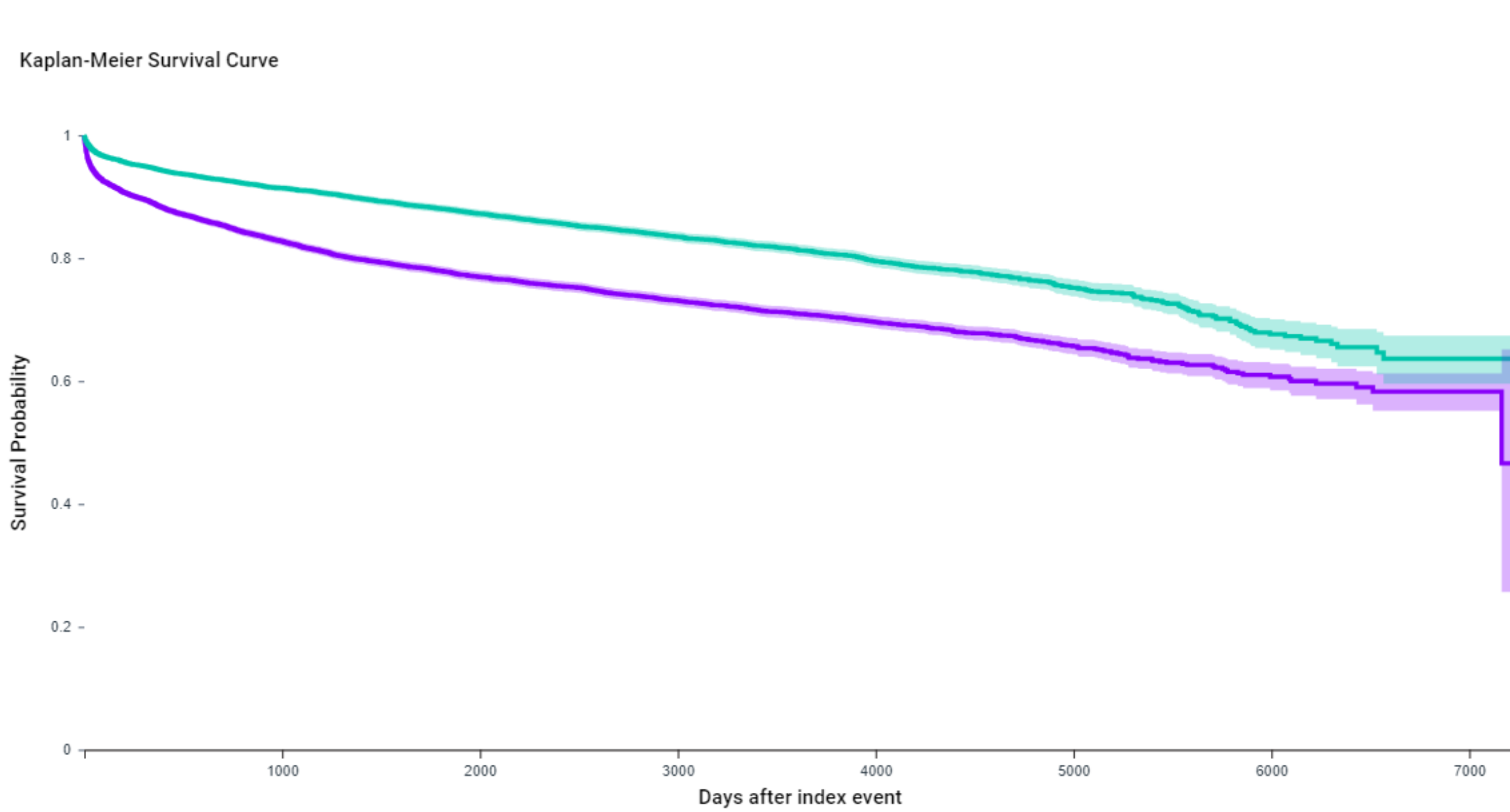
Figure 4. Cohort Statistics for outcome of CAPD diagnosis

	Patients in Cohort	CAPD at some point after first TATS diagnosis	Risk (%)
Cohort 1	13,180	200	1.53%
Cohort 2	13,180	90	0.69%

Risk Ratio	P-value
2.23 (1.74, 2.85)	<0.0001

a. ICD-10-CM H93.24 for Temporary Auditory Threshold Shift  
b. ICD-10-CM H91 for Other and unspecified hearing loss  
c. ICD-10-CM H91 for Other and unspecified hearing loss  
d. ICD-10-CM H93.25 for Central auditory processing disorder

Figure 5. Kaplan-Meier Survival Curve for hearing loss diagnosis



## RESULTS

- After propensity score matching, patients in Cohort 1 had 1.77 times the risk of developing hearing loss (RR=1.77, p<0.0001) and 2.23 times the risk of being diagnosed with CAPD (RR=2.23, p<0.0001) at some point following the first instance of TATS in their record when compared to Cohort 2.
- Kaplan Meier analysis results yield a hazard ratio of 1.7 and 2.021 for diagnosis of hearing loss and diagnosis of CAPD, respectively. This supports the Measure of Association findings that rate of record of hearing loss and CAPD are both higher in Cohort 1 when compared to Cohort 2.

## CONCLUSIONS

Patients with rTATS have a significantly higher risk of developing hearing loss or CAPD compared to those experiencing TATS once, suggesting that frequent exposure to high volume levels likely contributes to subsequent diagnoses and may provide insight into the development and diagnosis of CAPD, as the source of the disorder is not currently well identified. In future research, the relationship between hearing loss and proximity to CAPD diagnosis should be studied to affirm the findings made in this study.

1. Hearing Difficulties Among Adults: United States, 2019 [Internet]. Centers for Disease Control and Prevention; 2021 [cited 2024 Nov 6]. Available from: <https://www.cdc.gov/nchs/products/databriefs/db414.htm>

2. Central Auditory Processing disorder [Internet]. American Speech-Language-Hearing Association; [cited 2024 Nov 6]. Available from: <https://www.asha.org/practice-portal/clinical-topics/central-auditory-processing-disorder/>