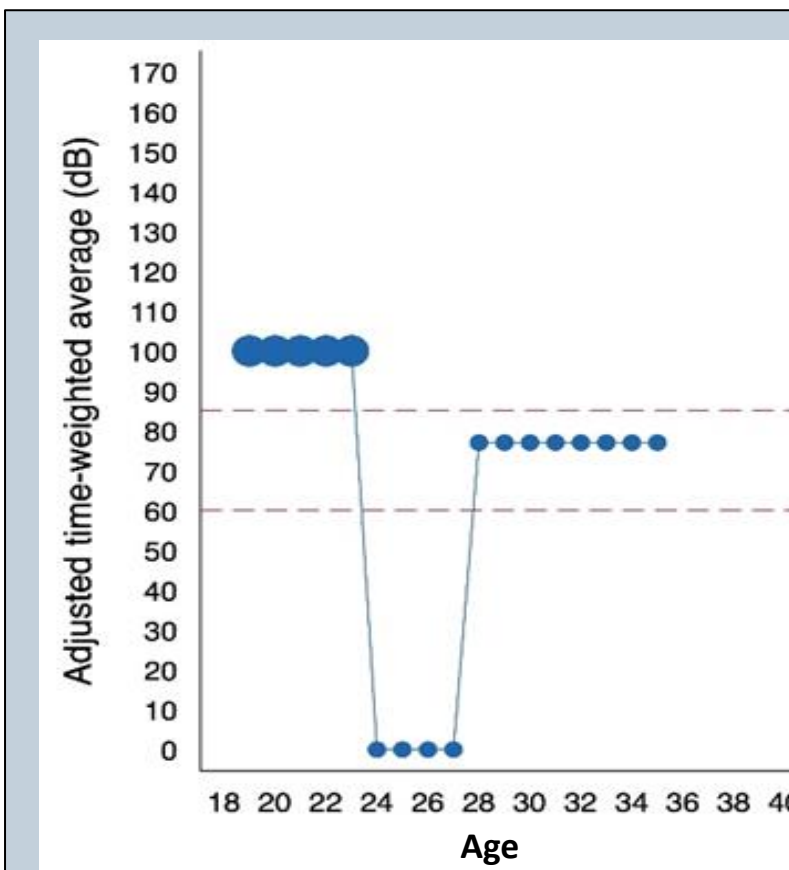


## INTRODUCTION

There are known challenges related to retaining research participants and collecting complete data in prospective studies with multiple follow-up timepoints. The **Noise Outcomes in Service members Epidemiology (NOISE) Study** is an ongoing longitudinal study which has enrolled over 1,200 study participants since 2014 across three sites.<sup>1</sup>

Exposure data collected by the NOISE Study can vary over time (**Figure 1**). This requires repeated data collection at time intervals which reasonably allow participant recall of exposures since the previous timepoint. As such, the NOISE Study was designed to include, following an in-person exam, annual surveys to update exposures and ascertain incident hearing loss and/or tinnitus.



**Figure 1.** Example of how noise exposure varies over time necessitating repeat surveys.

## METHODS

- Study Sample:**
- Veterans (within 2.5 years of separation) and active-duty Service members.<sup>2</sup>
- Sites:**
- NCRAR:** National Center for Rehabilitative Auditory Research, Portland, OR
  - HCE:** Hearing Center of Excellence, San Antonio, TX
  - SoCA:** Naval Medical Center San Diego and Camp Pendleton, San Diego, CA

Tracking Database:

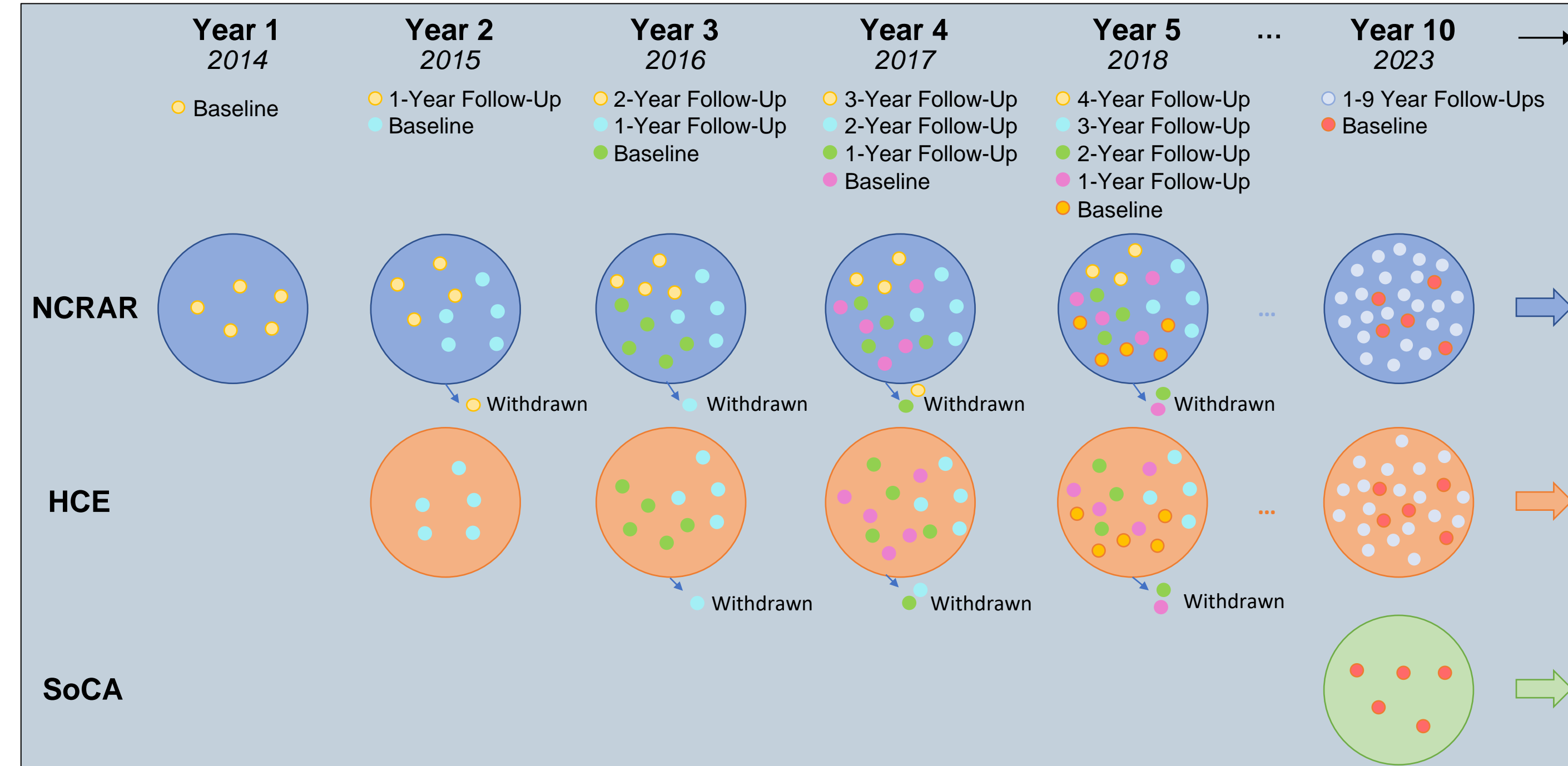
NOISE Study Subjects		Sample Participant	Tracking ID	1000
Subject Info   Screening Questions   Visits   Questionnaires   Consent History   EFT Form Tracking				
<b>Follow-Up Tracking</b>				
TimePoint	AddressCheck	Method	DateSent	DateReceived
1	Address OK	REDCap	4/25/2021	5/2/2021
2	Address OK	REDCap	4/25/2022	4/30/2022
3	Address OK	REDCap	4/25/2023	5/11/2023

**Figure 2.** A Microsoft Access database tracks participant enrollment, follow-up target dates, data collection efforts and communication with participants. All study team members may access the database to ensure timelines are met.

## PROCESSES

	Mailed Questionnaire Procedures	REDCap Questionnaire Procedures
<b>Preliminary to Data Collection</b>	<ul style="list-style-type: none"> <li>4-6 weeks prior to follow-up target date, call participant to verify address, inform that surveys will be coming soon. If first attempt fails, try calling another time.</li> </ul>	
<b>Survey Administration</b>	<ul style="list-style-type: none"> <li>Send 64-page questionnaire packet by mail 1-2 weeks ahead of follow-up target date.</li> </ul>	<ul style="list-style-type: none"> <li>REDCap survey invitation is automatically sent (NCRAR) or sent by study team (HCE, SoCA) on follow-up target date.</li> </ul>
<b>Data Collection Follow-Up</b>	<ul style="list-style-type: none"> <li>1-2 weeks after target date (if not returned), call to verify receipt of packet, remind to fill out and return.</li> <li>Weekly reminder calls up to 1 month following target date.</li> <li>Less frequent reminders up to 6 months following target date. May resend questionnaire packet if needed.</li> </ul>	<ul style="list-style-type: none"> <li>Survey reminder emails sent automatically (NCRAR) or by study team (HCE, SoCA) every 3 days, up to 3 reminders, or as needed.</li> <li>1-2 weeks after target date (if not returned), call/text to verify receipt of email, remind to complete surveys.</li> <li>Less frequent reminders up to 6 months following target date. Resend survey link if needed.</li> </ul>
<b>Data Verification and Cleaning</b>	<p><b>Missing Data Check</b></p> <ul style="list-style-type: none"> <li>Once received, check over questionnaire packet, flag missed items and data quality issues.</li> <li>As needed, call participant to obtain missed response(s) and clarify other flagged responses</li> </ul> <p><b>Data Entry and Verification</b></p> <ul style="list-style-type: none"> <li>Double-enter data by scanning twice into two separate destination databases, requiring about 30 minutes per packet.</li> <li>Periodically verify data entry by comparing the two scanned databases, and fixing any discrepancies</li> </ul> <p><b>Clean Dataset</b></p> <ul style="list-style-type: none"> <li>Clean (verified) data may be used in analysis datasets.</li> </ul>	<p><b>Missing Data Check</b></p> <ul style="list-style-type: none"> <li>Once completed, check over questionnaires in REDCap, flag missed items and data quality issues.</li> <li>As needed, call participant to obtain missed response(s) and clarify other flagged responses</li> </ul> <p><b>Clean Dataset</b></p> <ul style="list-style-type: none"> <li>Data downloaded from REDCap are considered clean and may be used in analysis datasets.</li> </ul>
<b>Overall Return Rate*</b>	<b>57%</b>	<b>63%</b>

**Figure 3.** This diagram contrasts the processes involved in mailing paper questionnaires vs. utilizing the Research Electronic Data Capture<sup>3</sup> (REDCap) system to collect survey data electronically. The REDCap method reduces time spent by participants and the study team, and improves response rate. \*Calculated as of 11/30/2022



**Figure 4.** This diagram illustrates the growing cohort of enrolled participants over time, increasing complexity of participant groups reaching new timepoints each year, and expansion of the NOISE Study to additional sites.

## DISCUSSION

- The goal of the NOISE Study is to capture changes in hearing loss, tinnitus and other health concerns over the careers and lifetimes of Service members and Veterans. **Exposures and outcomes can vary over time, necessitating annual survey collection.**
- Longitudinal studies are laborious and require a **robust remote data collection system** to ensure smooth data management.
- An Access database was leveraged to create a tracking system for **meticulous record-keeping**.
- Longitudinal studies require **flexibility for growth** of the study cohort and expansion to additional study sites.
- Multi-site **studies require frequent communication** across sites to maintain consistency in data collection processes.

- Data collection transitioned from paper packets to electronic data capture to reduce workload and improve:
  - Efficiency:** reduced time preparing and entering data
  - Follow-up:** increased response rate
  - Accessibility:** participants appreciated ease of online surveys

**Conclusion:** As the NOISE Study nears 10 years of data collection, the significance of meticulous record-keeping, seamless communication among team members, and proactive anticipation of future needs are recognized as essential to the success of this project.

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