ARIC Manuscript Proposal #3526

PC Reviewed: 12/10/19 **Status: _____** **Priority: 2**
SC Reviewed: _____ **Status: _____** **Priority: ____**

1.a. Full Title: Accuracy of proxy- and self-rated hearing among older adults with cognitive impairment

b. Abbreviated Title (Length 26 characters): Proxy-Rated Hearing & Dementia

2. Writing Group:
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I, the first author, confirm that all the coauthors have given their approval for this manuscript proposal. __AK__ **[please confirm with your initials electronically or in writing]**

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ARIC author to be contacted if there are questions about the manuscript and the first author does not respond or cannot be located (this must be an ARIC investigator).

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3. Timeline:
Analysis and manuscript will be completed within 6 months

4. Rationale:

Alzheimer's disease and related dementias (ADRD) affect an estimated 5.8 million Americans, primarily composed of people age 65 and over.[1] As another age-related condition, bilateral hearing loss is highly prevalent, estimated to affect approximately two-thirds of individuals age 70 and over, and may exacerbate the care of older adults with ADRD.[2,3] Pure-tone audiometry is the gold standard for measuring hearing loss, though clinicians and researchers often use proxy-reported assessments of hearing due to the costs and logistics involved in conducting audiometric assessments. Previous studies have examined the concordance of subjective hearing assessments with audiometric assessments among cognitively healthy individuals, with sensitivity and specificity estimates ranging from 30-80%.[4,5] Multiple factors have been found to affect the association between subjective and objective hearing, including gender, age, race/ethnicity, and education.[6] However, older adults with ADRD or mild cognitive impairment (MCI) face additional challenges due to increased communication impairment, and current evidence supports that caregivers and health professionals often underestimate the presence of hearing-related communication difficulties.[7] Past studies are limited to relatively small clinic-based samples. Currently, the use of subjective hearing assessments as a predictor of objective loss in persons with cognitive impairment remains understudied, and cohorts with proxy- and self-rated measures of hearing loss, audiometric data, and neurocognitive testing provide a unique opportunity to evaluate their associations in a community-dwelling populations of individuals with dementia or MCI.

5. Main Hypothesis/Study Questions:
Within a cohort of older adults with cognitive impairment (dementia or MCI), what is the concordance of subjective hearing assessments (proxy- and self-rated) with objective audiometric assessments and the factors associated with concordance?

Aim 1a: To describe the concordance of ***proxy***-rated hearing assessments among older adults with ***dementia*** compared to objective audiometric assessment.
Hypothesis 1a: We hypothesize that ***proxy***-rated hearing assessments in older adults with ***dementia*** underestimates objective audiometric hearing loss.

Aim 1b: To describe the concordance of ***self***-rated hearing assessments among older adults with ***MCI*** compared to objective audiometric assessment.
Hypothesis 1b: We hypothesize that ***self***-rated hearing assessments in older adults with ***MCI*** underestimates objective audiometric hearing loss.

Aim 2: To examine the factors associated with concordance between ***proxy***-rated hearing assessment and objective audiometric assessment in older adults with ***dementia*** and between ***self***-rated hearing assessment and objective audiometric assessment in older adults with ***MCI***.
Hypothesis 2: We hypothesize that factors related to the individual, such as degree of hearing loss and global cognitive score, and the informant, such as relationship to participant, are

respectively associated with concordance between self- or proxy-rated hearing assessment and objective audiometric assessment.

6. Design and analysis (study design, inclusion/exclusion, outcome and other variables of interest with specific reference to the time of their collection, summary of data analysis, and any anticipated methodologic limitations or challenges if present).

Study Design: Cross-sectional study of ARIC visit 6 participants with audiometric data and either a dementia or MCI diagnosis.

Study Population: The analytical cohort will include older adults with audiometric data and neurocognitive testing, specifically those with informant interviews for clinical dementia to address Aim 1a and those with MCI who completed the Self Reporting Hearing and Noise Exposure Form (HNE) to address Aim 1b. Participants with missing frequencies at 0.5, 1, 2, or 4 kHz will be excluded. However, missingness of audiometric data will be analyzed.

Variables of Interest:

Audiometric hearing: hearing loss will be defined as better hearing ear speech pure tone average (0.5, 1, 2, 4 kHz) greater than 25 dB based on the WHO classification, collected at visit 6. Hearing loss will be explored as a continuous and categorical variable.

Proxy-rated hearing: responses from informants regarding hearing difficulties (Yes/No) from the clinical dementia rating informant interviews collected at visit 6, specifically CDI4.

Self-reported hearing: responses from the Self Reporting Hearing and Noise Exposure Form collected at visit 6 (HNE1, HNE2) on perception of hearing without an aid in the left and right ears. This is a 6-level variable (excellent/good/little trouble/moderate trouble/lot of trouble/deaf).

Individual Factors: Individual factors potentially associated with concordance between proxy- or self-rated hearing and objective audiometric assessment will include demographic and individual-level socioeconomic position variables. For race/ethnicity, we will include a derived variable for self-identified race/ethnicity-center given the strong association between race/ethnicity and center within the ARIC cohort. For variables related to individual-level socioeconomic position, we will include education level (HOM54 from visit 1) and visit 1 annual household income (HOM62 from visit 1). We will also include participant global cognitive performance, measured as a normalized Z-score.

Proxy Factors: Proxy-related factors will include those also collected at visit 6 via the Clinical Dementia Rating Informant interview, specifically the informant's relationship to the participant (CDI1), years the informant has known the participant (CDI2), and how often the informant sees the participant (CDI3).

Statistical Analysis: Exploratory data analysis with graphical displays and frequency distributions, and cross-tabulations will be used. For ***Aim 1a***, sensitivity and specificity of ***proxy***-rated hearing assessments will be calculated for participants with ***dementia*** as a 3×2

contingency table (normal/mild/moderate or greater audiometric hearing loss vs yes/no ***proxy***-rated hearing loss). The agreement between proxy-rated hearing and the objective, audiometric definition of hearing loss beyond that expected by chance will be assessed using Cohen's Kappa and its 95% confidence interval. For ***Aim 1b***, similar to Aim 1a, sensitivity and specificity of ***self***-rated hearing assessments will be calculated for participants with ***MCI*** as a 3 × 6 contingency table (normal/mild/moderate or greater audiometric hearing loss vs 6-level ***self***-rated hearing loss – excellent/good/little trouble/moderate trouble/lot of trouble/deaf). Logistic regression models stratified by audiometric hearing loss status will be used to explore how sensitivity and specificity of ***self***- or ***proxy***-rated hearing vary by characteristics of the individual assess, the proxy, and their relationship. For ***Aim 2***, log-linear models will be used to estimate the association of individual- and proxy-level factors with concordance between proxy-/self-rated hearing and objective hearing assessments.

Limitations: Potential limitations include missing or inaccurate data from either participants or proxies of participants with cognitive impairment, as the measurement properties of these assessments may vary along the continuum of cognitive function. The exclusion of participants without audiometric data may also bias our estimates given participants had to be well enough to present for audiometric evaluation and may not represent community-dwelling persons with dementia.

7.a. Will the data be used for non-CVD analysis in this manuscript? ____ Yes __X__ No

b. If Yes, is the author aware that the file ICTDER03 must be used to exclude persons with a value RES_OTH = "CVD Research" for non-DNA analysis, and for DNA analysis RES_DNA = "CVD Research" would be used? ____ Yes ____ No
(This file ICTDER has been distributed to ARIC PIs, and contains the responses to consent updates related to stored sample use for research.)

8.a. Will the DNA data be used in this manuscript? ____ Yes _X_ No

8.b. If yes, is the author aware that either DNA data distributed by the Coordinating Center must be used, or the file ICTDER03 must be used to exclude those with value RES_DNA = "No use/storage DNA"? ____ Yes ____ No

9. The lead author of this manuscript proposal has reviewed the list of existing ARIC Study manuscript proposals and has found no overlap between this proposal and previously approved manuscript proposals either published or still in active status.
ARIC Investigators have access to the publications lists under the Study Members Area of the web site at: http://www.cscc.unc.edu/aric/mantrack/maintain/search/dtSearch.html

___X___ Yes _____ No

10. What are the most related manuscript proposals in ARIC (authors are encouraged to contact lead authors of these proposals for comments on the new proposal or collaboration)?

3253 – "Using Self-Reported Hearing Quality to Infer About Epidemiological Associations between Functional Outcomes and Objective Hearing Loss in ARIC"

2327 – "Hearing impairment and cognitive performance in the Atherosclerosis Risk in Communities Neurocognitive Study (ARIC NCS): cross-sectional and longitudinal results"

11.a. Is this manuscript proposal associated with any ARIC ancillary studies or use any ancillary study data? ____ Yes __X__ No

11.b. If yes, is the proposal

___ A. primarily the result of an ancillary study (list number* _____)

___ B. primarily based on ARIC data with ancillary data playing a minor role (usually control variables; list number(s)* _____ _____ _____)

*ancillary studies are listed by number at https://www2.cscc.unc.edu/aric/approved-ancillary-studies

12a. Manuscript preparation is expected to be completed in one to three years. If a manuscript is not submitted for ARIC review at the end of the 3-years from the date of the approval, the manuscript proposal will expire.

12b. The NIH instituted a Public Access Policy in April, 2008 which ensures that the public has access to the published results of NIH funded research. It is **your responsibility to upload manuscripts to PubMed Central** whenever the journal does not and be in compliance with this policy. Four files about the public access policy from http://publicaccess.nih.gov/ are posted in http://www.cscc.unc.edu/aric/index.php, under Publications, Policies & Forms. http://publicaccess.nih.gov/submit_process_journals.htm shows you which journals automatically upload articles to PubMed central.

References:

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