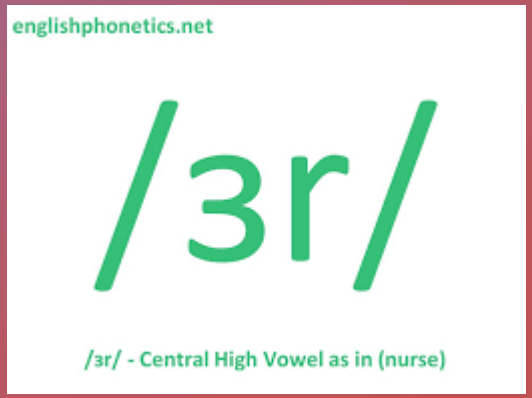
Sociophonetic study of NURSE vowels in Nigerian English



LING 2020: Data Science Research in Linguistics
Oluwasegun Amoniyan

Motivation for the study

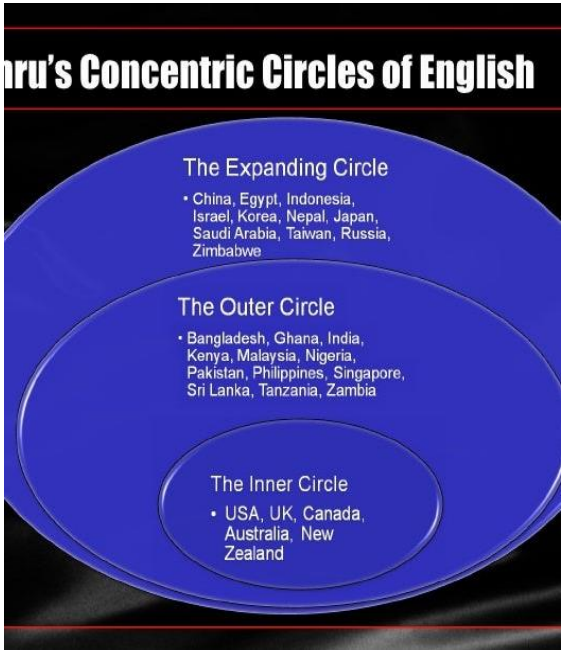
- NURSE vowel means vowels produced in similarity or variation to the mid-central vowel [ɜ] as [nɜrs], [nɛs]...

- The existing literature contains information about **NURSE vowel** production, particularly in the inner circle of English. However, their findings often overgeneralize other Englishes without providing supporting evidence. The (current) study will investigate the phenomenon in the outer circle of English and provide a balanced description of the variation that characterizes the NURSE vowel.

Background and Review

Background

NURSE vowels have received scholarly attention in different *varieties* (especially in the inner circle) of English (e.g., *American English*, *British English*, *New Zealand English*). Their results are similar (not absolutely).



Review

Studies of NURSE vowel variation in different types of English, spoken alone or with a partner, show that the vowels can merge (as a centralized vowel) or keep their three-way contrast as [ɪ], [ɛ], and [ʌ], with rhotacization occurring in different ways. These realizations are influenced by social (e.g., **gender**, **age**) and linguistic factors (e.g., **speech style**) (Li et. al., 2021; Maclagan et. al., 2017; Mayr, 2010; Mesthrie & Chevalier, 2014; Watson & Clark, 2013).

Research gap

However, very little is known about NURSE vowel variation in New Englishes like Nigerian English (NE), which exists in a rich multilingual context with regional varieties (i.e., Hausa, Igbo, Yoruba) and over 250 ethnic groups. This study bridges the gap in the knowledge of NURSE vowel production in Englishes.

- What are NURSE vowel productions in NE?
- What possible factors determine variation in NURSE vowel production in NE?
- To what extent do phonetic features describe the vowel identity of NURSE vowels?

METHODOLOGY

Data ICE-Nigeria

The data for this study were drawn from the International Corpus of English Nigeria (ICE-Nig). The corpus contains 1,010,382 collections, with 609,586 spoken words and 400,796 written words (Wunder et al., 2010). The sound and text files were downloaded and uploaded to WebMAUS for forced alignment. The forced-aligned speech samples were manually adjusted on the fourth tier on Praat.

- 16 sound files
- two speech styles (*broadcast talk* - 5 and *broadcast news* - 10)
- All speakers in this study used NE as second language participants
- Vary by gender (male vs female), ethnicity, speech style, Profession, and age

Fast Track

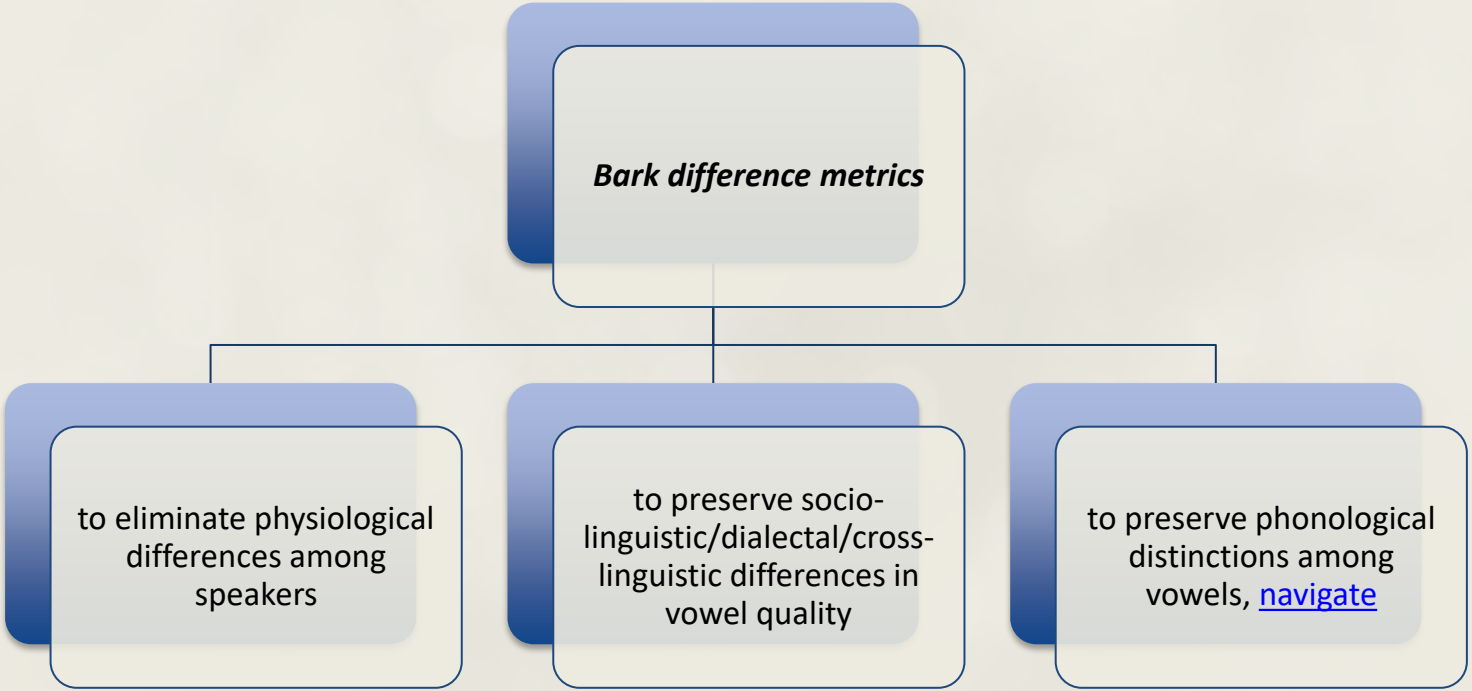
Fast Track reports 5 formant levels (f1, f2, f3, f4, f5), with the lowest as 4700Hz and the highest as 7550Hz. The algorithm generates 20 formants for undistorted formants and selects a winner after comparison with other possible formant outputs. Unlike previous studies of NURSE vowels that implemented midpoint and three-point vowel measurement, Fast Track would enable me to account for formant trajectories. This algorithm has better formant representation than midpoint and three-point vowel measurement. Samples

segment info nurse aggregate nurse social

Data Wrangling

- remove uninformative columns
- adding and renaming some columns
- categorization of age group, profession
- joining data frames

Vowel normalization

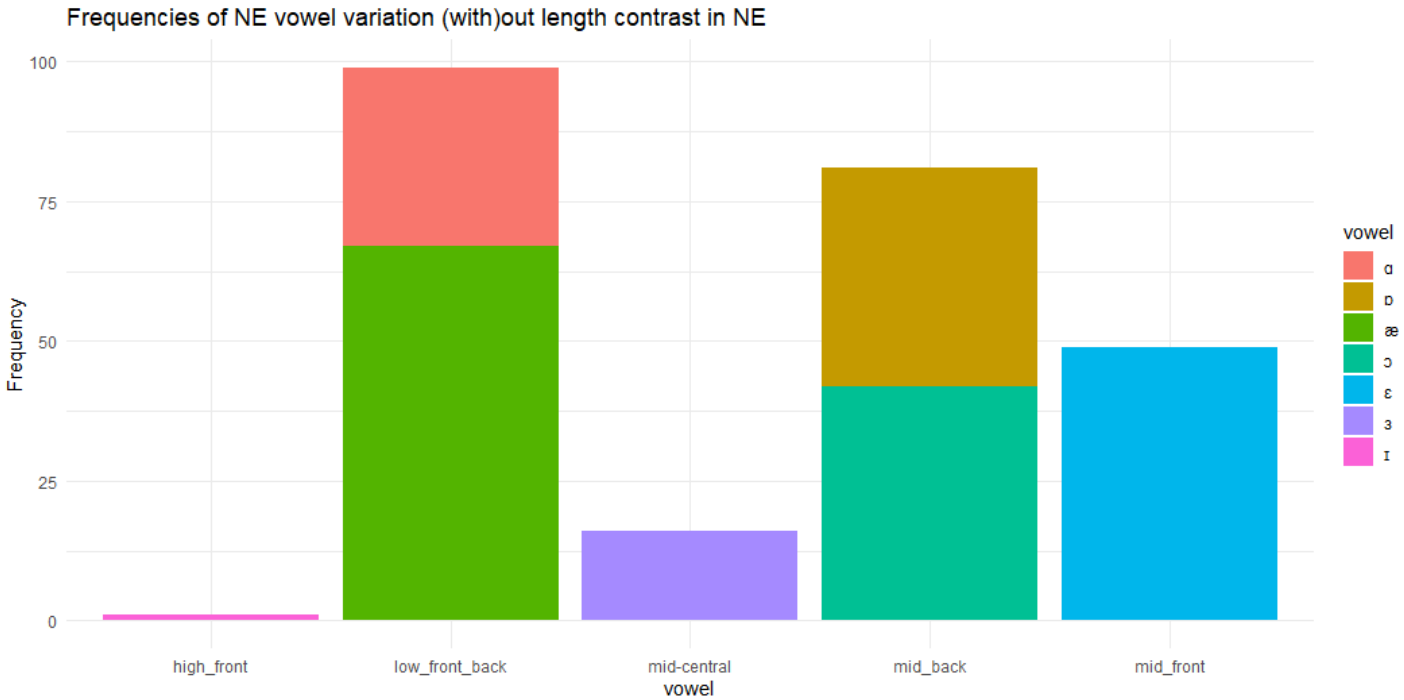


Statistical Analysis

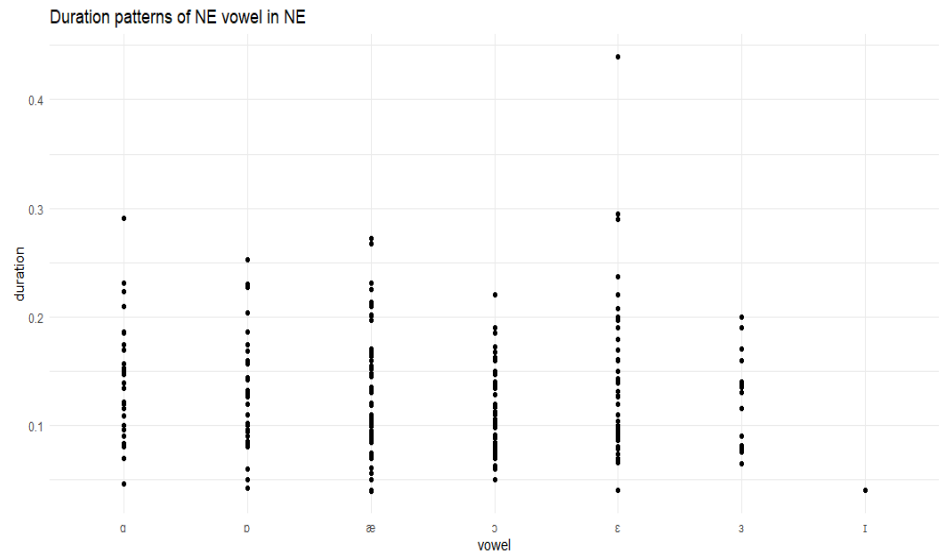
The raw files were analyzed using Mixed effects regression with **tidyverse** and **lme4** to account for linguistic, ethnic, and social variables that determine (or may contribute to) variation in Nigerian English NURSE vowels.

ANALYSIS

NURSE vowel productions in NE



Duration patterns for NURSE vowels in NE

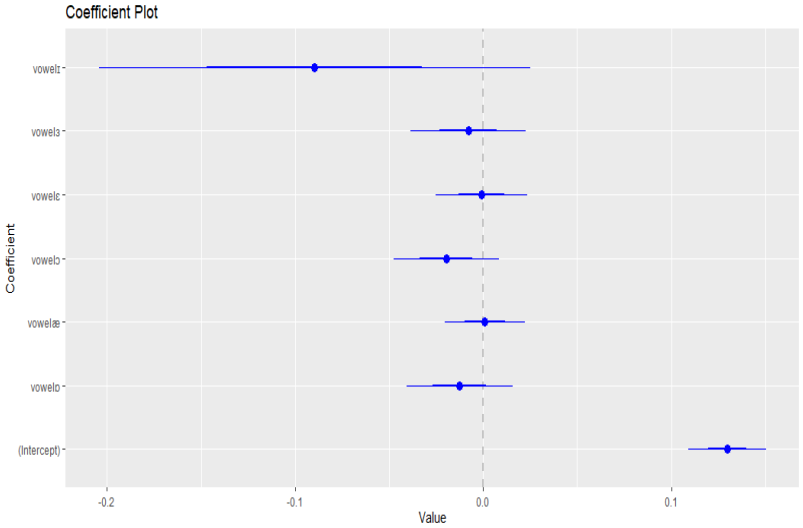


This tests if there is a merger by duration (not by vowel space as largely reported in the literature)

Segment info (Is duration significant?)

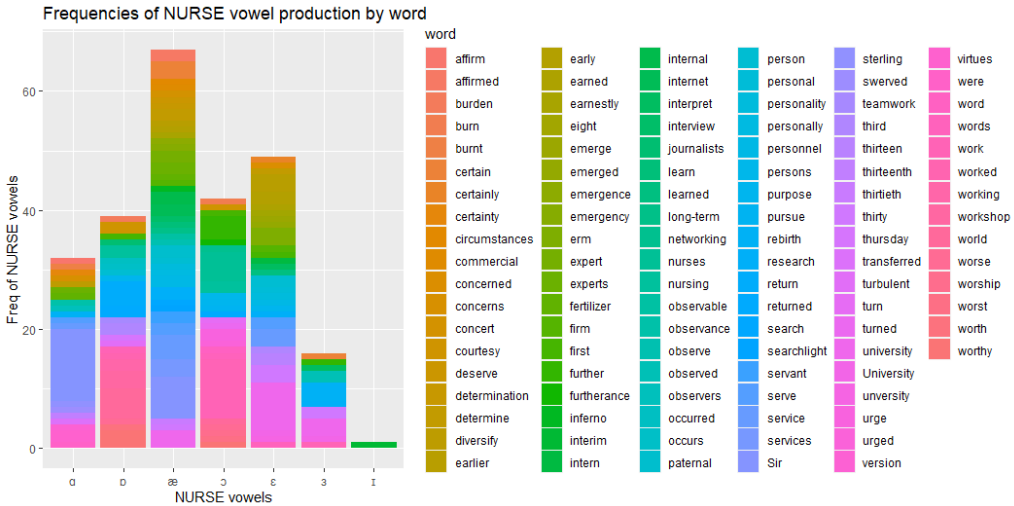
Regression analysis of duration

Duration **does not** significantly determine variance in NURSE vowels. The model, the results show that the realization of the NURSE vowel as a low back vowel ([ɑ]) was statistically significantly different in duration from other NURSE vowels (intercept = 0.13, 95%, t(237) = 12.54, p < .001).

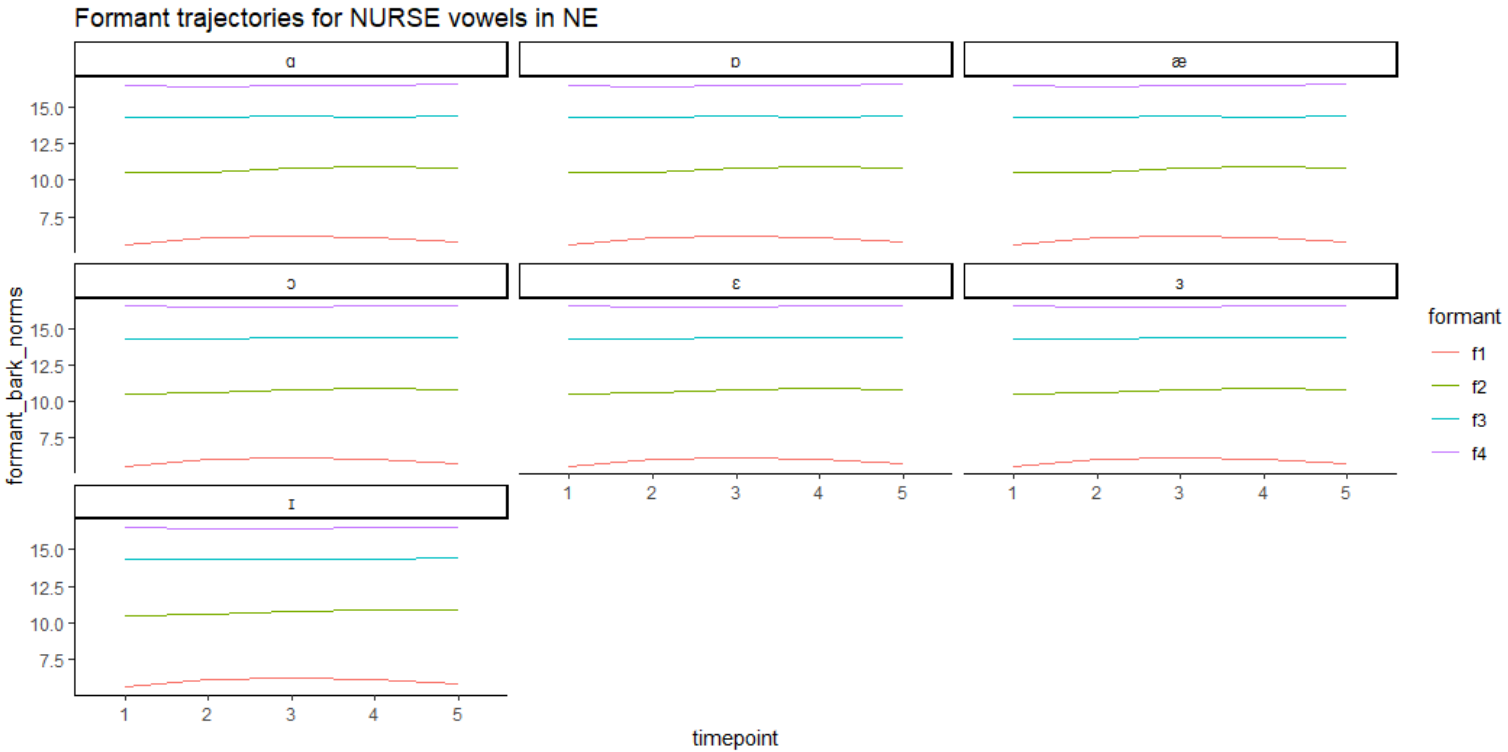


Phonological effect on NURSE vowel

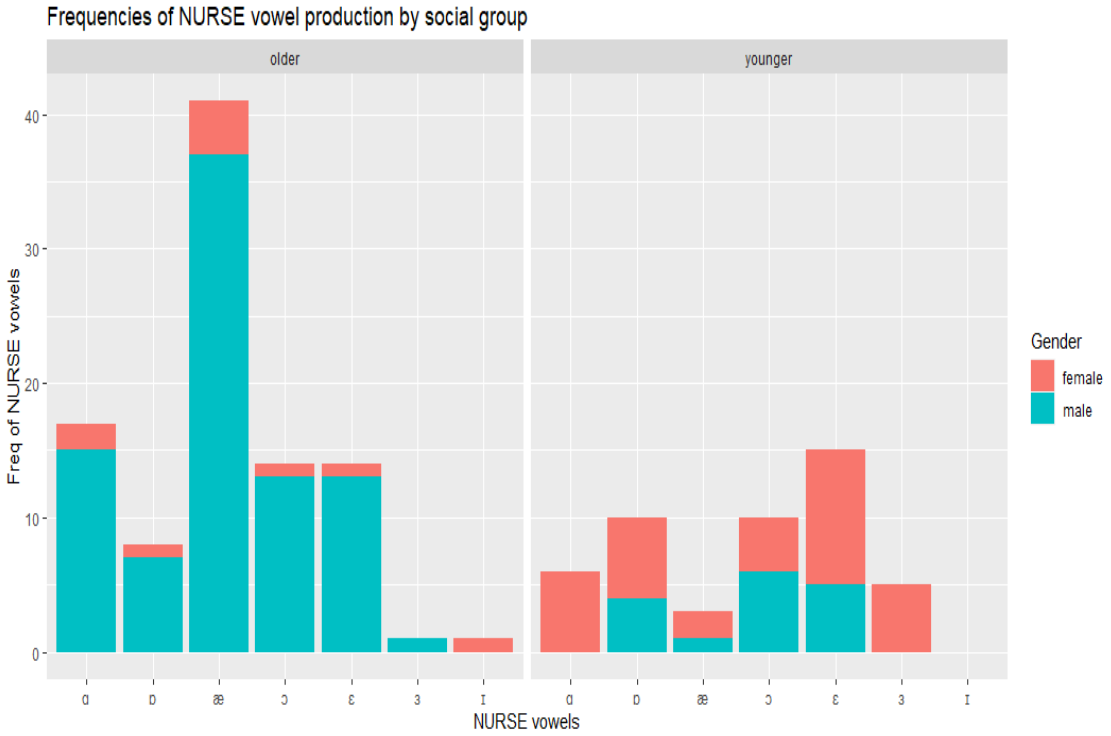
One of the hypotheses identifies the effect of the phonological environment on NURSE vowel production in NE.



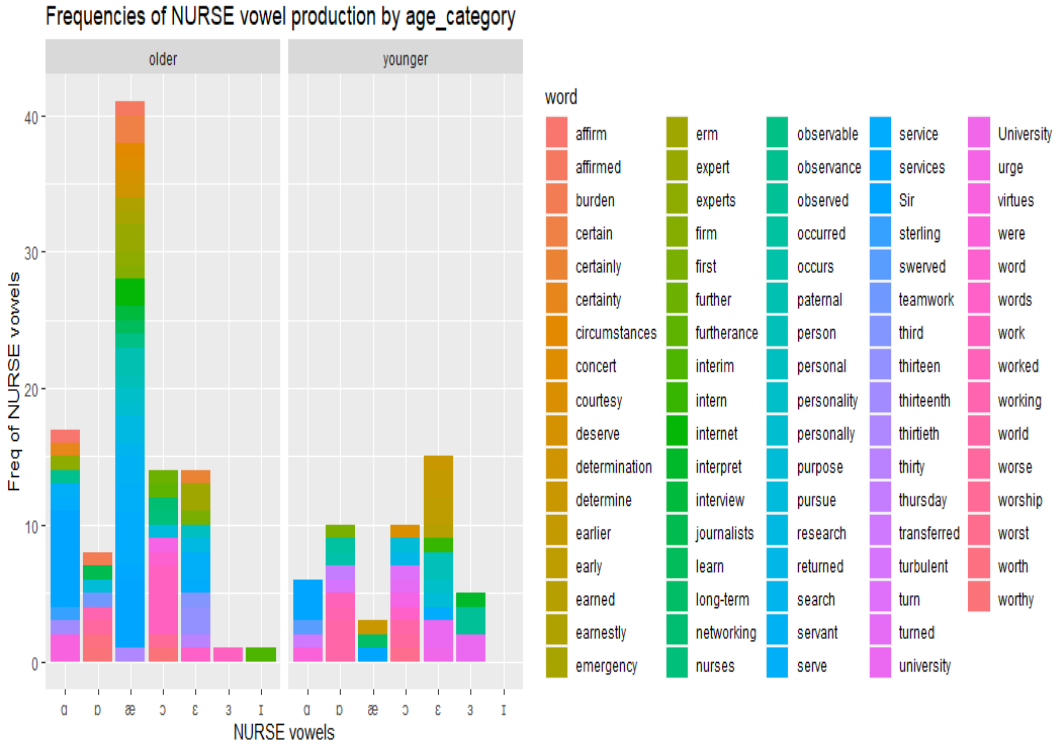
NURSE vowel formant trajectories



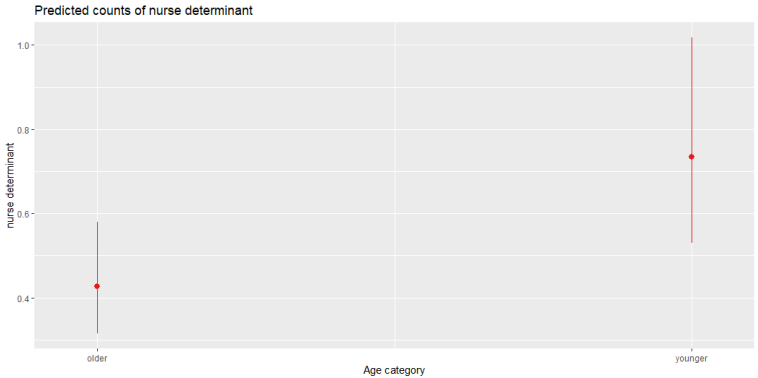
NURSE vowel production in NE by age and gender



NURSE vowel determinant by age and gender

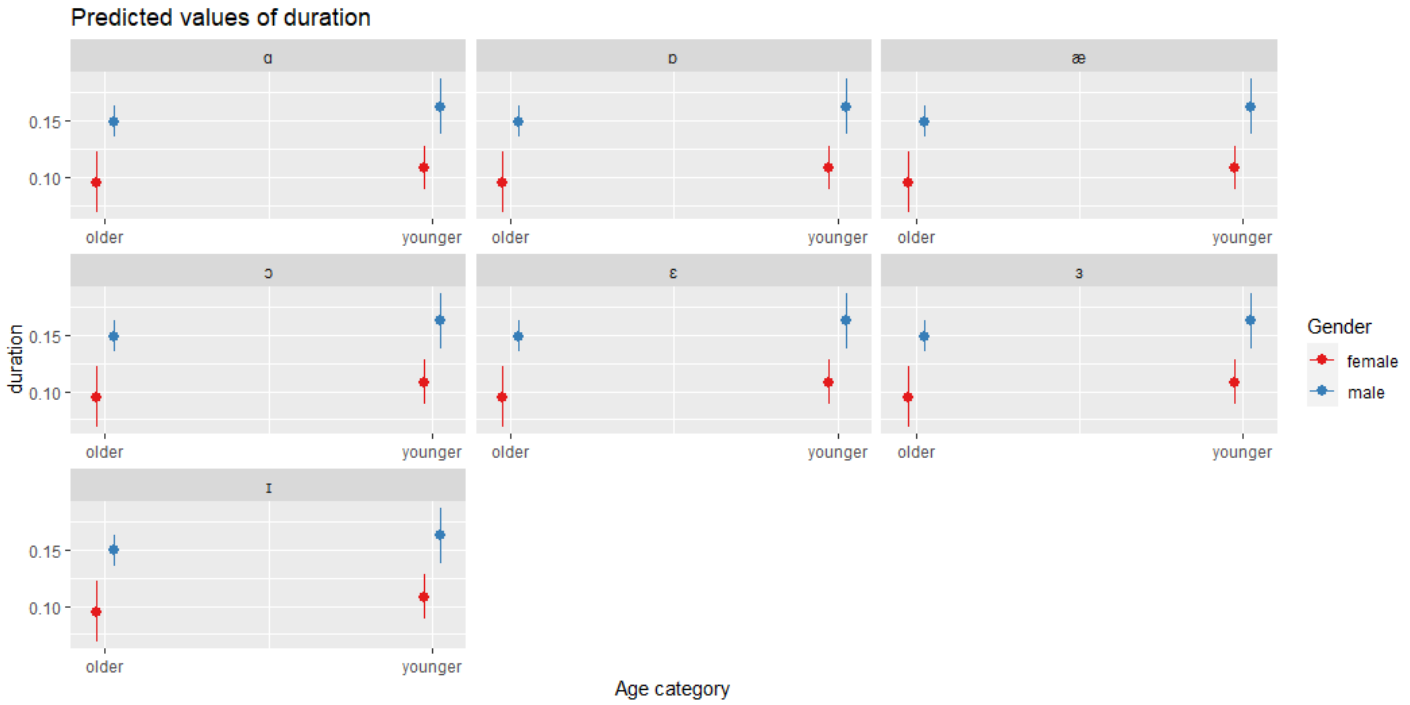


NURSE vowel determinant in NE by age and gender



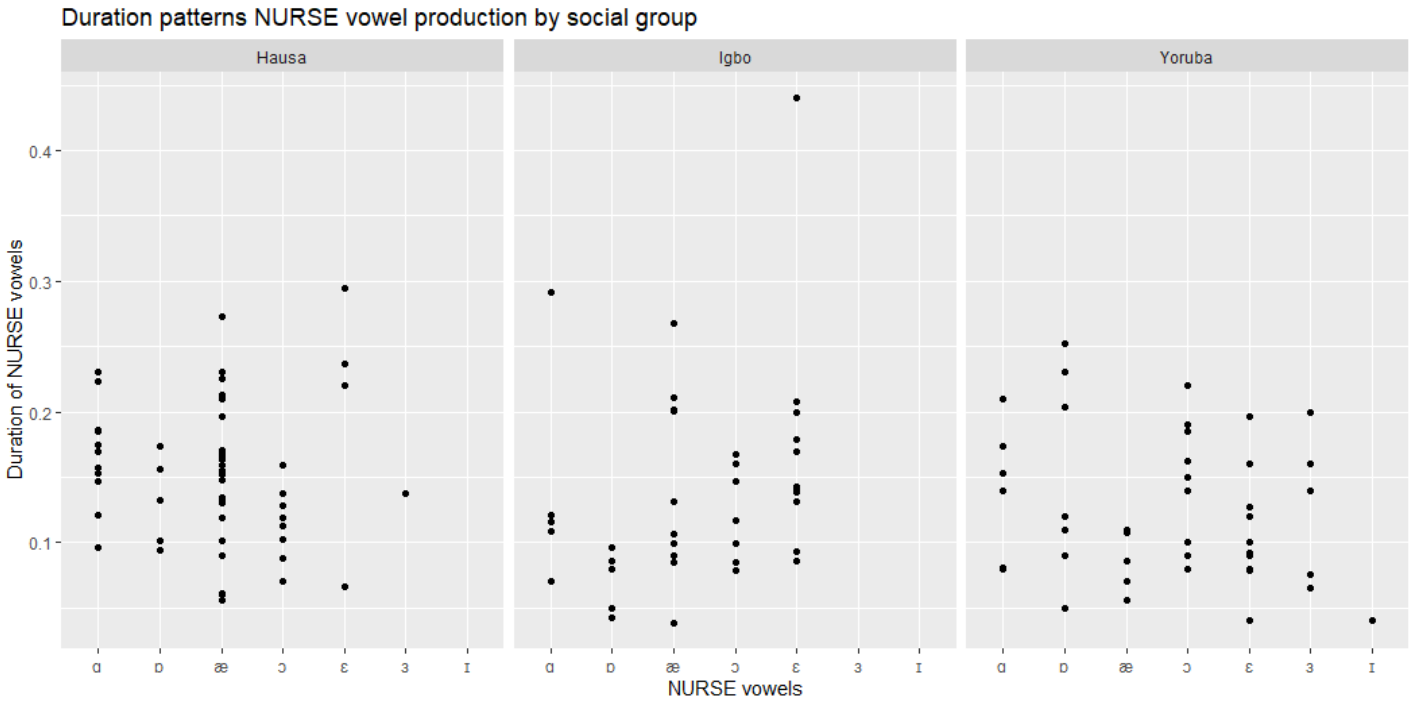
Age(significant), but gender(not sig, no convergence)

Duration patterns of NURSE vowel production in NE by age and gender

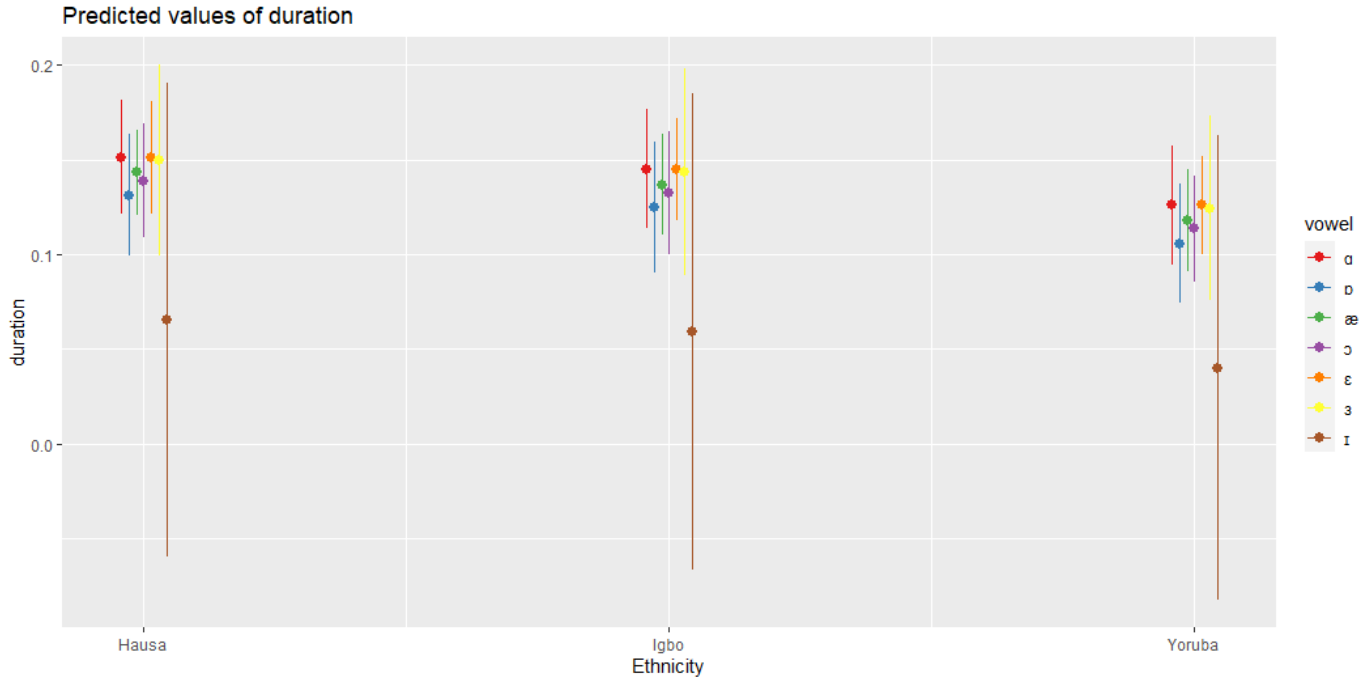


Significant by gender (alone)

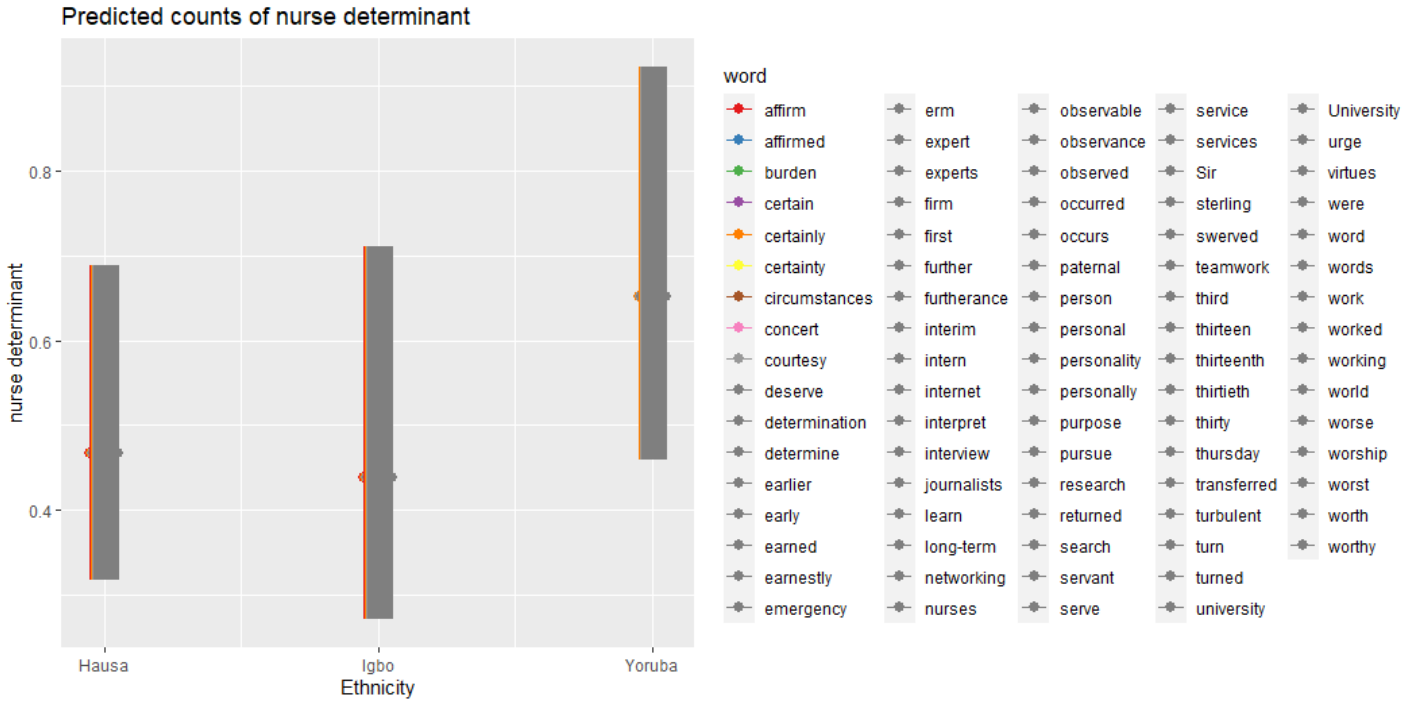
NURSE vowel production by ethnicity



NURSE vowel production by ethnicity (regression)



NURSE vowel determinant by ethnicity



RQ evaluation

The production of NURSE vowels in Nigerian English varies across **linguistic** (vowel production and phonological context), **ethnicity/languages** (Hausa, Igbo, and Yoruba), and **sociolinguistic** (age, gender) factors. Additionally, these productions do not follow a categorical or gradient pattern. As a result, the strategies for NURSE vowel variation in NE differ from the inner circle of the English variety.

Discussion and future investigation

Evidently, there are variations in NURSE vowels other than categorical or gradient r-presence. If we included other speech styles later, the variation might exceed what we observed.

My findings are similar to those of previous studies, which found that gender, age, style/register/community of practice, and geographical location could affect NURSE vowel production. (Li et. al., 2021; Maclagan et. al., 2017; Mayr, 2010; Mesthrie & Chevalier, 2014; Watson & Clark, 2013)

My analysis is limited (just 246 data points), so I will add more speech samples before generalization.

As my interest in sociophonetics grows, I will continue to learn R packages and skills in data science for data management, presentation, and accessibility.

References

Li, Z., Gut, U., & Schützler, O. (2021). nurse Vowels in Scottish Standard English: Still Distinct or Merged? *Journal of English Linguistics*, *49*(3), 305-330.

Maclagan, M., Watson, C. I., Harlow, R., King, J., & Keegan, P. (2017). Investigating the sound change in the New Zealand English nurse vowel/ɜ. *Australian Journal of Linguistics*, *37*(4), 465-485.

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Mesthrie, R., & Chevalier, A. (2014). Sociophonetics and the Indian diaspora: The NURSE vowel and other selected features in South African Indian English. In English in the Indian diaspora (pp. 85-104). John Benjamins.