Nasalization Change Over Time in Michigan English

NWAV51
Queens College

Yongqing Ye
Michigan State University
https://yongqingye.github.io/

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Articulatory variation

Examining variation for non-segmental representations

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- What about community-level change to subphonemic representations?
- Nasalization!
- Vowel nasalization in Michigan English.

Why nasalization in Michigan English?

Do Michiganders sound nasally?

- There is a strong folk linguistic belief in Michigan that Michigan English sounds nasally.
  - "That's a pretty Michigan nuance – talk through your nose be nasal ... Talk as though your lower jaw doesn't exist. .. It's been said that the Michigan accent sounds like a pirate with a head cold." – excerpt from an interview with Edward MCClelland, author of the book *How to speak Midwestern*

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- Michigan English is found to have the presence of nasal peaks, broadened F1 bandwidth and anti-formants in oral vowels (Plichta 2004).

Non-segmental sociophonetic variation: Nasalization

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Non-segmental sociophonetic variation: Nasalization

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- Coarticulatory nasalization has been found to be a community-level change in progress in Mid-Atlantic (Philadelphia) (Zellou and Tamminga 2014).

Questions

- Does nasalization change over time in Michigan English?
  - Pre-nasal context [CVN]
  - Pre-oral context [CVC]

MI Diaries

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- Michigan residents (ages 3+).
- This study examined a subset of the data from the MI Diaries corpus.

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- native speakers of American English.
- grew up and currently reside in the state of Michigan.

Recordings and sounds

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- Target vowels
  - LOT ([ɑ], AA)
    THOUGHT ([ɔ], AO)
    FACE ([e], EY)
    GOAT ([oʊ], OW)
  - TRAP ([æ], AE) was excluded considering the effect of different consonantal environments on the production of [æ] in Michigan English (Evans 2001; Ito 1999b; Labov 1994; Mielke et al. 2017).
  - High vowels are problematic with acoustic measurements (Styler 2017a).

Measuring nasalization with acoustics

- Nasality was extracted with a modified Praat script (Styler 2017a).
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- A_1-P_0 measurements were taken at 10 time points per vowel.
- The [SVS] context is used as the baseline because it is arguably the environment when the vowel is least nasalized (Busa and Ohala 1995; Lintz and Sherman 1961).

Statistical analysis

Modeling in R

- Linear regression models:
  - **Dependent variables**:
    - A_1-P_0 (degree of nasalization)
    - Duration of nasalization
  - **Independent variables**:
    - `Birth year`
    - `Vowel`
    - `Context`

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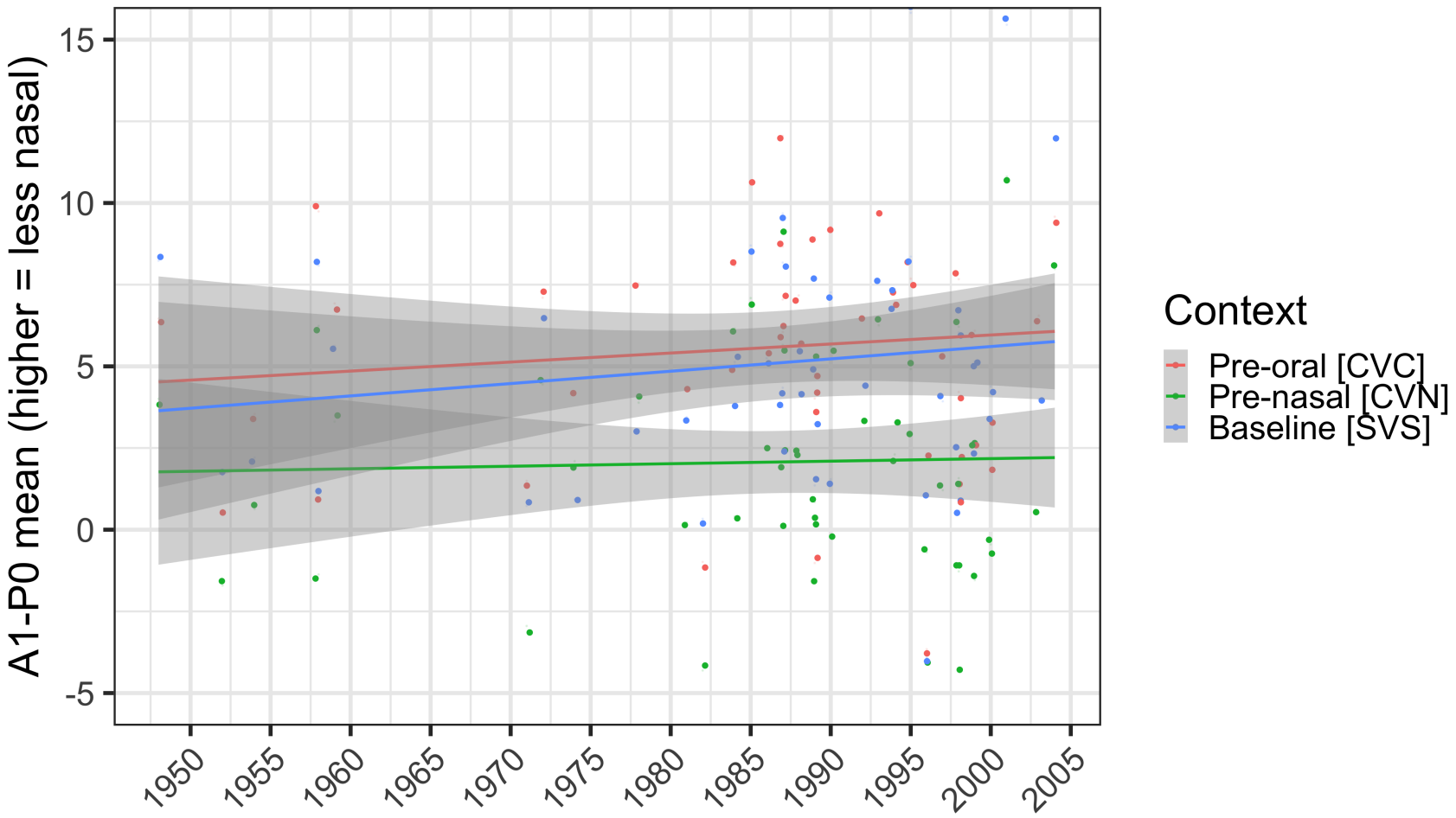
    - `Vowel`
    - `Context`
- A log-likelihood model comparison was conducted to determine the best-fitting model (Baayen, 2012; Baayen et al. 2008).

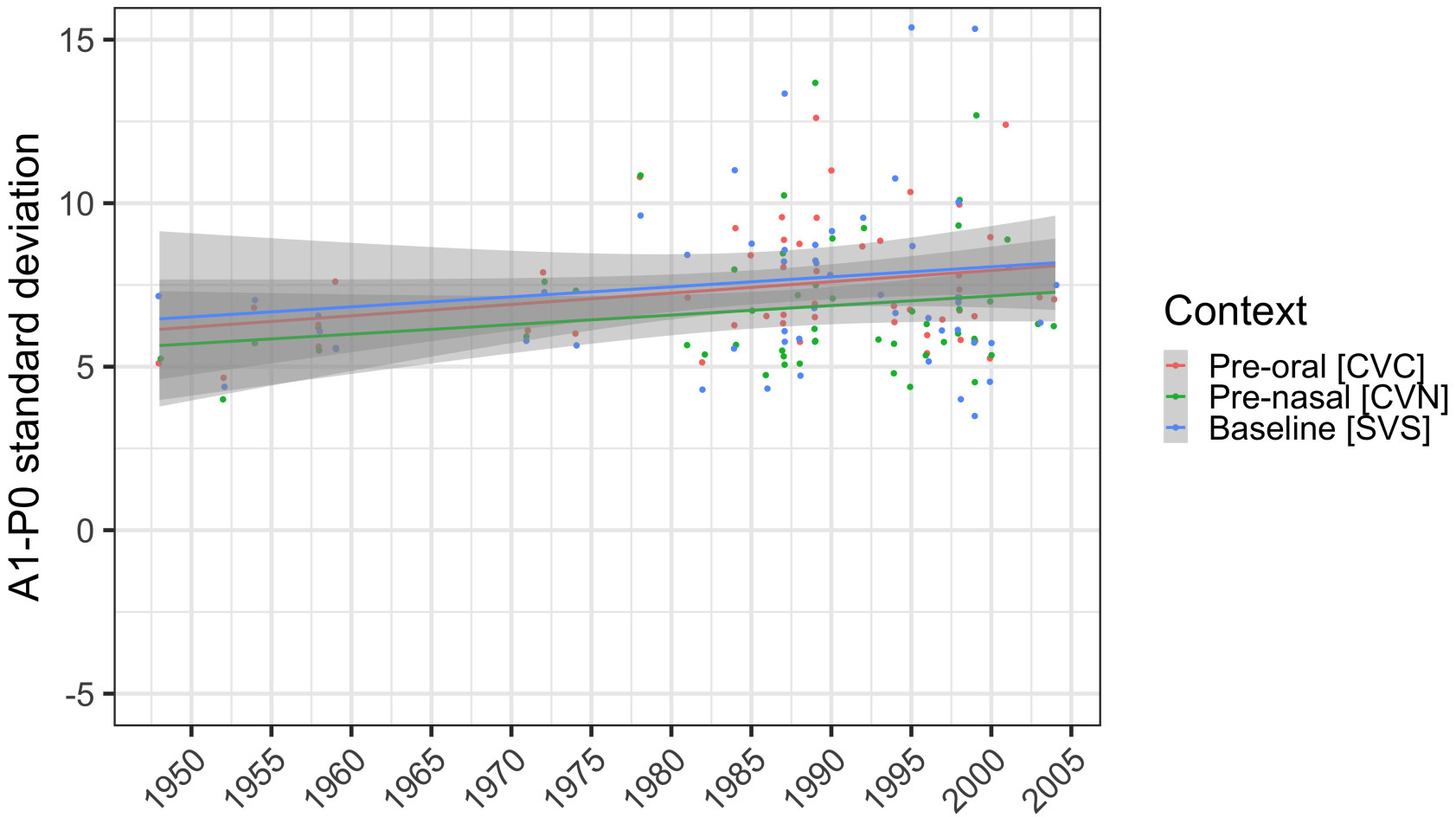
Nasalization decreases as birth year increases

The measurement for the degree of nasalization, aggregated across all vowels



Nasalization variability increases w/ birth year

Standard deviations for the degree of nasalization, aggregated across all vowels



Degree of nasalization results summary

- Birth year is a significant predictor for the degree of nasalization. The younger the participant, the less nasalization they are likely to have.

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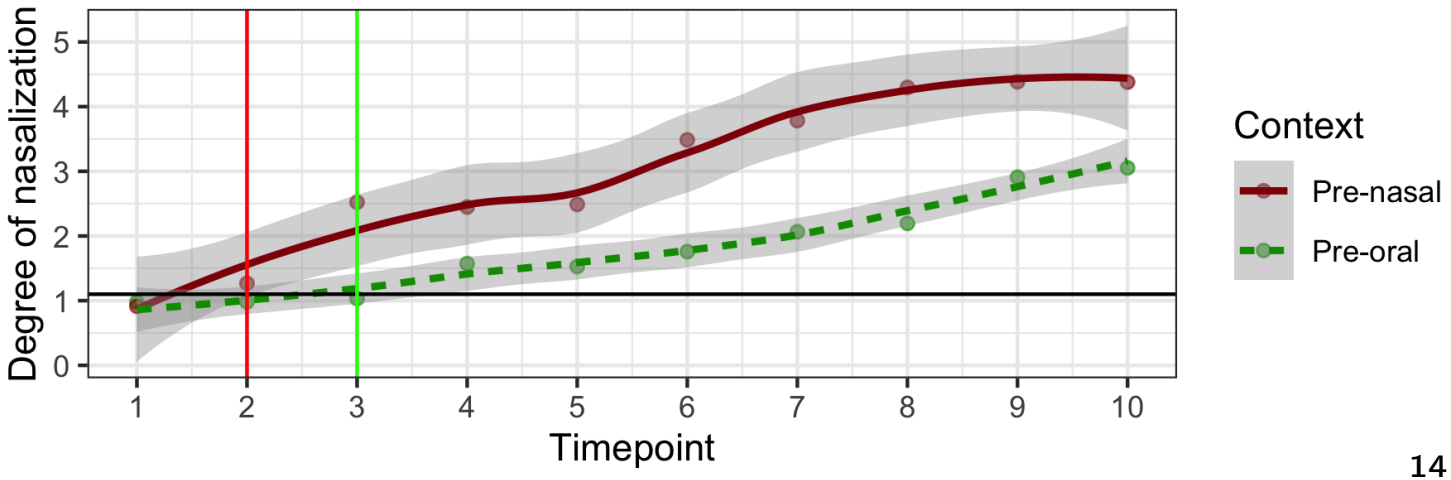
- Birth year is a significant predictor for the degree of nasalization. The younger the participant, the less nasalization they are likely to have.
- Young participants exhibit higher degree of variability in their production of nasalization.
  - The pattern holds across all vowels and all contexts (pre-nasal, pre-oral and baseline).

Measuring duration of nasalization

- Baseline to measure duration
  - For every participant, the nasalization baseline is the averaged A_1-P_0 values in the [SVS] context.
  - The beginning of nasalization was defined as the significant divergent time point between the nasal trajectories in pre-nasal and pre-oral contexts and the baseline.



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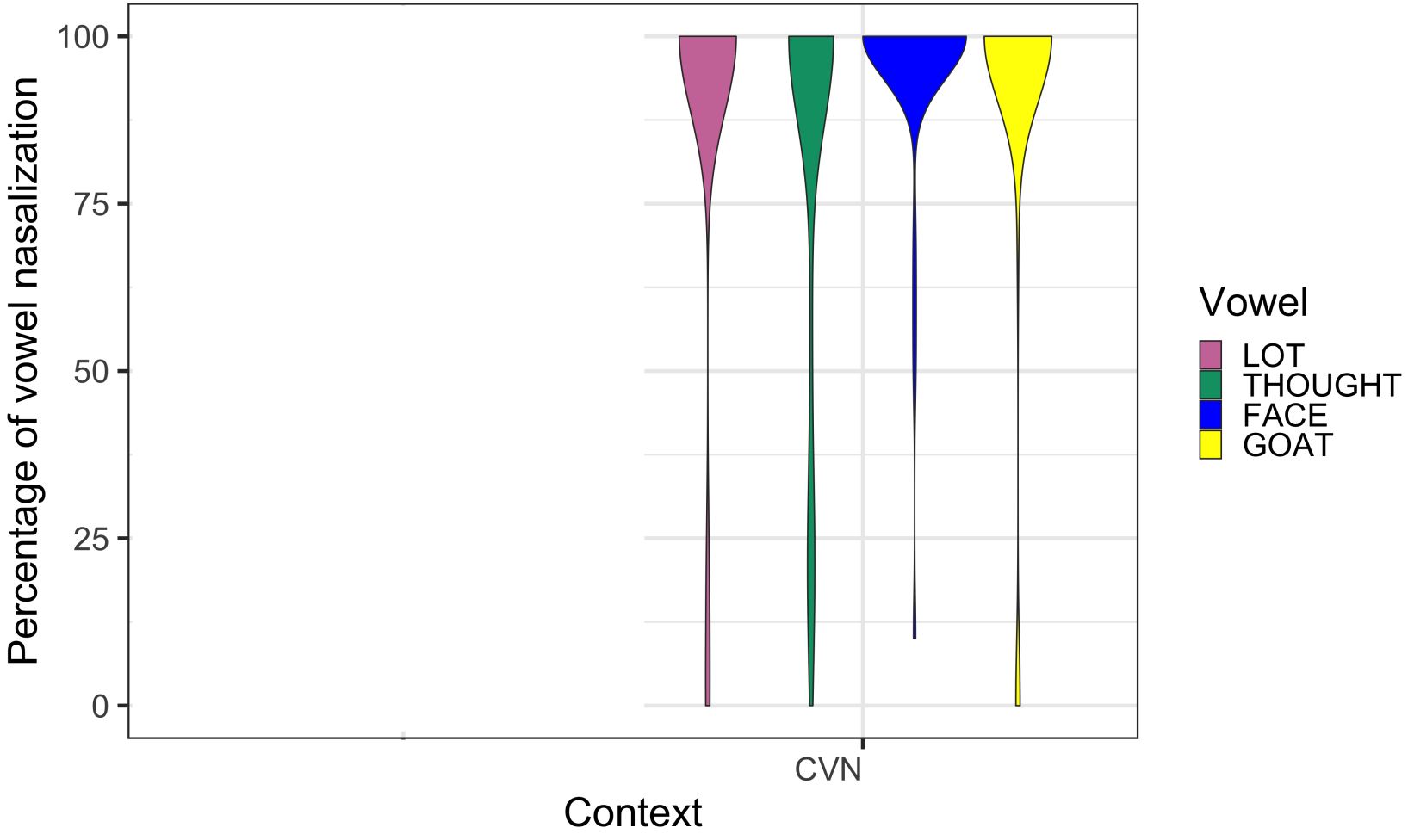
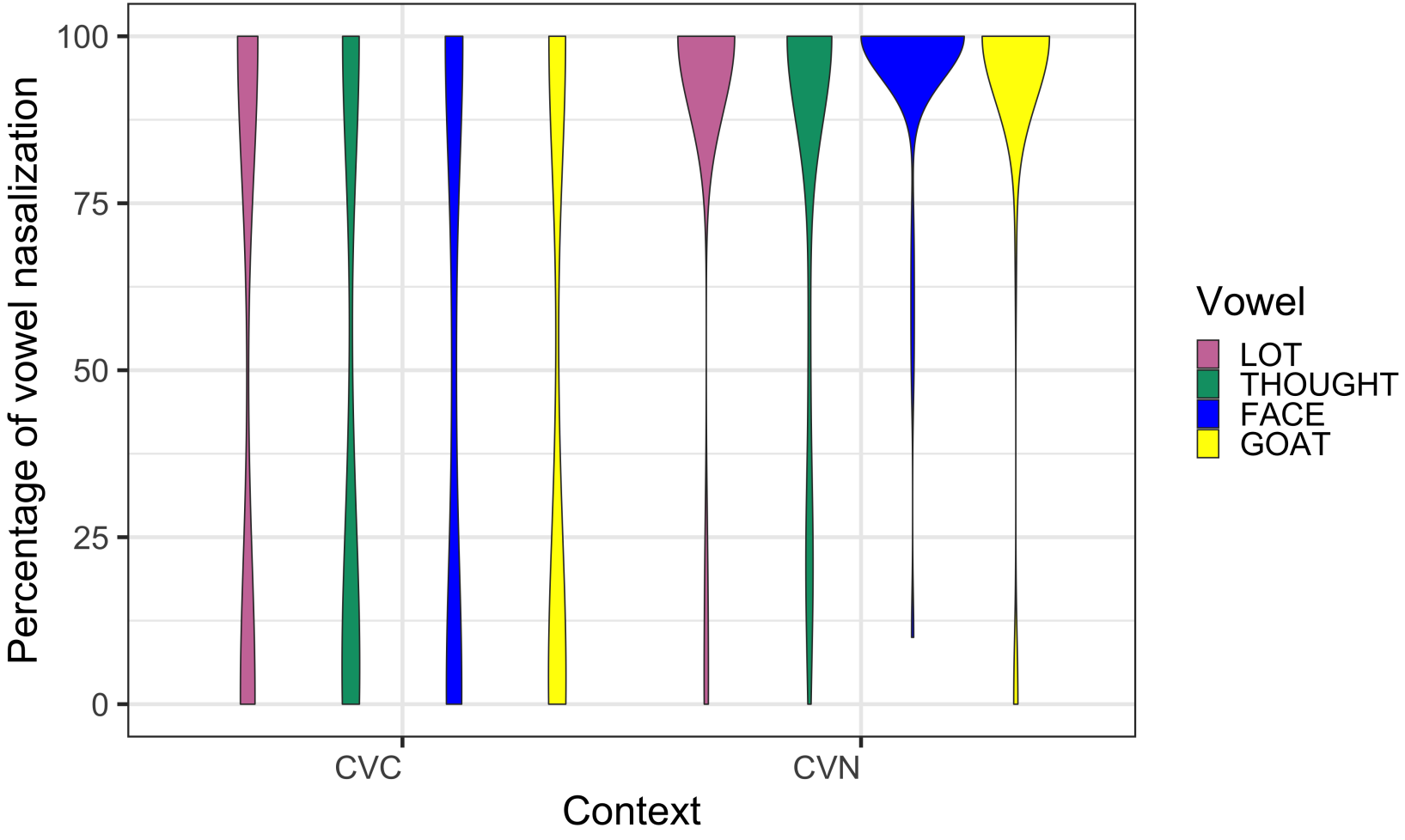
Duration of nasalization:CVN

Pre-nasal Vs are fully nasalized



Duration of nasalization: CVC and CVN

Pre-nasal Vs are fully nasalized; Pre-oral Vs are sometimes nasalized



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  - American English speakers exhibit extensive vowel nasalization from the very beginning of the vowel (phonologized nasalization) (Sole 1992).
- A bimodal distribution in pre-oral context.
  - In comparison with the baseline nasalization, speakers' vowels are either fully nasalized (100% of the vowel is more nasal than the baseline) or not nasalized at all.
  - The [SVS] context may not be a good baseline.

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  - Michigan English is getting less nasally in apparent time.
  - The decrease is only in degree of nasalization, not duration.
- Variation in Michigan English nasalization
  - Degree of nasalization is subject to lots of interspeaker variation for younger Michiganders.

Implications for sound change

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- Variation and change
  - Interspeaker variation, coupled with the coarticulatory bias, facilitates the initiation of sound change (Baker et al. 2011).
  - It would be informative to also investigate intraspeaker variability, which could be an indication of a change in progress via grammar competition (Kroch 1978, Fruehwald 2013; Sneller 2018).

Selected Reference

Chen, Marilyn Y (1997). "Acoustic correlates of English and French nasalized vowels". In: *The Journal of the Acoustical Society of America 102*.4. 2360– 2370
Eckert, Penelope (2011). "Language and power in the preadolescent heterosexual market". In: *American Speech 86*.1. 85–97. Fruehwald, Josef (2013). "Phonological involvement in phonetic change". PhD thesis. University of Pennsylvania.
Plichta, Bartlomiej (2004). "Interdisciplinary perspectives on the Northern Cities chain shift". PhD thesis. Michigan State University.
Sneller, Betsy., (2018). Mechanisms of phonological change. PhD dissertation: University of Pennsylvania.
Styler, Will (2017a). Nasality Automeasure Script Package. *https* : *//github.com/stylerw/styler_praat_scripts/tree/master/nasality_automeasure*.
Styler, Will (2017b). "On the acoustical features of vowel nasality in English and French". In: *The Journal of the Acoustical Society of America 142*.4. 2469–2482
Zellou, Georgia and Meredith Tamminga (2014)."Nasal coarticulation changes over time in Philadelphia English". In: *Journal of Phonetics 47*. 18–35.

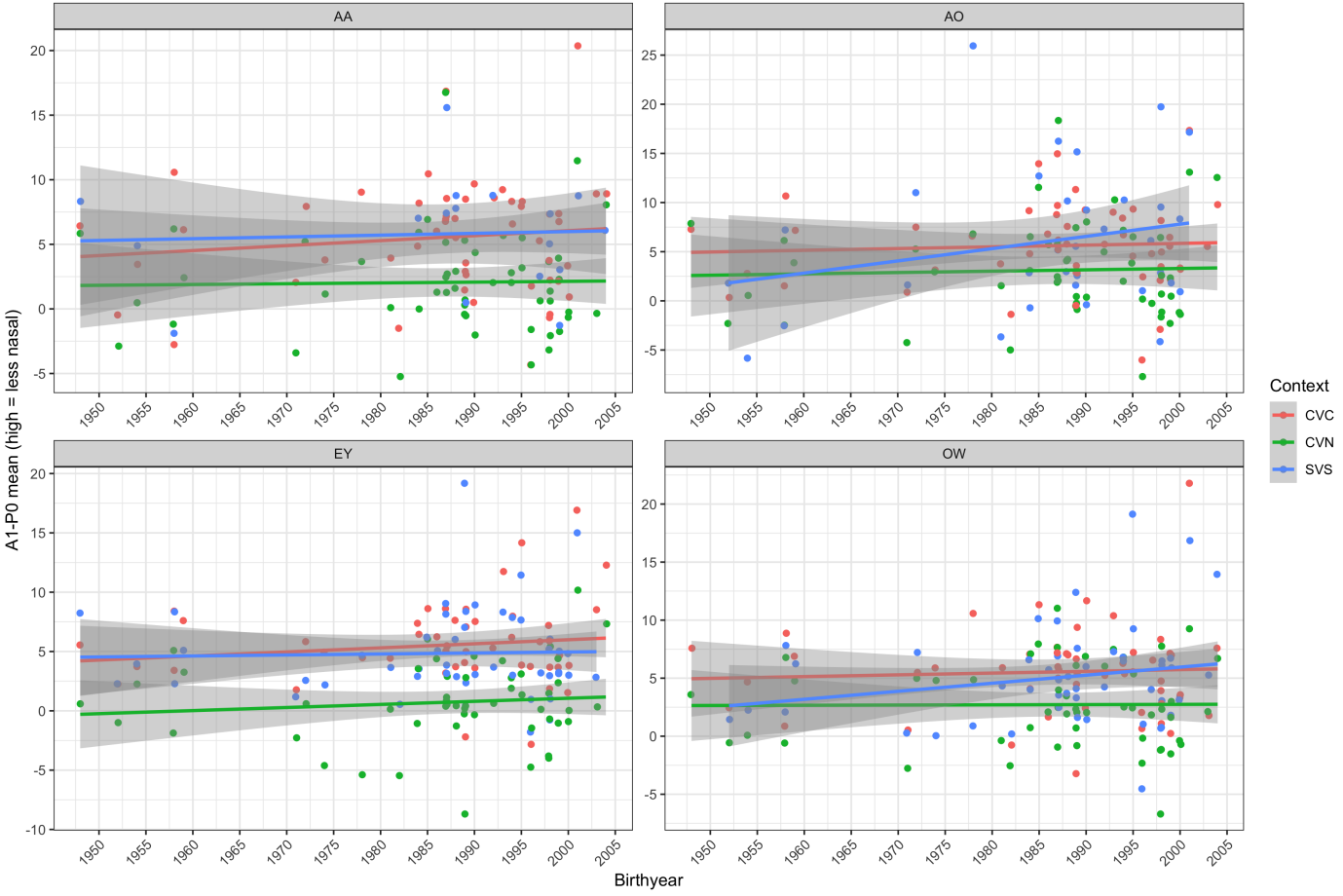
Thank you for your time!

- I would like to thank ...
  - the MI Diaries project (https://mi-diaries.org)
  - the Sociolinguistics Lab at MSU (https://sociolab.msu.edu)
  - our transcribers and participants

  ... for their continuous support.
- The slides for this talk and my contact info can be found at: https://yongqingye.github.io/

The degree of nasalization decreases

by vowel



The variability for degree of nasalization increases

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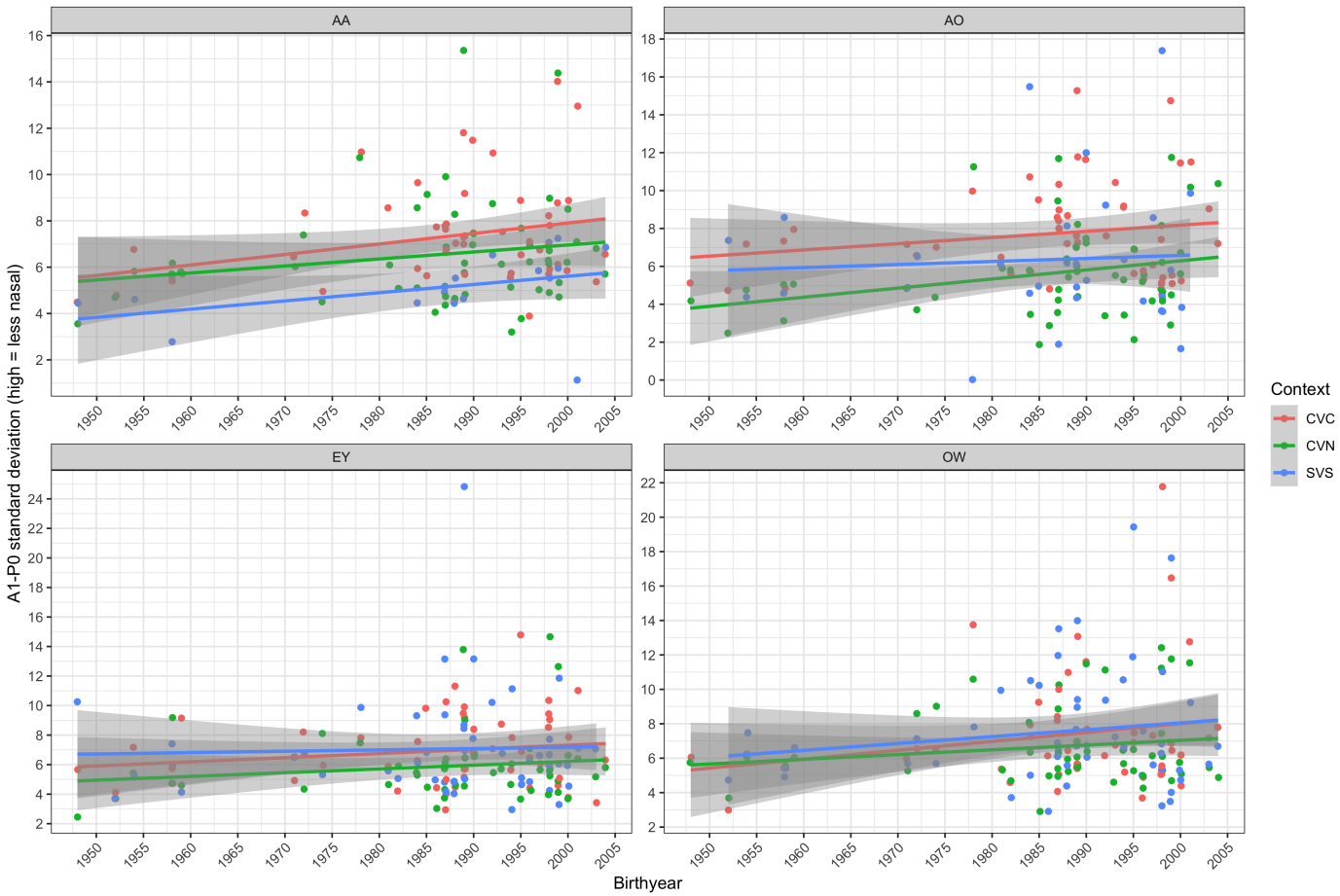
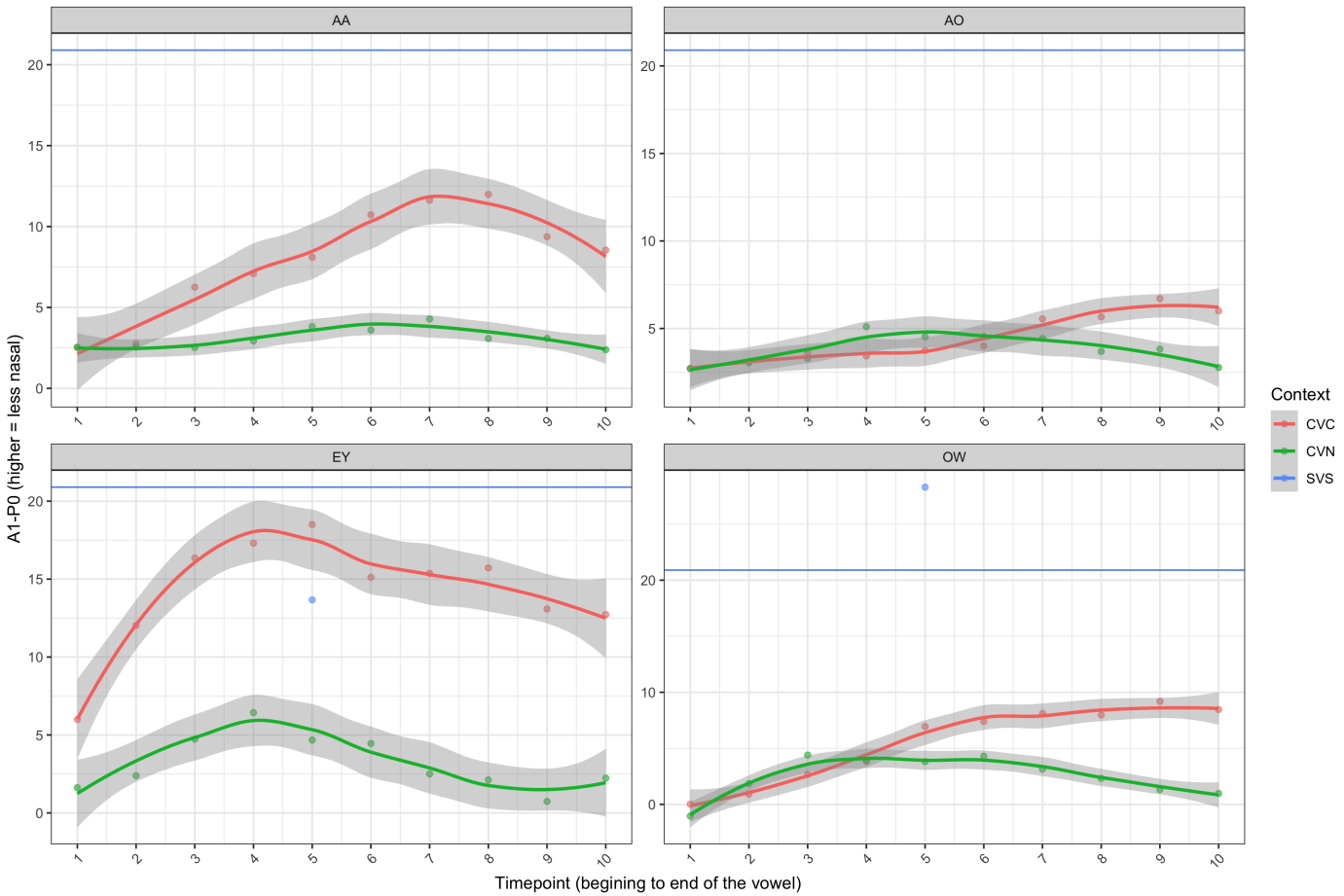


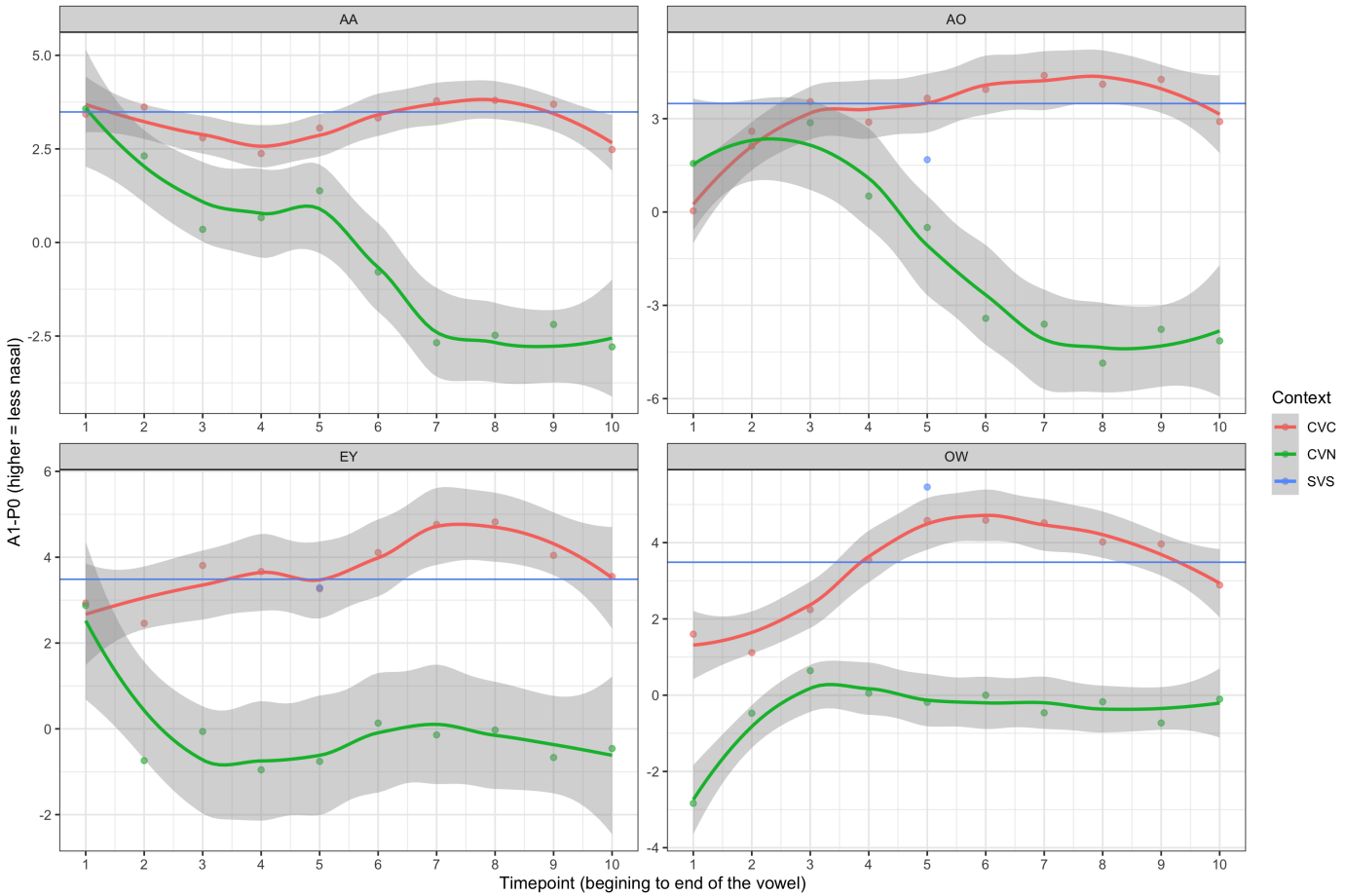
Duration of nasalization in CVC: a fully nasalizing speaker

Individual speaker: MCD00016



Duration of nasalization in CVC: a non-nasalizing speaker

Individual speaker: MCD00268



Age related change?

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- There was no consensus in the literature on how age affects nasal openness/resistance and their study with Korean participants found that speaker's nasalance decreases with age (in contexts with nasal consonants) although significant increases were observed in speakers' nasal cavity volume and nasal patency as they age (Xu et al., 2019).

Normalization

- Baseline may be changing.
  - Normalizing variations using speaker's baseline nasality is based on the assumption that the variation in the baseline is not socially meaningful (patterns with social factors such as birth year or gender) and is not going through a process of change.
  - If the reference point is changing, normalizing could disproportionately favor one age group and penalize another.

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  - If the reference point is changing, normalizing could disproportionately favor one age group and penalize another.
- In the current study, the degree of nasalization in [SVS] context does pattern with birth year.

Bith year is a significant predictor

Table: Summary of the results of the linear regression model for the average degree of nasalization

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-56.66	27.86	-2.03	0.04*
birthYear	0.03	0.01	2.30	0.02*
THOUGHT	0.54	0.57	0.93	0.35
FACE	-0.60	0.56	-1.06	0.29
GOAT	0.31	0.56	0.55	0.58
ContextCVC	-1.93	0.50	-3.90	0.0001***
ContextCVN	-5.34	0.50	-10.78	0.00***

Birthyear and the duration of nasalization

Model Results

Table: Summary of the results of the linear regression model for the duration of vowel nasalization.

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-94.48	270.69	-0.35	0.73
birthYear	0.08	0.14	0.55	0.58
THOUGHT	-7.35	5.31	-1.38	0.17
FACE	-0.04	5.29	-0.01	0.99
GOAT	-3.08	5.28	-0.58	0.56
ContextCVN	38.96	3.75	10.40	0.00^{***}