

# Measuring Changes in Vowel Space Shape across California

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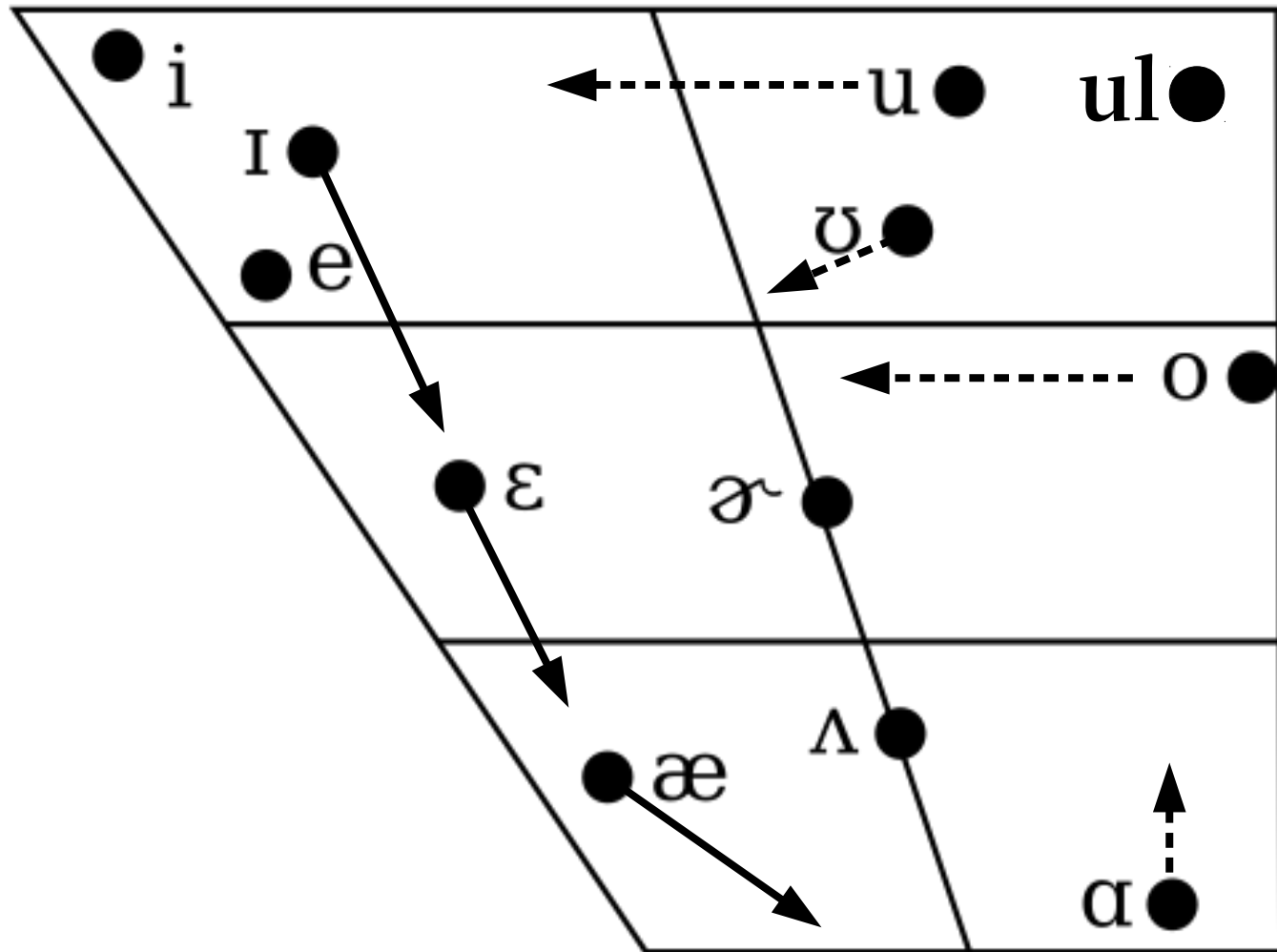
# Outline

- California English and vowel shift
  - › Phonological change
- Measuring vowel space shape
  - › Method
  - › Data
  - › Results
- Discussion
- Conclusion

## California English

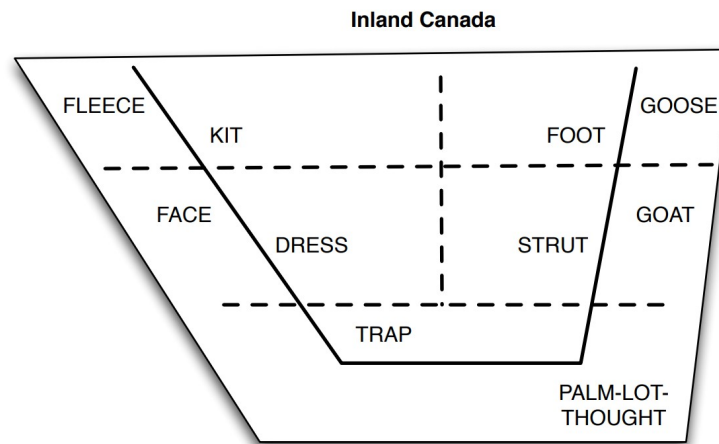
- Pull chain precipitated by low back merger
  - LOT merges upwards to THOUGHT
  - BAT retracts
  - Front lax vowels fall

# California English



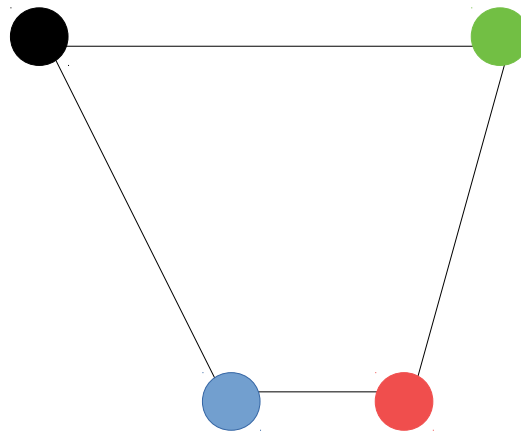
## California English

- Pull chain precipitated by apparent low back merger
  - LOT moves upwards
  - BAT retracts
  - Front lax vowels fall
- Vowel space looks more triangular (D'Onofrio, et al. 2016)
- Reflects triangular phonological system? (cf. Roeder & Gardner 2013)



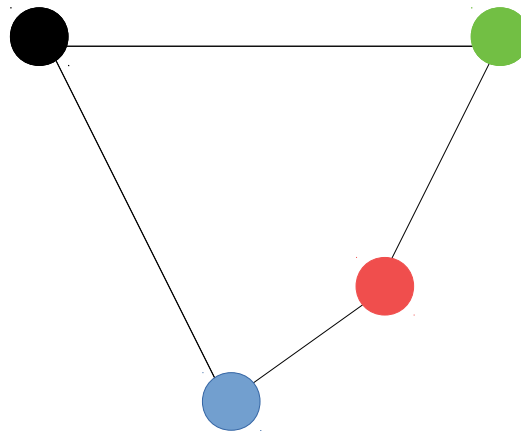
# Phonological change

- Quadrilateral before low back merger



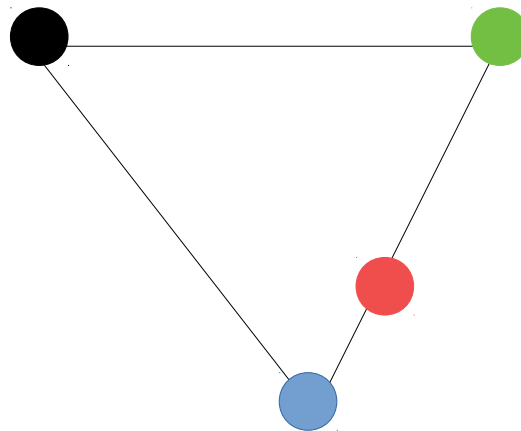
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- Combination results in triangle





## Phonological change

- Quadrilateral before low back merger
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- Combination results in triangle
- Wrongly predicts low back merger always leads to triangular systems

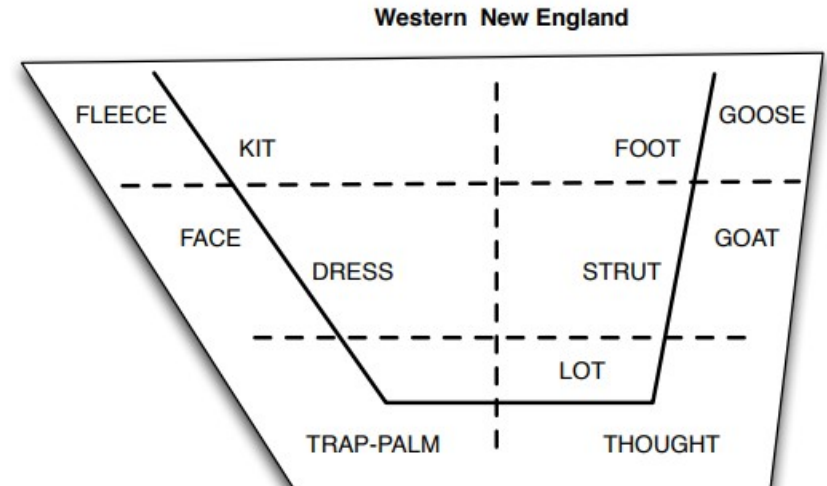
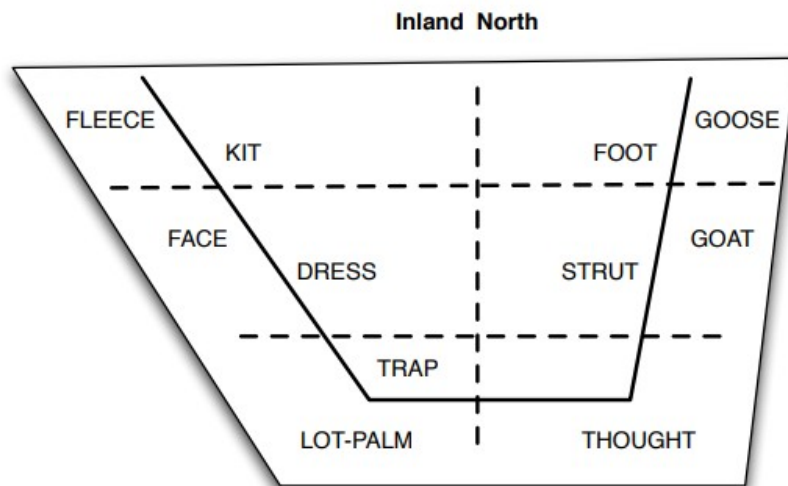
# California English

## Research Questions

1. What prevents shift outside of California?
2. Does phonetic shape provide evidence for phonological change?

## Actuation of BAT retraction

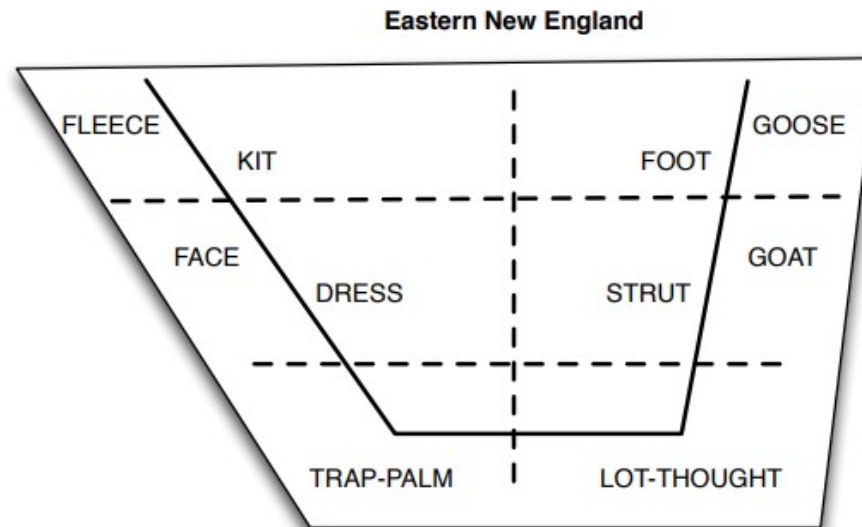
- Segments specified only for contrastive features (Dresher, 2009)
- 3 low vowel systems require two features to distinguish
  - [+/- Peripheral]
  - [+/- Back]
- [+/- Back] in low vowels = quadrilateral system



Roeder & Gardner (2013)

## Actuation of BAT retraction

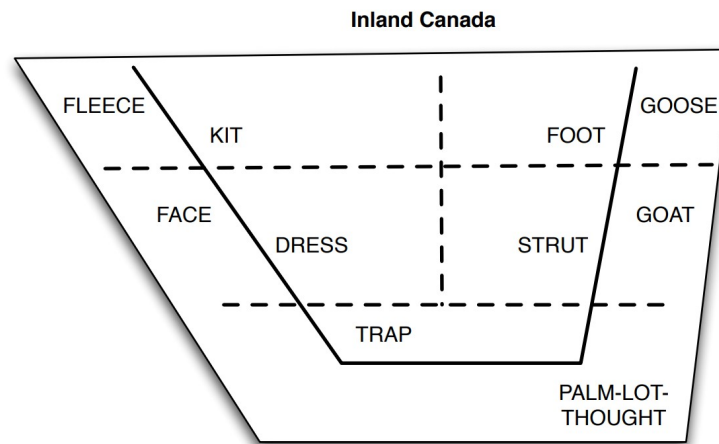
- Can retain quadrilateral system post merger
- LOT-THOUGHT merge across [Peripheral]
- Maintains [+/- Back]
  - [- Back] prevents BAT retraction
- Remains quadrilateral system



Roeder & Gardner (2013)

## Actuation of BAT retraction

- Canadian English similar to CalEng
  - Low back merger
  - BAT retraction
  - Front lax vowels fall
- LOT-THOUGHT merge across [Back] not [Peripheral] (Roeder & Gardner 2013)
- [Ø Back] specification for TRAP allows retraction
- Canadian vowel space increasingly triangular (Boberg 2011)

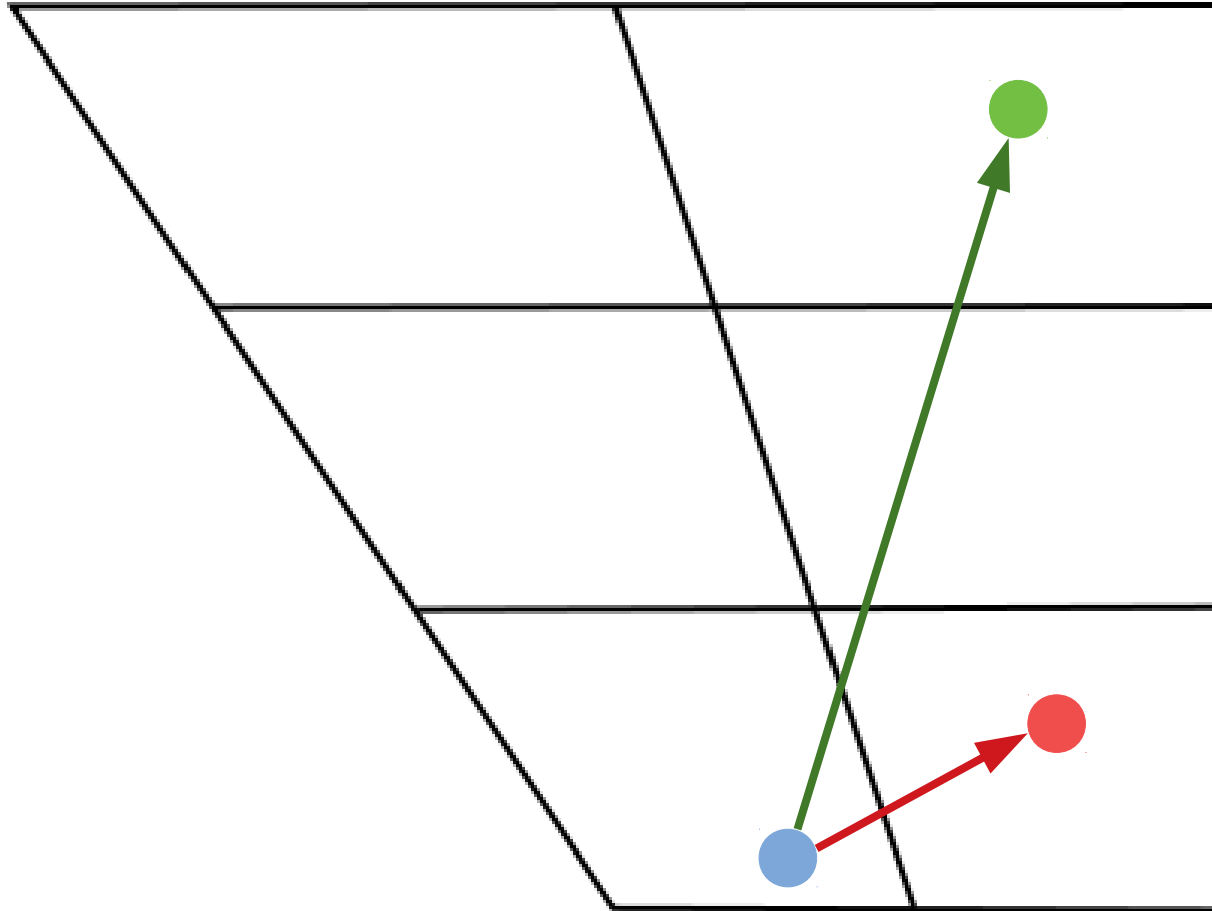


## Interim Summary

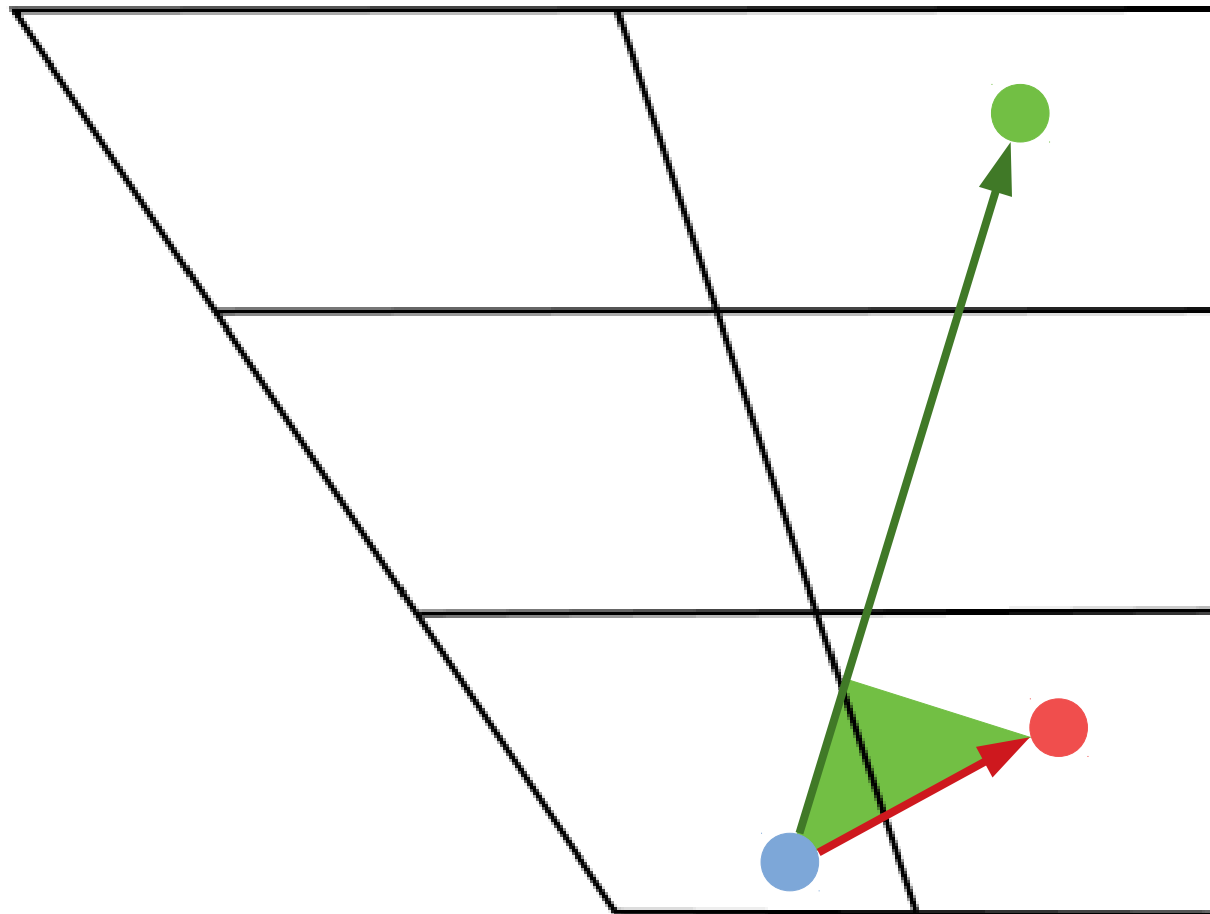
Why change to triangle in California and not all merged dialects?

- Merge by loss of [Back] or [Peripheral]
  - Quadrilateral if [+/- Back] retained
  - Triangle if [+/- Back] lost
- California lost [+/- Back] in low vowels
  - Merger allows BAT retraction
  - Explains start of pull chain
- Hypothesis predicts specific movements
  - LOT-THOUGHT should move up and in
  - BAT should move back (maybe down)
- Does phonetic evidence support phonological hypothesis?

## Measuring Vowel Space Shape

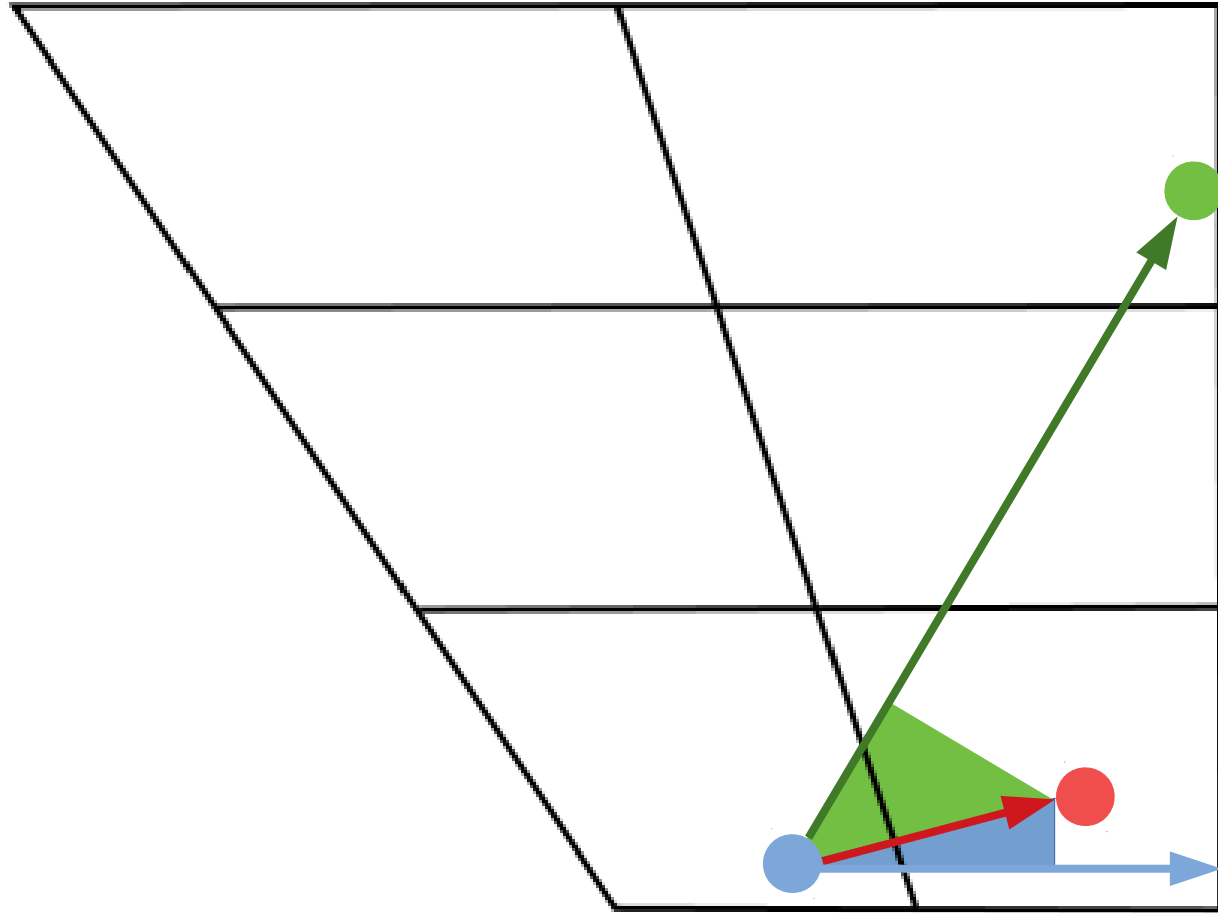


## Measuring Vowel Space Shape

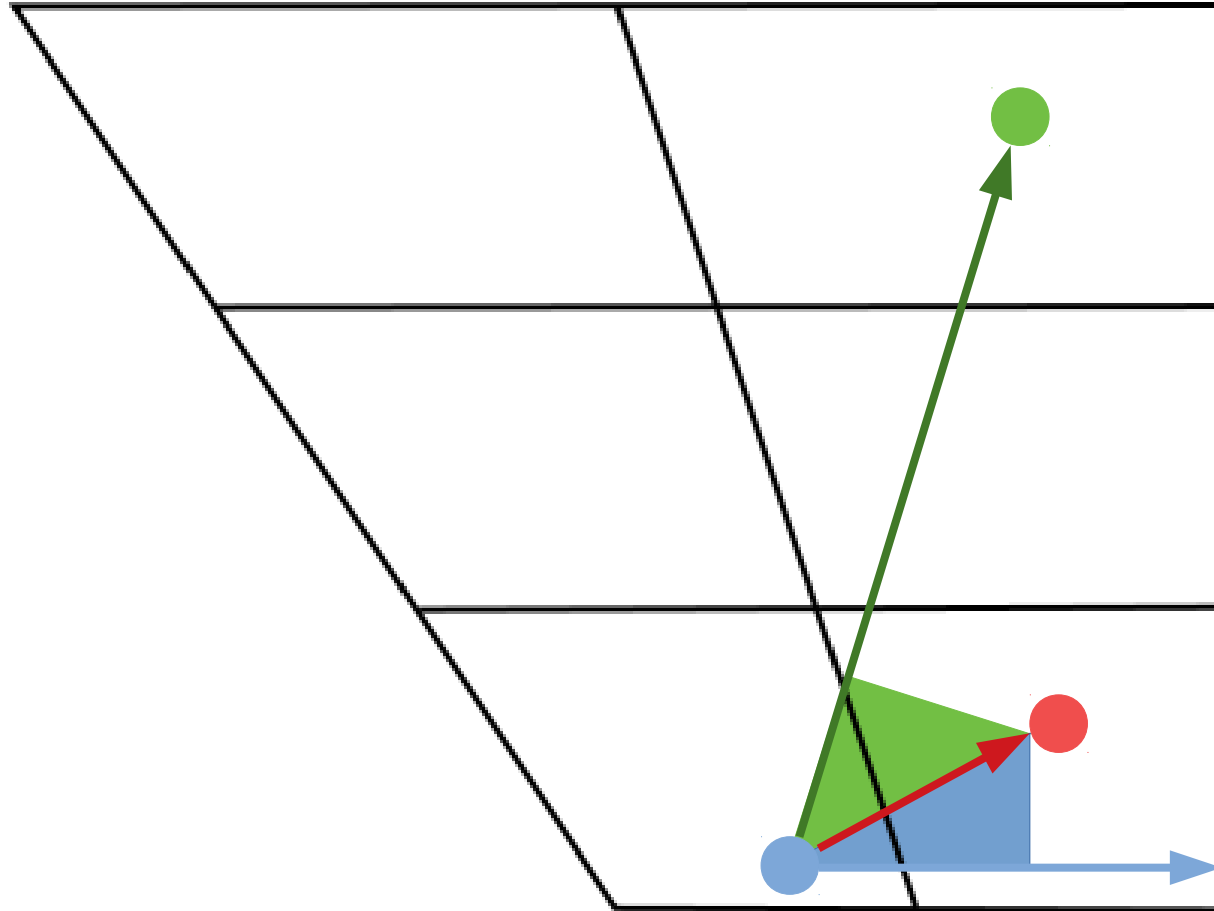




## Measuring Vowel Space Shape



## Measuring Vowel Space Shape



## Measuring Vowel Space Shape

1. Identify high back (POOL), low front (TRAP), and LOT vowels
2. Translate the system so TRAP is at (0,0)
3. Measure (LOT-)POOL angle *and* (LOT-)Axis angle
4. Compute POOL angle to Axis angle ratio
  - Ratio  $> 1$  vowels more triangular
  - Ratio  $< 1$  vowels more trapezoidal

## Participants

403 speakers from 5 field sites

Merced (7)

Redding (10)

Bakersfield (67)

Sacramento (118)

Salinas (54)

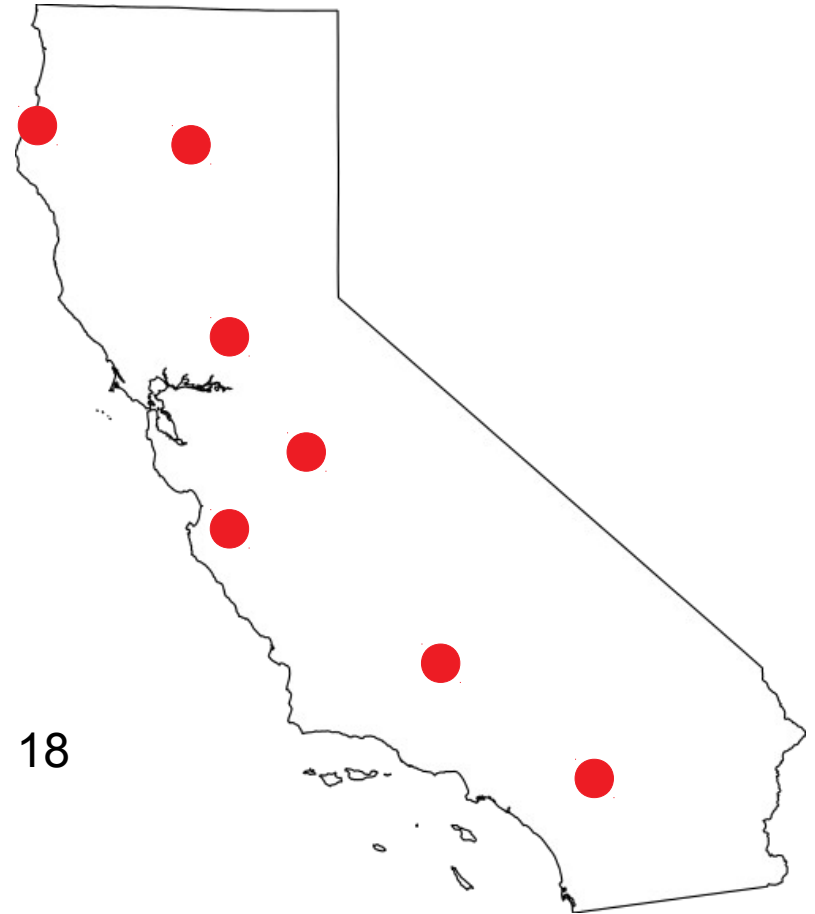
Humboldt (84)

Redlands (80)

Participants were excluded if they lived  
outside the field site for...

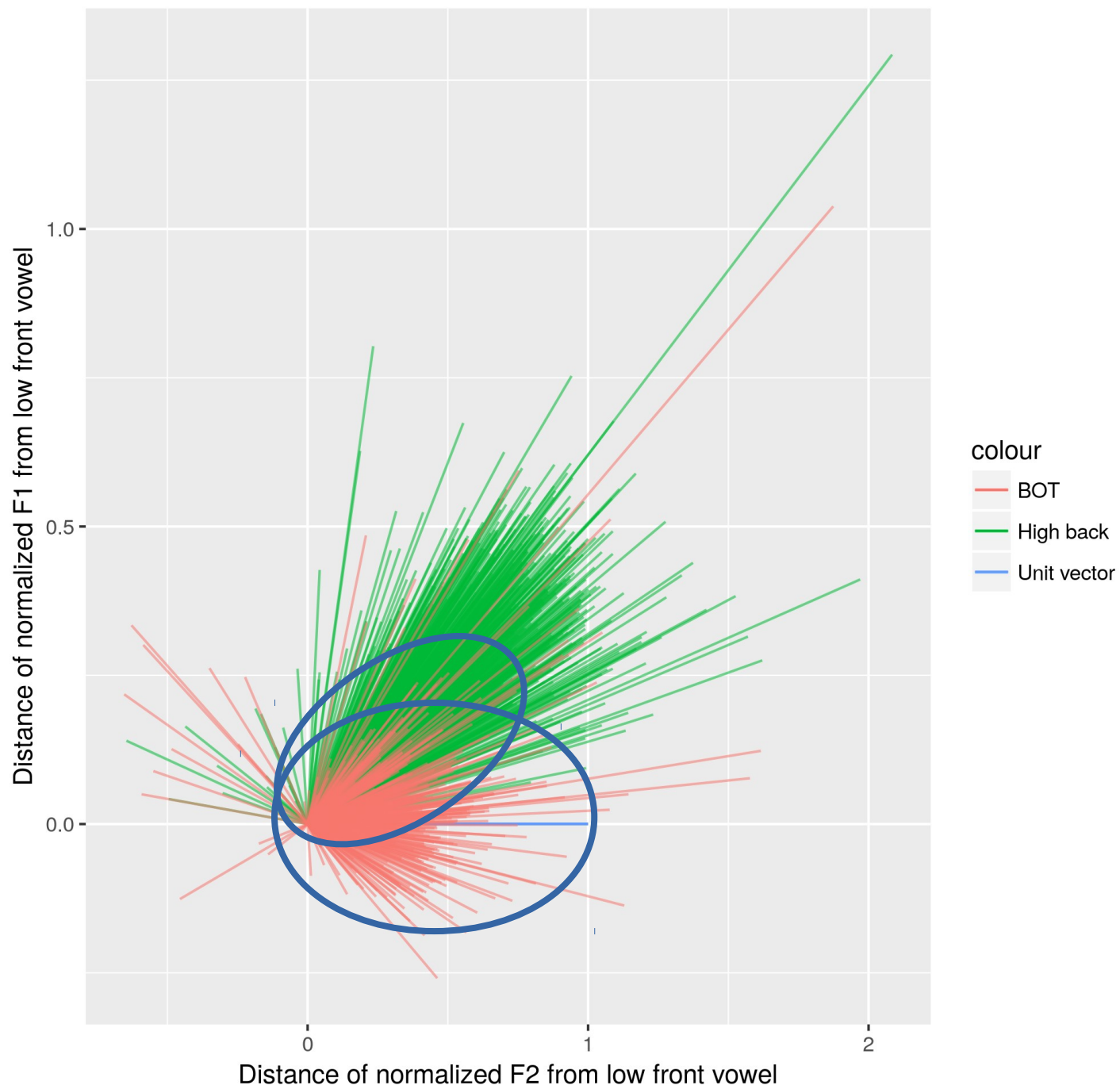
...more than 2 years between 7 and 18

...more than 6 years after 18

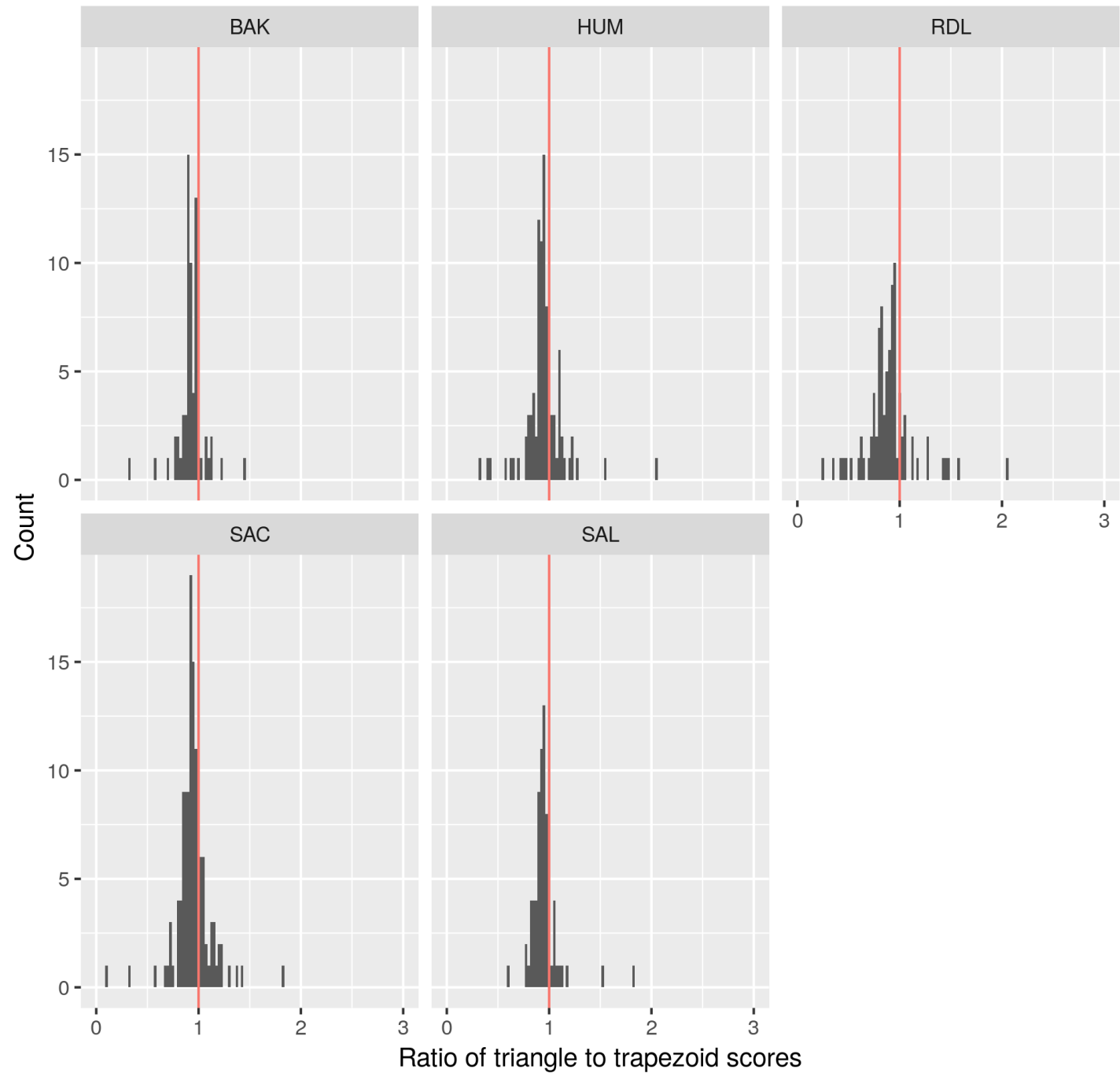


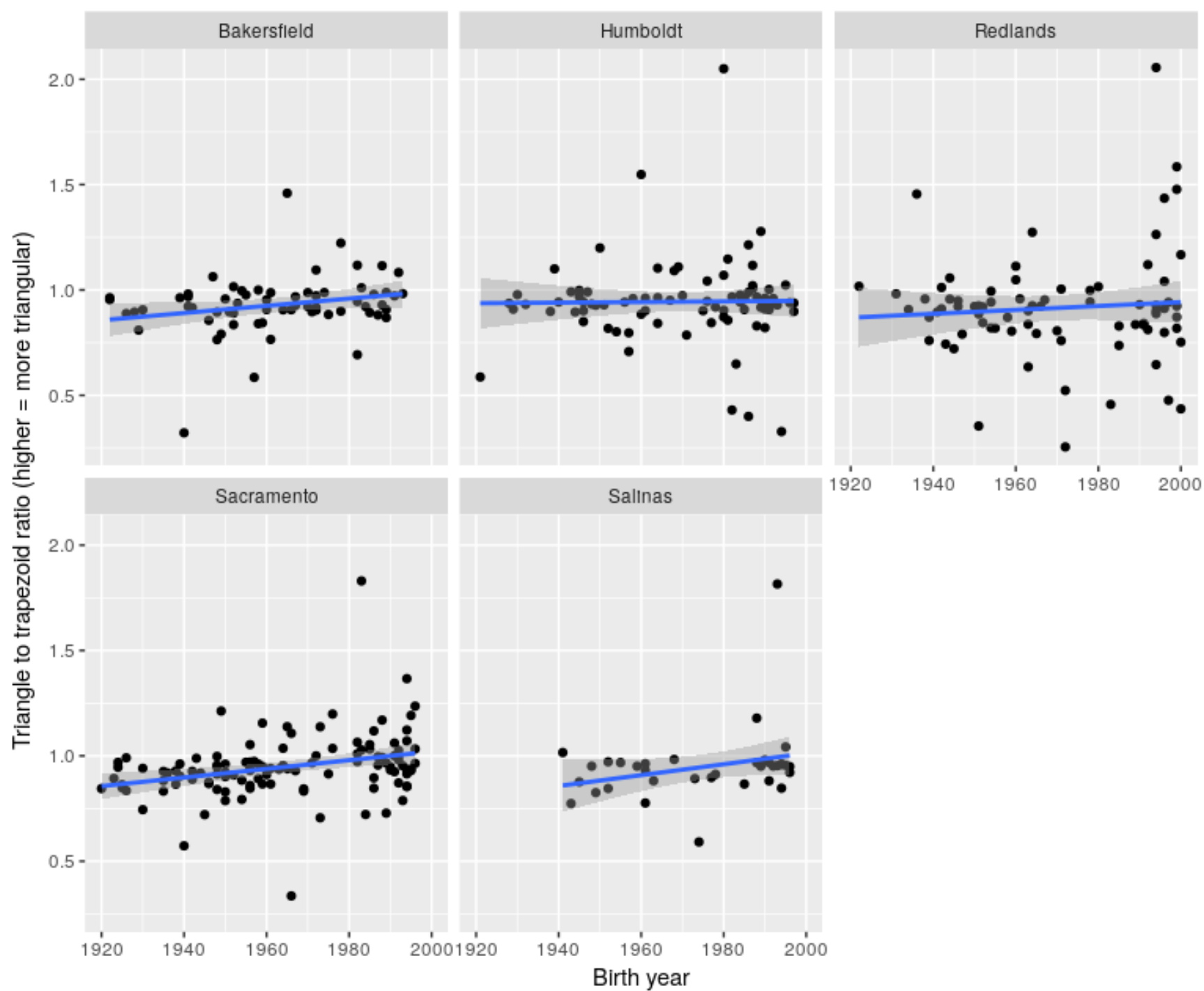
## Data Collection

- Wordlist collected after sociolinguistic interview
  - Bakersfield: Order randomized by participant
  - Other: Randomly assigned one of two orders
- Aligned using FAVE (Rosenfelder, et al. 2014)
- Vowels with primary stress extracted by script
- Measurements via PraatSauce (Kirby, 2019)
- F1 and F2 averages across the vowel Nearey normalized
- ~29 tokens per participant



4 Mar 2019

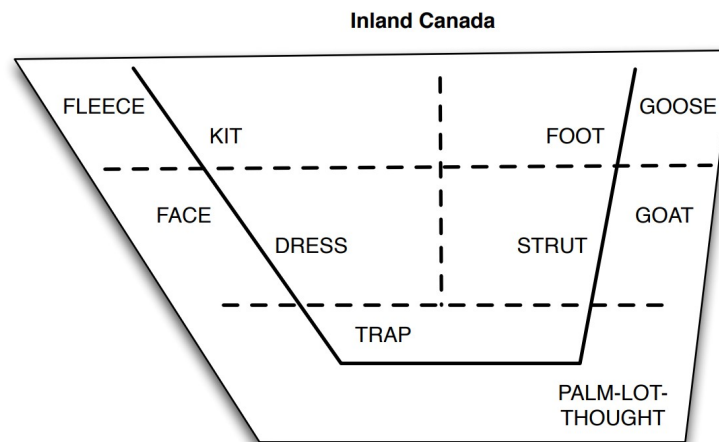






## Discussion

- Evidence for phonological change
  - Suggests complete rather than near merger
- Confirms previous findings based on vowel height (D'Onofrio, et al. 2016)
- Problem of phonetic implementation of [+/- Peripheral]
  - TRAP needs [- Peripheral] to continue pull chain
  - LOT more peripheral articulation
- Alternate feature, e.g. length?



## Acknowledgements

- Voices of California participants, fieldworkers, and data tidiers
- Rob Podesva
- Meghan Sumner

## Questions and comments

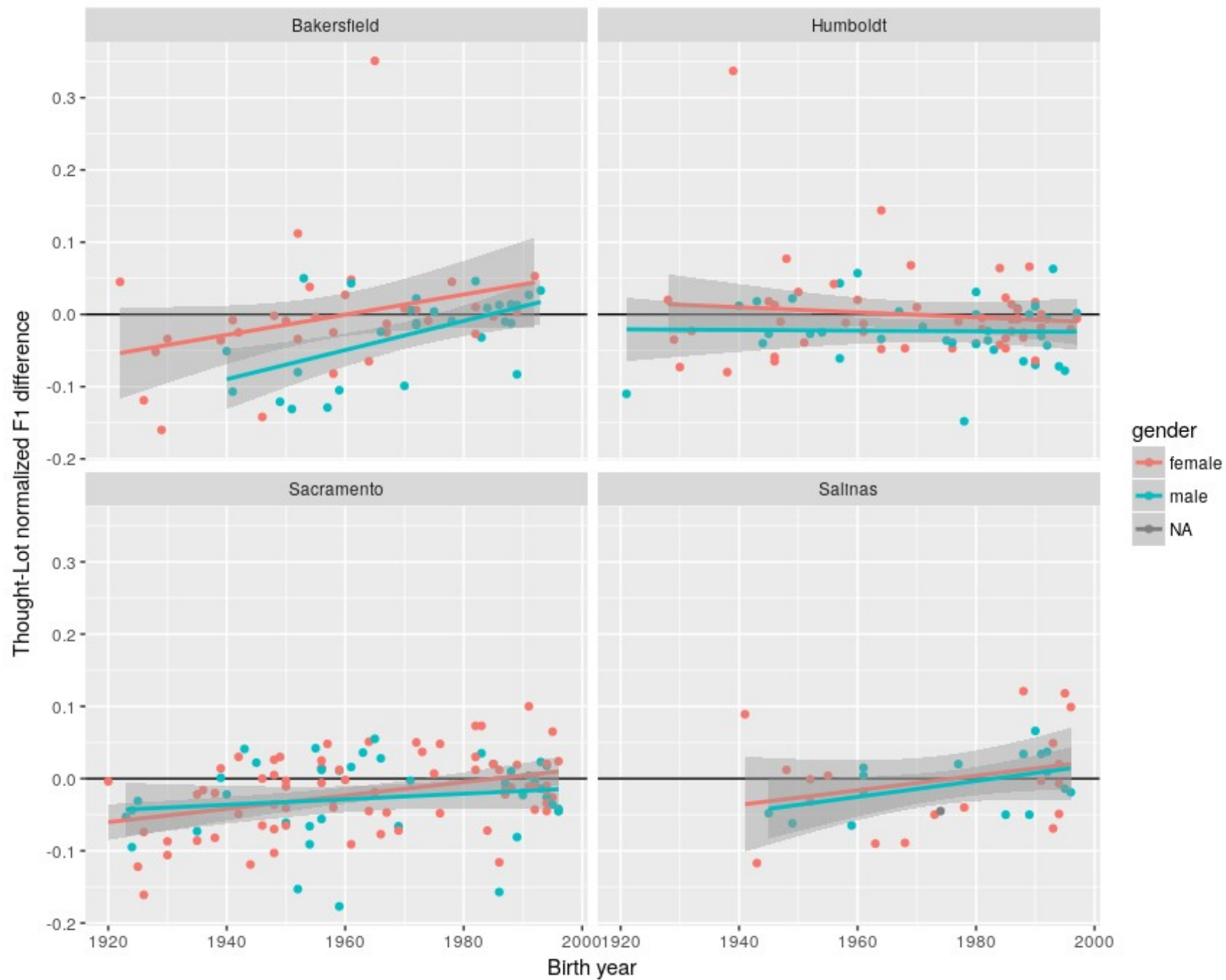
Email: [brickhouse@stanford.edu](mailto:brickhouse@stanford.edu)

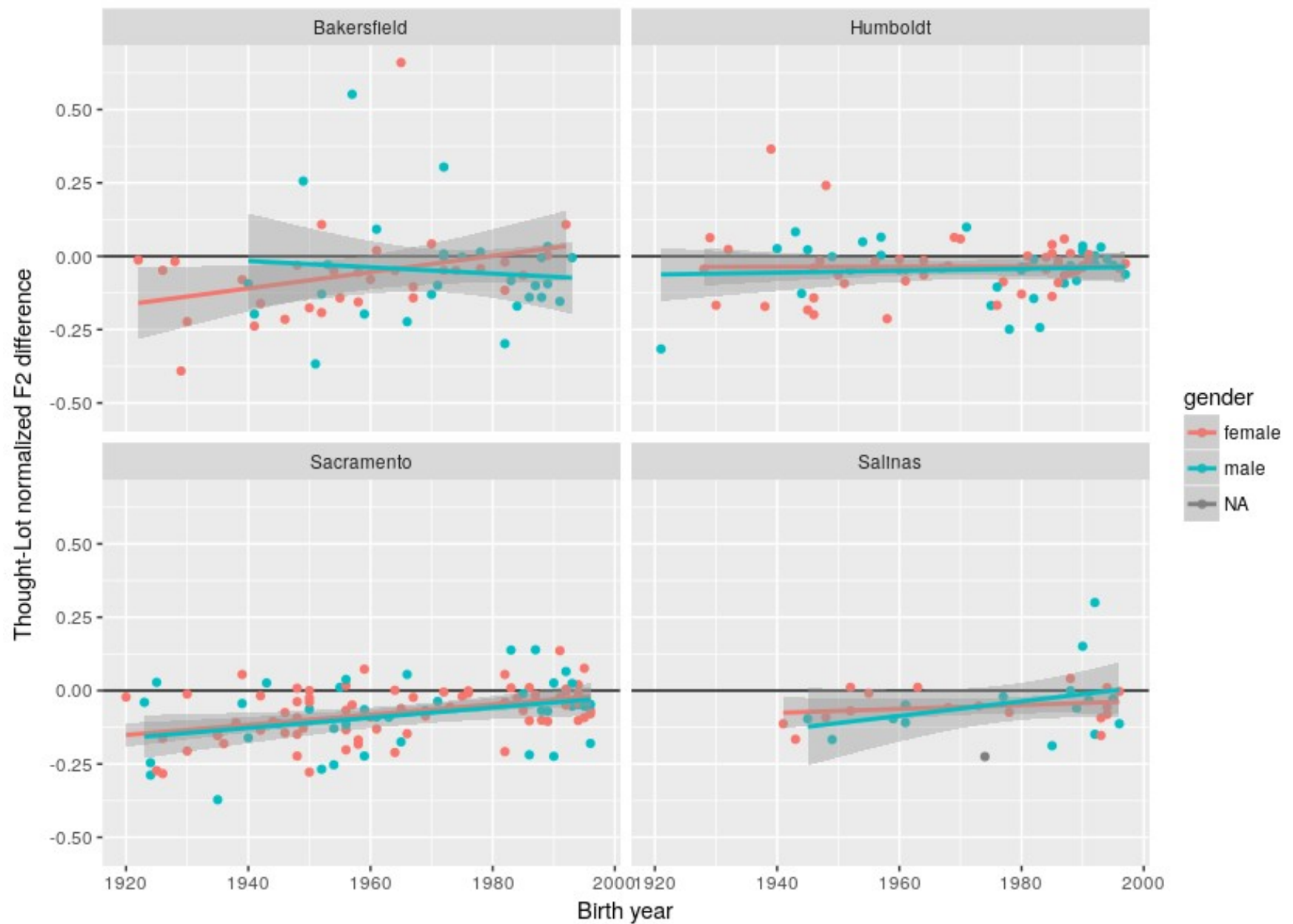
Git repo: [@ChrisBrickhouse/california-vowels](https://github.com/ChrisBrickhouse/california-vowels) (slides, materials, etc)

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## Bonus Slides





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