

# Vowel raising in Washington English: What's the *BAG* deal?

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# Outline

1. **Goal:** What are the implications, for sociolinguistic theories of merger, of the low-front prevelar raising of BAG (aeg) observed in the English of Washington state?

Merger: (def.) “In sound change, a process characterized by coalescence of vowel qualities resulting in loss of phonological contrast (Labov, 1994: 33)”.

2. **Background:** Theoretical types of merger
3. **Methods:** To examining path of the change, present overlap data for three generations of Washington speakers
4. **Results:**
  - Change in apparent time (inter-generational patterns)
  - Individual variability

# Research Questions

**Research Question I:** *Does one (or more) of the theoretical types of merger proposed by Labov (1994) best fit the data for most speakers in the sample? Do these elucidate our understanding of the mechanism of the merger?*

**Group-level** examination of by-generational differences in apparent time to indicate community-wide patterns:

- ▶ H0: Inter-generational variability will obscure any pattern.
- ▶ H1: Inter-generational variability will point to merger by transfer.
- ▶ H2: Inter-generational variability will point to merger by approximation.

**Research Question II:** *Do we see different configurations reflecting different merger strategies at the speaker level?*

**Individual-level** examination of speaker-level variation:

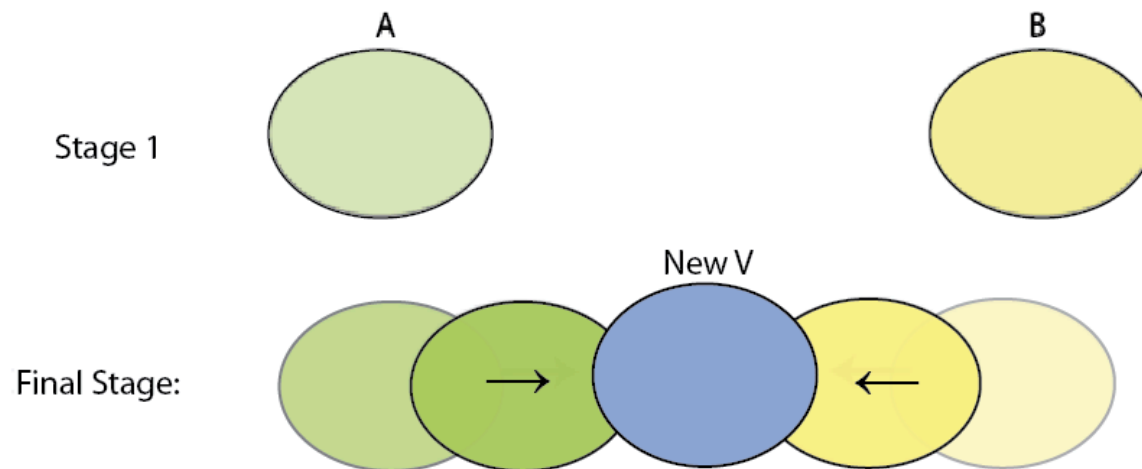
- ▶ H0: Individual variation will make it difficult to discern any pattern.
- ▶ H1: We will see merger by transfer.
- ▶ H2: We will see merger by approximation.

# Background

- Raising or merger? (Reed, 1961; Wassink et al. 2009, Wassink & Riebold 2013). Pre-velar raising is widespread, affects different WA communities (Riebold, 2013).
- Younger speakers' target for BAG (aeg) appears to be [ɛ ɛ̃] (ehg~eyg), not (eyg) (Freeman, 2013).
- Disruption of the symmetry of a vowel system (Martinet 1952, Chen & Wang 1975).
- Phonological implications of raising either (ɛ) or (æ) to (ey) may be minimal.
  - ▶ (eyg) may be susceptible to phonetic crowding: low functional load  
“bagel”, “vague”, “plague”, “pagan”
  - ▶ no (æg~eyg) minimal pairs
- but merging (æ) with (ɛ) has more significant implications.
  - ▶ “bag/beg”, “lag/leg”, “rag/regular”

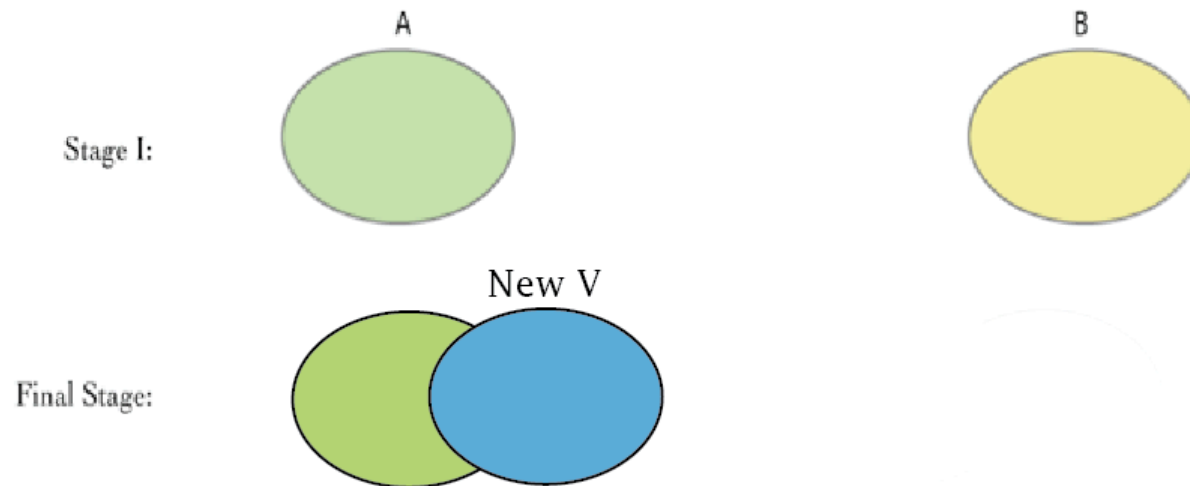
# Merger Type I

- Merger by **Approximation**: (2 subtypes)
- (1) Vowels A and B both shift, resulting in a new vowel quality intermediate to the original phonetic values (“middle ground”).
- (2) or, one affected vowel gradually approaches the other



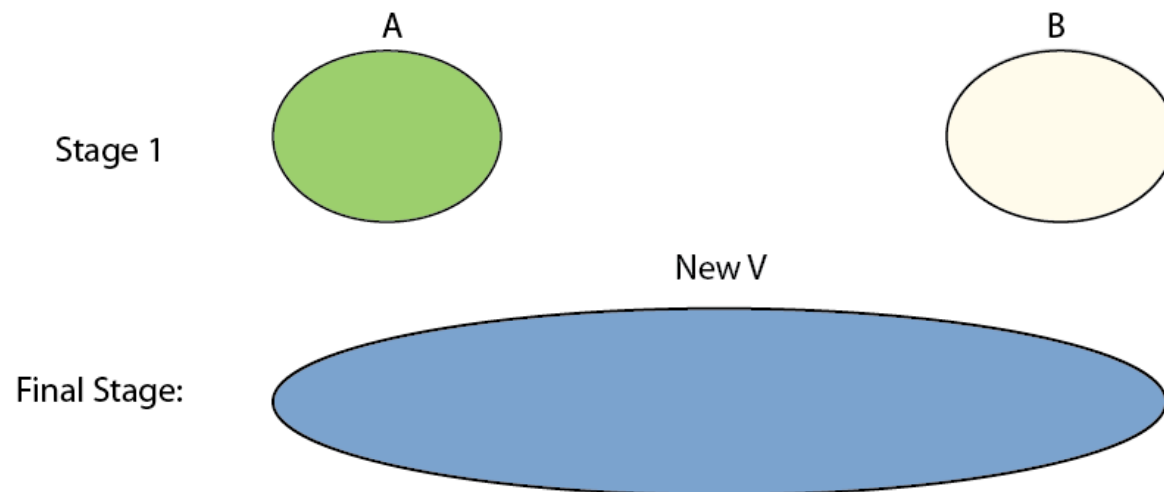
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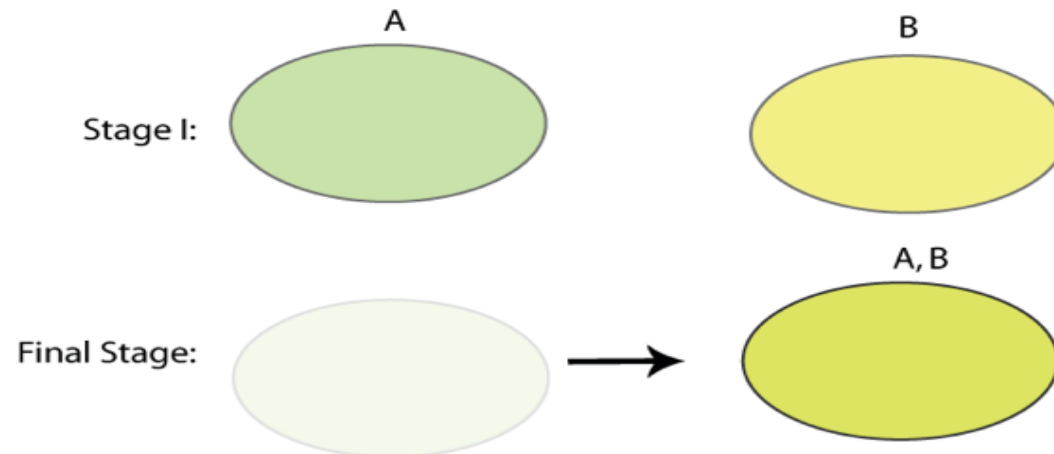
# Merger Type 2

- Merger by **Expansion**:
- Distribution of Vowel B (shifting V) becomes enlarged, eventually assumes the mean value of Vowel A.
- Indistinguishable from merger by approximation in mid-course



# Merger Type 3

- Merger by **Transfer**:
- unidirectional shift in which elements of distribution B are transferred into A, leaving no intermediate phonetic forms.
- McMahon (1999): easy type to see.
- Inference: acoustic effects easiest to observe.





# Methods

Speakers: 18 Caucasian-Americans Apparent-time sample, 3 generational cohorts:

Generation 1 (n=5): born 1900-1950 (eldest 100 y.o.a.)

Generation 2 (n=8): born 1951-1976

Generation 3 (n=5): born 1977-1992 (youngest 21 y.o.a.)

Materials: /æ(g), ε(g), ey(g)/ + /i, a, ɔ, u/

Words in carrier: “Write \_\_\_ today.”

Reading passage: Aesop’s Fables “The Cat and the Mouse” (adapted)

Digitally recorded using a 44kHz sampling rate

Penn Phonetics Lab Forced Aligner (P2FA) for forced-alignment

Measures: Vowel duration, F1-F3 measured at 20, 50, 80% into vowel

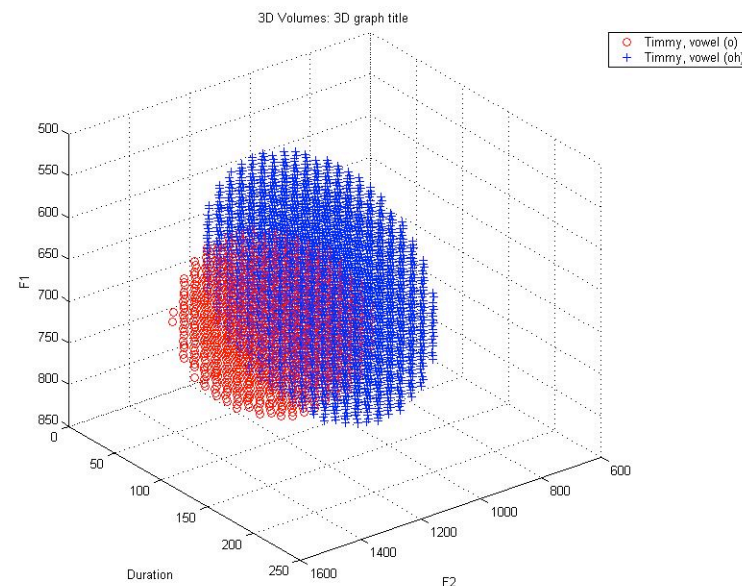
Nearey-2 normalization

PhonR for midpoint plotting (McCloy 2013), SSANOVA (trajectory)

Token count: 14,519

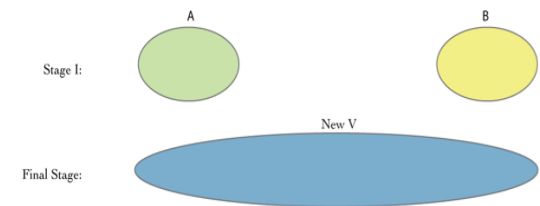
# Spectral Overlap in Merger Research

- Spectral Overlap Assessment Metric: Normalized scatter for two vowel distributions is modeled as two best-fit ellipsoids angled to reflect the distribution's orientation in  $F1 \times F2 \times \text{Duration}$  space. (Wassink, 1999, 2006).
- Overlap Proportion: ( $\Omega$  value from 0-1.0, or 0-100%) Represents the area of the region shared by both vowel distributions.
- Conservative heuristic:
  - COMPLETE:  $\Omega=75-100\%$
  - PARTIAL OVERLAP:  $\Omega=21-74\%$
  - NO OVERLAP:  $\Omega=0-20\%$

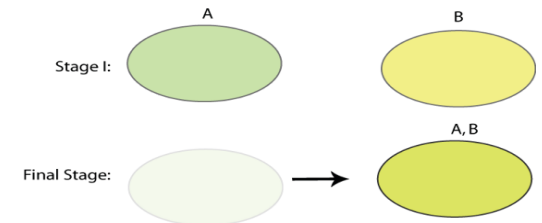


# Operationalizing Types of Merger

- **Approximation (expansion):** Might appear numerically as: Complete or partial overlap between affected vowel(s) with residual forms at neighboring classes.



- **Transfer:** Might appear numerically as: Complete overlap with target distribution, but No overlap with intermediate neighboring classes.



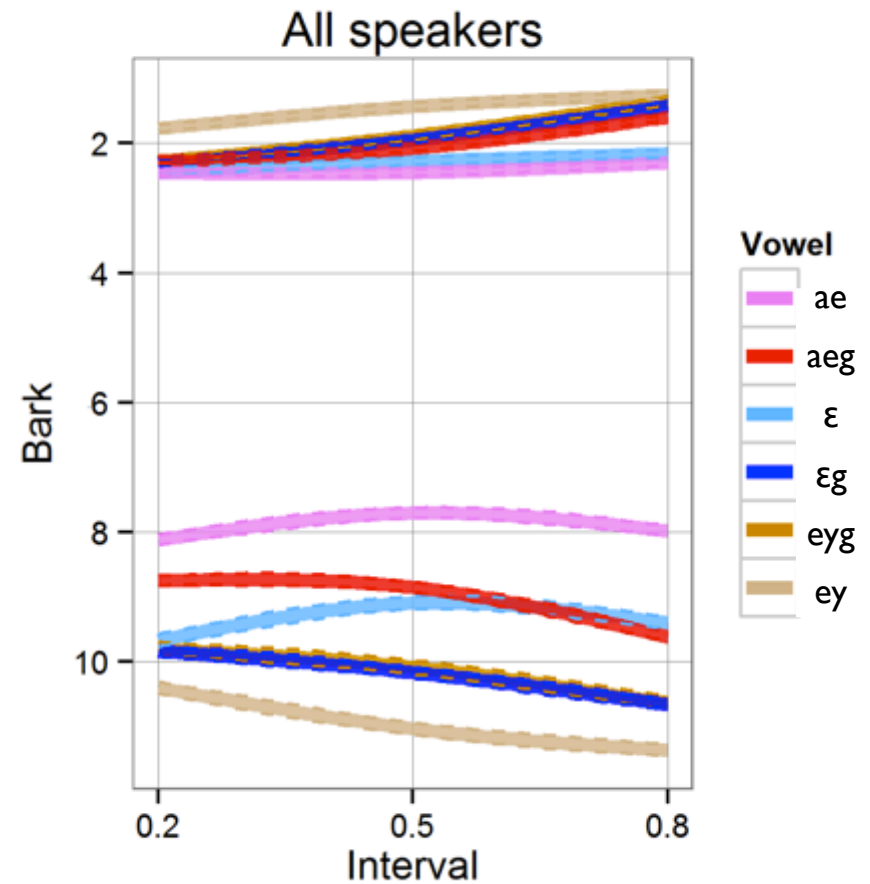
# Summary: Generational Differences

Table 1: % of speakers in each generational cohort who show COMPLETE SPECTRAL OVERLAP for (aeg) with a neighboring vowel.

Gen.	(ey~aeg)	(εg~ aeg)	(ε~aeg)	(ae~aeg)
1 (n=5)	0%	0%	20%	60%
2 (n=8)	13%	50%	35%	63%
3 (n=5)	40%	40%	40%	60%

3-D (F1xF2xDuration) overlap proportions (logHz data). COMPLETE:  $\Omega=75\%$  or higher, PARTIAL:  $\Omega=21-74\%$ , NO OVERLAP:  $\Omega=0-20\%$

- (ey~eyg) appear to become more separate as speaker age decreases
- (ey) is higher than (eyg)
- (εg~eyg) BEG, BAGEL are similar in trajectory

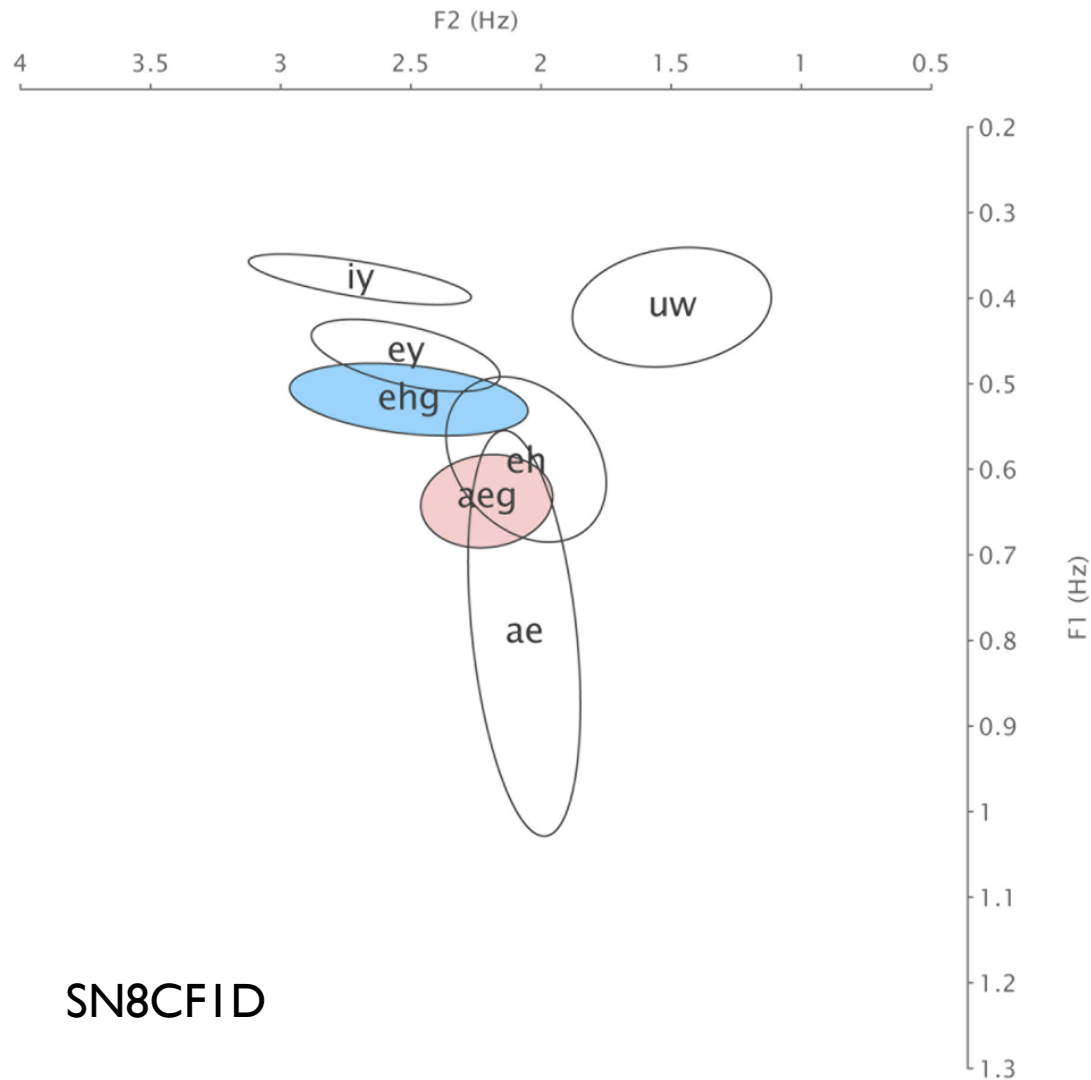


source: Freeman (2013)

# RQ2:

- Do we see different configurations reflecting different merger strategies at the speaker level?

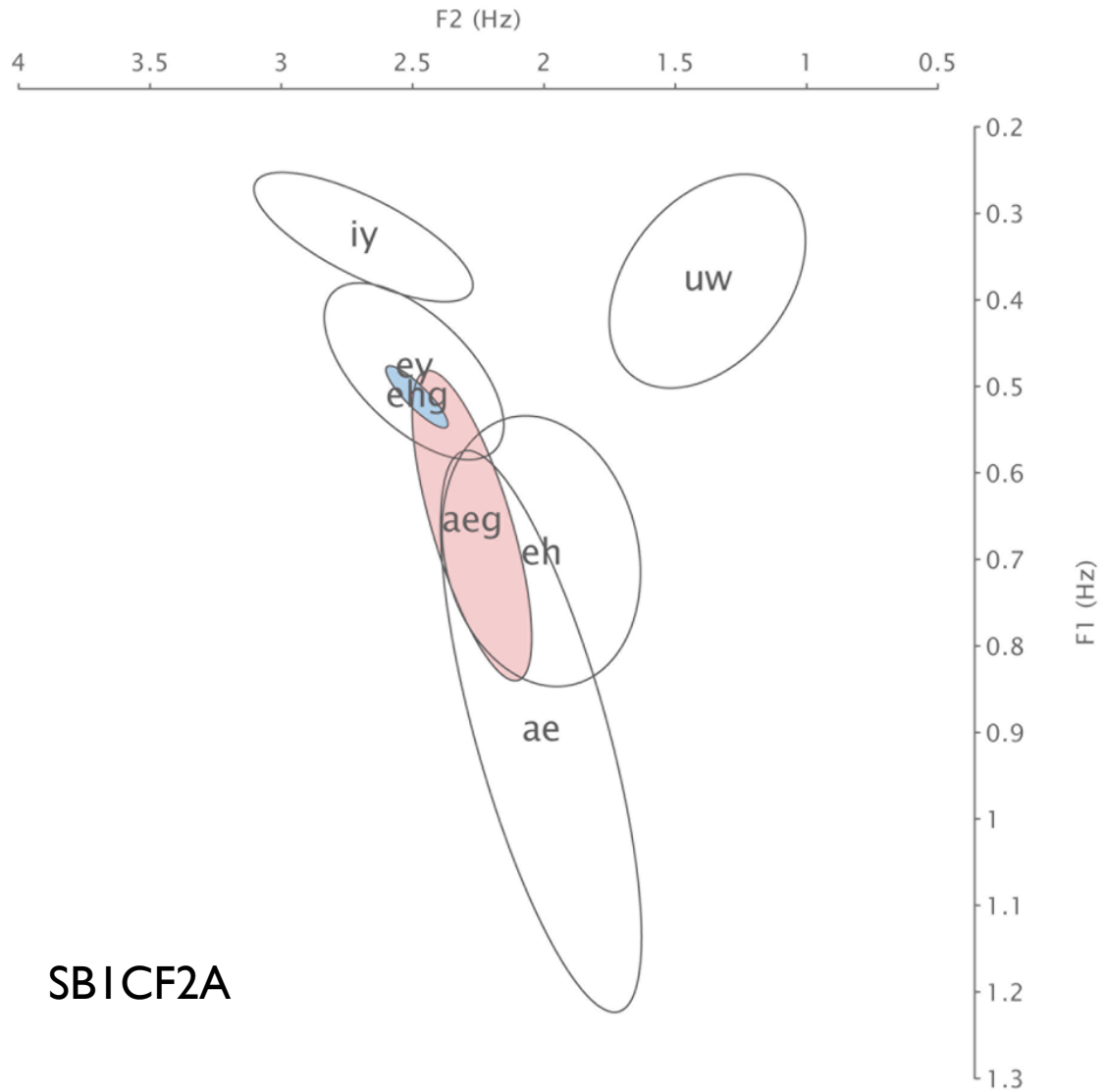
# Approximation



Here, (aeg) shows raising to [ɛ] (eh) without expansion (distribution shows limited F1 range). But (ae) targets in all environments are widely dispersed.

(ehg) also shows raising with approximation to (ey).

# Transfer



(ehg): Transfer to (eyg) likely.

(aeg): Expansion evident. Intermediate forms overlap with (ae), (eh) and (ey).



# Summary

- Generational view shows us possible progression of a merger by approximation.
- **Intermediate forms** commonly observed. We observe evidence for lowering of (eyg). Spectral evidence for both subtypes (“middle ground”, and “approaching”).
- Little evidence found for merger by transfer (possible assessment for only 1 speaker), but it is easy to detect. The raising of (ehg) most likely candidate for transfer.
- **Transfer**: This type is not common cross-linguistically. Where it is, it has been associated with lexically-diffusing change (McMahon, 1999).

# Implications

- (eyg)'s small membership create no problem for raising.
- In fact, some ambiguity arises because of the small membership, enabling (eyg)-class forms to be reanalyzed as (ehg), e.g., “vague”
- But (aeg) raising to (ehg) is problematic. (aeg) forms become diphthongal (when raised), enabling distinction from (ehg).
- Theories should account for speakers' reorganization of the phonetic features supporting the contrast. Trajectory information is important--indicates spectral differentiation. Is this merger?
- Bottom line: We see \*both\* the tendency for maintenance of distinction (in two larger word-classes (ehg, aeg), and loss of contrast (eyg)).

# References

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## APPENDIX A

Overall means for vowel duration (in ms), and for the first two formants (F1, F2) at three measurement points (20, 50, 80%). All speakers pooled.

Vowel	Duration (ms)	F1			F2			F3		
		20%	50%	80%	20%	50%	80%	20%	50%	80%
iy	138	364.10	357.28	357.25	2403.64	2446.21	2311.52	2969.72	3023.08	2959.48
ɪ	78	431.47	451.77	447.55	2121.44	2063.22	1985.62	2923.56	2919.70	2918.13
ey	159	459.09	435.24	420.63	2263.40	2371.50	2324.23	2881.68	2899.55	2875.56
ɛ	117	545.90	575.68	551.80	1994.77	1959.07	1914.96	2814.44	2818.56	2823.63
æ	157	639.38	693.94	677.89	1998.45	1933.76	1845.98	2779.48	2763.84	2773.91
ɑ	160	715.13	752.36	712.33	1314.55	1327.76	1435.68	2610.70	2617.02	2606.73
ɑ	145	671.42	701.82	672.46	1243.87	1253.58	1339.93	2619.09	2618.18	2593.15
ow	156	494.29	457.12	422.43	1195.86	1097.74	1124.84	2637.03	2677.36	2679.58
ɔ	167	648.76	673.48	669.54	1301.98	1216.08	1319.80	2666.23	2647.00	2598.26
uw	137	373.95	370.74	369.82	1513.36	1434.95	1449.14	2612.11	2643.74	2683.67
u	83	445.18	462.76	450.60	1401.02	1450.63	1545.70	2723.18	2726.36	2753.20
ʌ	95	629.18	640.14	588.65	1582.90	1590.92	1623.78	2760.65	2766.47	2793.45
ɔj	181	468.42	482.92	423.56	1141.06	1525.59	2147.51	2644.95	2575.55	2688.86
aj	167	735.75	655.89	501.46	1629.36	1868.72	2106.95	2660.52	2690.91	2759.85
aw	176	734.76	702.29	579.66	1676.87	1444.56	1267.59	2640.39	2643.19	2672.96
ɚ	145	456.25	436.42	420.36	1610.97	1620.26	1709.74	2068.66	1976.84	2208.90