# Intersections Between Race, Place, and Gender in the Production of /s/

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## 1 Introduction

*Intersectionality* is a term that has gained much traction across disciplines— including sociolinguistics— over the last decade. The term, originally proposed by Crenshaw (1999), became an analytic tool to contend with the complexity of inequality, which is informed by the co-occurrence of multiple forms of social classification like race, class, and gender. Specifically, Crenshaw introduced intersectionality to highlight the lived experiences of Black women who face discrimination on account of both their race and gender in the legal system. However, the term has been adopted more broadly to explore how different demographic dimensions of identity co-construct and constitute one another in dynamic ways (Levon 2015). While linguistic variation has robustly explored how meaningful variables pattern with respect to individual dimensions of identity like race and gender, linguists have increasingly come to argue for the importance of prioritizing multidimensional approaches to variation that consider how these dimensions interact, and how sociolinguistic variables pattern with respect to co-occurring dimensions of identity (e.g., Becker 2014, Lanehart 2009, Levon 2015, King 2020). While intersectional analysis has started to proliferate in studies of language, gender, and sexuality (see e.g., Levon 2015, Køhler Mortensen, Maegaard, and Milani 2019), variationist studies theorizing the study of race through the lens of gender remain relatively scant.

In the study of African American Language (AAL), variationists have often explored how gender conditions the frequency of "vernacular" forms associated with this particular ethnic variety. Earlier studies identified men as the archetypical speakers of AAL (Labov et al 1968), while women were regarded as more "standard," producing less canonical features of the variety across class (Wolfram 1969). This has supported the conceptualization of the African American male as the prototypical subject of study of AAL (Morgan 1994, King 2020, Wassink and Curzan 2004). However, subsequent work has shown that young Black women can outnumber their male peers in their degree of vernacular forms, with Tinky and Foxy from Oakland and Rachel Jeantel from Miami showing some of the highest rates of vernacular usage across AAL studies (Rickford and McNair-Knox 1994, Rickford and Price 2013, Rickford and King 2016).

Studies of gender with African American speakers have also moved beyond examining the use of vernacular features, performing sociophonetic or discourse analyses to understand how Black women and queer speakers constructed gendered identities beyond features associated with the dialect (Lanehart 2002, Mallinson and Childs 2007, Morgan 1996). Few studies, however, have assessed the use of linguistic features which have been reported as primarily indexing gender among racialized speakers (with Podesva et al 2012 and Podesva 2013 being some of the only notable examples). And, to our knowledge, no studies of African Americans' speech have explored the patterning of gendered linguistic features cross-regionally.

In this study we aim to explore the intersection of race, gender, and place— and how these dimensions of identity condition phonetic variation. We explore how the phonetic variable /s/— which has been robustly linked to gender in studies of speech production and speech perception (see Section 2 for a discussion) — patterns among African American speakers in Bakersfield, California and Rochester, New York. We find that both race and place condition the degree to which this phonetic variable exhibits gendered variation. The fact that the phonetic variation of /s/ is not solely conditioned by gender, but also by race and place, illustrates the importance of considering multiple intersecting dimensions of identity in studies of linguistic variation.

## 2 The Variable: /s/ Frontness

In the linguistics literature, /s/ is, perhaps, the phonetic variable that has been most robustly linked to gender identity and sexual orientation. The voiceless anterior sibilant is articulated by placing the tongue at the alveolar ridge behind the top teeth and passing air over the tongue,

creating a hiss sound that resonates in the cavity between the tongue and the top teeth. The frontness of articulation—i.e. how close the tongue is to the top tee      th—affects the acoustic frequency of the hiss, such that fronter articulations, with the tongue closer to the top teeth, create a higher frequency hiss than more retracted articulations, with more space between the tongue and the top teeth. One measure that has been used to operationalize the frontness of /s/ is the spectral Center of Gravity (COG), which represents the mean of where the spectral energy in the fricative is focused. Higher COG corresponds to higher acoustic frequency, which corresponds to fronter articulation, while lower COG corresponds to lower acoustic frequency, and more retracted articulation.

Multiple studies of /s/ production have illuminated a robust gender pattern, such that women exhibit higher COG values than men, suggesting a fronter articulation of /s/ among women than among men (e.g., Stuart-Smith, Timmins, and Wrench 2003, Hazenberg 2012, Levon and Holmes-Elliot 2013, Podesva and Van Hofwegen 2014, Podesva and Van Hofwegen 2016). In addition, perception studies and ethnographic work have shown that fronter articulations of /s/ are ideologically linked to femininity, while more retracted articulations are ideologically linked with masculinity (e.g., Calder 2019a, b, Campbell-Kibler 2011, Levon 2014, Zimman 2017). Experimental studies have also shown that the perceived gender of the voice influences phonemic categorization, with the perceptual boundary between /s/ and the postalveolar sibilant /sh/ being conditioned by speaker gender, such that listeners expect this boundary to be at a higher frequency for women than for men (e.g., Strand and Johnson 1996, Strand 1999). While studies have illustrated the way gender robustly conditions /s/ realization in multiple geographic contexts, including California (Podesva and Van Hofwegen 2016), Canada (Hazenberg 2012), and Scotland (Stuart-Smith 2007), speaker race has not been foregrounded in production studies of /s/ frontness in the English language, and speaker samples have largely consisted of white speakers. Whether or not the same gender patterns are exhibited among non-white speakers remains an open question.

The articulation of /s/ has also been linked to a number of other social meanings beyond gender. For example, /s/ frontness may pattern with respect to a country-vs-urban continuum, as studies have shown that retracted articulations index country masculinity (e.g., Campbell-Kibler 2011, Podesva and Van Hofwegen 2016), while fronter articulations are used in an urban street style in Denmark (e.g., Pharao et al 2014, Maegaard and Pharao 2015). /s/ may also pattern with respect to a blue-collar-vs-white-collar continuum, with research showing that working class speakers exhibit more retracted articulations (Stuart-Smith 2007), and that fronter articulations are ideologically linked with education (Campbell-Kibler 2011, Levon 2014) or wealth and prestige (Bekker 2007). While dimensions of identity like urbanity and class may be ideologically connected to race in certain ways, the explicit role of race in conditioning the acoustic manifestation of /s/ has not been addressed in an English-speaking context. The present study aims to address this gap by exploring how /s/ frontness is realized among African American speakers in two different communities, and whether speaker race and geographic location conditions the presence or absence of a gender pattern among these speakers.

## 3  Communities: Bakersfield, CA and Rochester, NY

We examine the speech of African Americans in two communities in the United States: Bakersfield, California and Rochester, New York. Bakersfield is located in Southern California, about two hours northwest of Los Angeles. The city is part of the California Central Valley region, a non-urban region of the state whose economy is primarily focused on oil and agriculture. African Americans form a small minority of the population, with the demographic makeup of Bakersfield being 56.8% White and only 8.1% African American (U.S. Census Bureau 2010). African Americans migrated to the region from the Southern states during the Dustbowl Migration and the Great Migration (King & Calder forthcoming). For many decades, segregation was in effect in Bakersfield, with many areas of the city having sundown laws in effect until the Civil Rights movement. While African Americans initially established neighborhoods in the city, the city has become increasingly more integrated over the decades, with speakers reporting that there is now no primarily African American neighborhood in the city.

Rochester, New York, on the other hand, is a post-industrial urban community located in

Western New York State, outside of Buffalo. The city was part of the Rust Belt, and as such, the economy was primarily industrial until recently. African Americans form a large portion of the population, with the Rochester demographic makeup being 41% Black and 43% White. The largest influx of African Americans to the city took place during the Second Great Migration, between 1940 and 1970. Many neighborhoods in the inner city are primarily African-American, contributing to the ideology that the city of Rochester is racialized primarily as African American while the suburbs are racialized primarily as White (King forthcoming). Thus, many African American Rochesterians report living in neighborhoods that are majority-African American neighborhoods, in contrast to Bakersfield.

## 4  Methods

We analyze the speech of 12 speakers in the non-urban community of Bakersfield, CA and 24 speakers in the urban city of Rochester. The data come from sociolinguistic interviews collected in the field as part of larger ethnographic studies of the two communities. The Bakersfield interviews were conducted as part of Stanford University's Voices of California project, whose aims are documenting language and life in understudied regions across the state (King 2016). The Rochester interviews were conducted as part of King's (2018) dissertation fieldwork, exploring the articulation of African-American's multidimensional identities across the city. The samples are evenly split for gender in Bakersfield (6 male and 6 female) and Rochester (12 male and 12 female speakers), and represent a range of ages, with Bakersfieldians ranging from 23 to 75 and Rochesterians ranging from 21-68.

Each speakers' interview was transcribed in ELAN transcription software and aligned using Penn's FAVE align suite (Rosenfelder, Fruehwald, Evanini, and Yuan 2011). Praat scripts were used to automatically extract each token of /s/ from each interview and to measure the COG of each eligible token of /s/ in Hz. In collecting measurements, all tokens were band-pass filtered to a 1000-22050 Hz bandwidth in order to filter out frequencies too low to be in the range of /s/ frication, and measurements were taken within a 40ms Hamming window centered at the segment midpoint. Tokens under 40ms and tokens immediately adjacent to other sibilants were excluded from analysis. In total, we collected measurements for 10382 tokens from Bakersfield speakers and 26891 speakers for Rochester speakers.

The data were fitted to mixed effects linear regressions in R using the lme4 package (Bates, Maechler, Bolker, and Walker 2015). We used within-place models that only included the data from each field site (Bakersfield and Rochester) and an across-place model that included data from both field sites. For all models, /s/ COG was our dependent variable, and we included speaker gender, age, and logged duration of the /s/ token as fixed effects. Random effects included preceding and following environment, speaker, and word. For the across-place model we included field site as an additional fixed effect.

## 5  Results

First, we present the results for the within-place model for Bakersfield. The only fixed effect that emerged as statistically significant was logged duration (t=23.672; p < 0.001), such that longer tokens of /s/ exhibited higher COG than shorter tokens. Crucially, a gender effect did not emerge as a significant predictor for /s/ COG among African American Bakersfieldians, as illustrated in Figure 1. This is surprising in light of the previous literature on /s/ which has illuminated a robust gender split with respect to /s/ COG among many non-African-American speaker groups (e.g., Stuart-Smith 2007, Hazenberg 2012, Podesva and Van Hofwegen 2016). In addition, speaker age did not emerge as significant, suggesting that the lack of gender split holds among African American Bakersfieldians regardless of age. Finally, there was no significant interaction between fixed effects in the model.

For the within-place model for Rochester, a number of fixed effects emerge as statistically significant. Duration again significantly conditions /s/ frontness, such that longer tokens exhibit higher COG than shorter tokens. In contrast to Bakersfield, gender is a significant predictor for the

within-Rochester model (t=5.316; p<0.001), such that women exhibit higher COG values than men. This pattern is illustrated in Figure 2. In other words, African American women produce fronter /s/ tokens than African American men in Rochester. No other fixed effects or interactions emerged as statistically significant in the model.
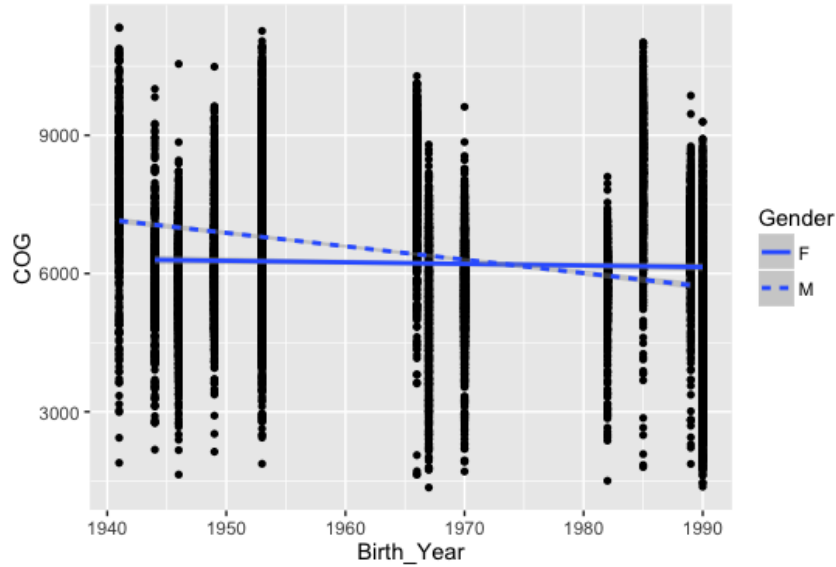


Figure 1: /s/ Center of Gravity by speaker birth year and gender among 12 African American Bakersfieldians.
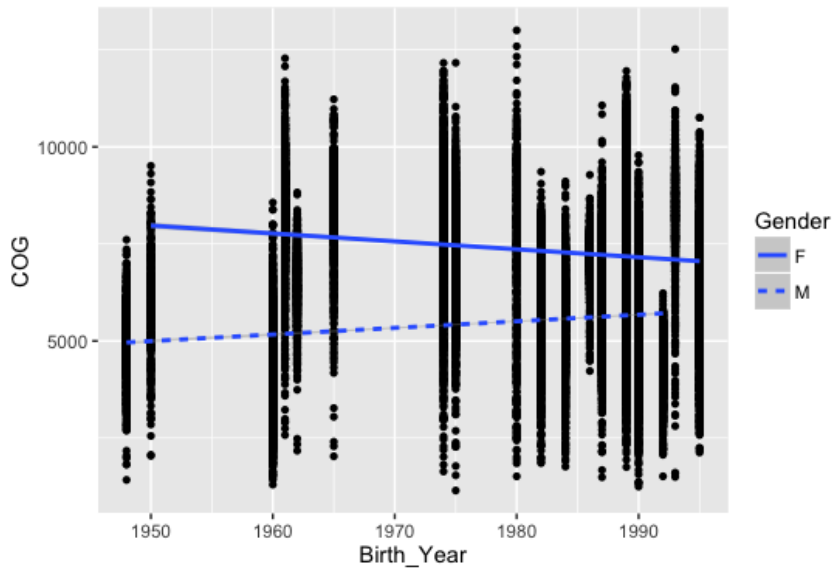


Figure 2: /s/ Center of Gravity by speaker birth year and gender among 24 African American Rochesterians.

Finally, the across-place model revealed a number of significant effects. In addition to the effect of duration in the same direction as the within-place models, a number of social effects emerged as significant. First, field site emerged as a marginally significant predictor (t=1.925;

p=0.063), such that African American Bakersfieldians are marginally more retracted overall than African American Rochesterians. Importantly, a significant interaction between gender and field site emerged, confirming the findings of the within-place models, such that a gender split was present in Rochester, but not in Bakersfield (t=-3.000; p<0.01).

The results illustrate a number of important findings. We find that among African American Bakersfieldians, there is no gender split with respect to /s/ frontness. This finding is surprising given that previous work on /s/ production has illustrated a robust gender pattern, such that women exhibit fronter /s/ than men (e.g., Stuart-Smith 2007, Hazenberg 2012, Podesva and Van Hofwegen 2016). Among African American Bakersfieldians, women do not exhibit fronter /s/ tokens than men. On the other hand, African Americans in Rochester exhibit a gender split more in line with what has been previously documented in other /s/ production studies, such that African American women in Rochester exhibit fronter /s/ than African American men. Finally, African American Rochesterians exhibit marginally fronter productions of /s/ than African American Bakersfieldians.

## 6 Discussion and Conclusions

We now situate the findings for African Americans in Bakersfield and Rochester with respect to previous production studies. Given that Bakersfield is located in the California Central Valley and Rochester is located in the North-American Northeast, we qualitatively compare the gender patterns in these two cities with the patterns found in production studies in the closest regions to Bakersfield and Rochester respectively where /s/ studies have been done: the California Central Valley town of Redding (Podesva and Van Hofwegen 2016) and the urban capital city Ottawa, Canada (Hazenberg 2012). Figure 3 presents COG means for African American men and women in Bakersfield, CA, as compared to white men and women in Redding, CA and Ottawa, CA. Figure 4 presents COG means for African American men and women in Rochester, NY, as compared to White men and women in Redding and Ottawa. Given the heterosexual makeup of our African American samples, we compare with heterosexual speakers in these two previous production studies.
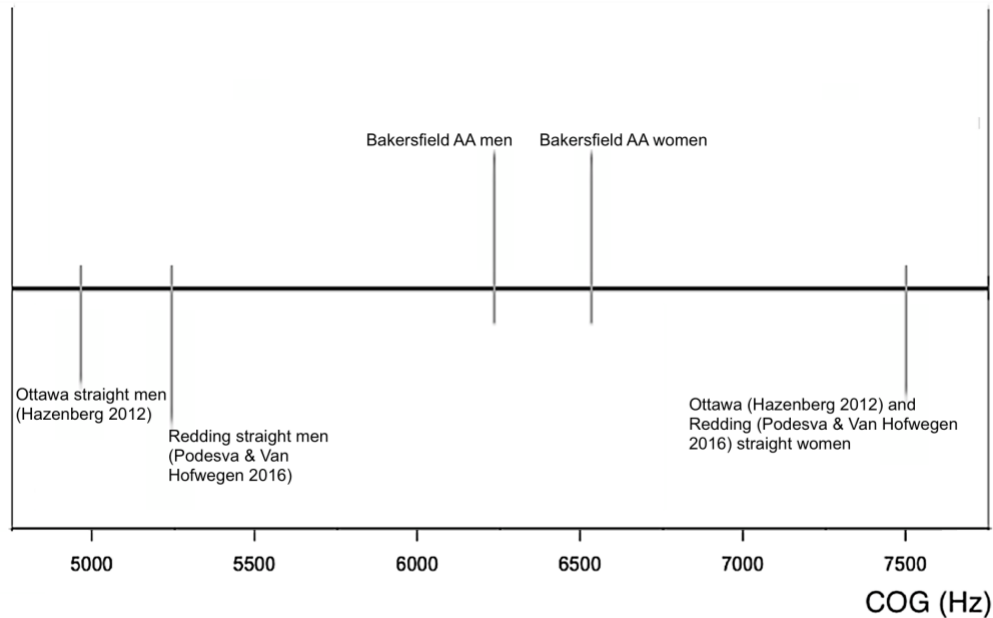


Figure 3: /s/ Center of Gravity means across gender among African American Bakersfieldians (top) and speakers in Ottawa and Redding (bottom).
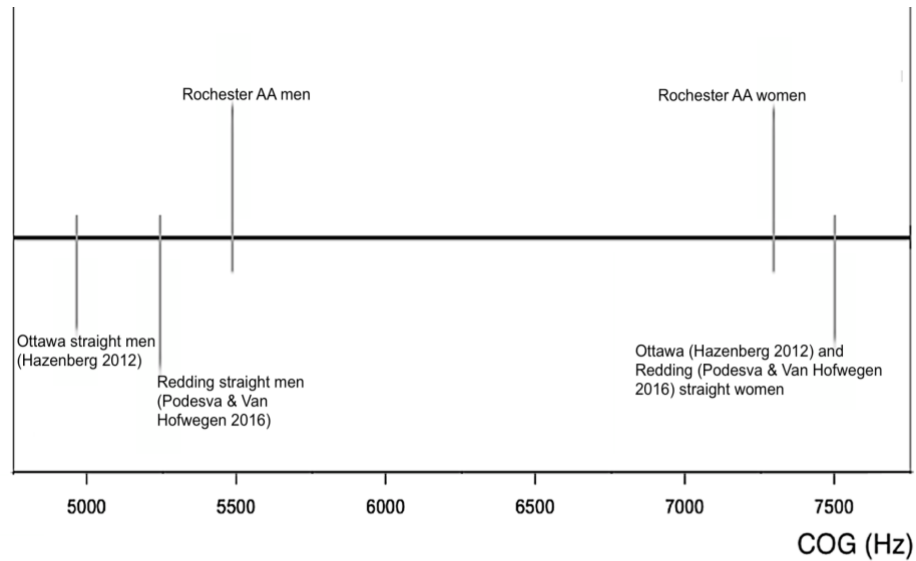
Figure 4: /s/ Center of Gravity means across gender among African American Rochesterians (top) and speakers in Ottawa and Redding (bottom).

As shown in Figure 3, African American men and women in Bakersfield pattern closely to each other with respect to /s/ COG means, hovering around the 6200-6500 Hz range. In contrast, Redding and Ottawa exhibit large gender splits, with women exhibiting COG values around the 7500 Hz range and men exhibiting COG values between 5000-5500 Hz in both field sites. In Figure 4, African Americans exhibit a gender split; however, the magnitude of this gender split is not as wide as the magnitude of the split in Redding and Ottawa. In other words, African American women in Rochester do not produce /s/ as fronted as women in the largely white speaker samples in Redding and Ottawa, and African American men in Rochester do not produce /s/ as retracted as the men in these largely white speaker samples.

Importantly, the gender split that has been borne out in numerous studies of /s/ production and taken for granted as a gendered linguistic variable does not hold among all speaker groups and all communities. While the gender split has been robustly illustrated in many production studies with largely white speaker samples, examining this variable among speakers of another racial group illuminates that speaker race can condition both the degree to which this gender split manifests, and whether such a gender split quantitatively emerges at all. In general, African American speakers do not exhibit gender splits with respect to /s/ COG to the same degree as do white speakers in previous studies, with African American men in both Bakersfield and Rochester exhibiting fronter /s/ tokens than white men in previous studies and African American women in both Bakersfield and Rochester exhibiting more retracted /s/ tokens than white women in previous studies. In other words, the phonetic articulation of gender emerges to different degrees, and perhaps through different means, for speakers of different racial groups, and phonetic models of gender based on white speaker samples may not account for speaker samples of other ethnic groups.

Region also conditions the manifestation of phonetic gender patterns, such that African American Bakersfieldians exhibit no gender split, while African American Rochesterians do exhibit a gender split. In addition, urban Rochester exhibits marginally fronter COG values overall than non-urban Bakersfield, a pattern which may reflect the ways /s/ frontness has been linked to urbanity-vs-countryness in previous work (e.g., Campbell-Kibler 2011, Pharao et al 2014). In other words, the racial performance of gender is not monolithic across regions, and specific manifestations of gendered phonetic patterns may reflect regionally and racially specific models of gender performance. These patterns illuminate the importance of taking into account multiple intersecting dimensions of identity in studies of phonetic variation, as broad trends established for one group of speakers may not account for the complexity of how speakers of different demographic groups in different regions phonetically articulate gender identity. Future work will

explore the specific ideological circumstances in each field site that contribute to the varying patterns with respect to /s/ production, investigating why some speaker groups adopt a gender pattern while others eschew it.

In addition to considering how different racialized constructions of gender emerge across place, these results also prompt us to reconsider assumptions about racialized varieties. Specifically, these results highlight the difficulty of categorizing certain linguistic phenomena across the White and Black binary and the need for us to utilize theoretic models, which can account for more than just speakers' race. For example, not all Black speakers pattern the same with respect to /s/, and thus do not comprise a monolith against which to contrast the /s/ patterns exhibited among white speakers. Further, the cross-regional heterogeneity supports the need to continue exploring understudied linguistic variables among African Americans, like /s/ frontness, in order to elucidate different dimensions of African American identity (King 2020) like locality and gender performance. Lastly, these studies will need to continue interrogating how different gendered performances among African Americans help to inform our understanding of the racial category itself.

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