7. SPEECH IN THE SILVER STATE

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While there have been a number of changes reported in the California vowel system this century (Labov, Ash, and Boberg 2006; Eckert 2008; Kennedy and Grama 2012), as well as several reports on Californian vowel patterns in volume 1 (Fridland et al. 2016), we know far less about speech in Nevada. To date, Elizabeth Bright's (1967) dissertation, "A Word Geography of California and Nevada," remains one of the only scholarly investigations of speech in the Silver State, providing a traditional dialectological look at Nevadan speech (mainly lexicon) in the mid-twentieth century. In a recent project examining vowels in the Western states (Fridland and Kendall 2017), acoustic analysis of archival speech recordings from Nevada and California suggested much had changed over the last century. In that work, we found that speakers born in the late nineteenth century had a strikingly different vowel system than that of contemporary Nevadans and Californians. Meanwhile, a comparison with a small sample of modern Californian and Nevadan speakers, though suggesting overall similarity, hinted at subtle differences in vowel position between the two states. The current chapter provides a first detailed look at the vowel system of contemporary Nevada, allowing us to better understand its place among states in the West and among American regional dialect patterns more generally.

We might expect to find much similarity between California and Nevada speech; after all, much of the history of the settlement of Nevada was closely linked to the settlement of California. Such regional affinity is not surprising given the heavy migration from Northern California into Nevada driven by the Comstock Lode, the first (occurring in 1859) and richest discovery of silver ore in the United States. Yet, there were some potentially important differences in settlement patterns and population flows, differences that might also lead to a distinction in the variety of Western speech spoken in Nevada. So, first, it will be useful to overview some of these key defining events over the last couple of centuries in the state.

Before the 1800s, the linguistic landscape of Nevada was primarily forged by Native American languages, primarily Northern and Southern Paiute, Shoshone, and Washoe, and limited European exploration of the state left little linguistic trace. In 1849, however, Nevada's earliest white settlement arrived from Utah, in the form of the Mormon settlements of Mormon Station in northern Nevada, and, subsequently (in 1855), Las Vegas Fort in southern Nevada (Warner 1992; McBride 2002). While the Mormon settlements were focused on trading and agriculture, part of the

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Church of Jesus Christ of Latter-day Saints's plan for expansion into the Great Basin region, increasing non-Mormon settlement in Nevada, began in the 1850s, driven mainly by mining interests. Much of the migrant traffic through Nevada was transient, as the state was central to a number of well-traversed migration routes westward, such as the California, the Central Overland, and the Georgetown Trails, and transnational migration surged as a result of the California gold rush. Mining rapidly changed the purpose of immigration into the state, particularly after the discovery of the Comstock Lode, with most immigration to Nevada consisting of miners and mining companies moving back and forth from (mainly northern) California. According to the Nevada State Historic Preservation office's report on the early settlement of the state, "1859 was the major turning point for the settlement of Nevada, the year that settlement patterns, numbers, infrastructure, and economic opportunities all changed" (McBride 2002, 1). Mining created great growth potential in northern Nevada, with Reno established as a city in 1868. Las Vegas, peripheral to the early mining boom, did not become a city until 1905.

This mining influx likely planted the seeds for contemporary Nevada speech, as these new settlers overwhelmed earlier Mormon pioneers, many of whom were called back to Utah by 1857 (McBride 2002), although Nevada still maintains a sizable Mormon population. Adding to these early transnational settlers were a number of foreign-born settlers, mainly of German, Irish, and English descent (Bright 1967), and, like the Bay Area of California, Nevada also had a significant amount of Chinese settlement (in large part brought to Nevada for the construction of the transcontinental railroad). However, the majority of Nevada's early population was from the Eastern Unites States, producing a large Northern and Midland dialect influx into the state in the mid to late 1800s (Bright 1967; Reed and Reed 1972). Bright suggests that, as of 1870, the largest interstate immigrants into Nevada (represented across almost every county, both north and south) were from New York and California, followed by Ohio.

Contemporary in-migration to Nevada has continued at rapid pace, with a remarkably transient population, the most, in fact, of any state. As discussed above, early migration into the state was driven (especially for northern Nevada) by Mormon expansion and, subsequently, by mining interests. Now, driving the modern migration into the state, particularly for Las Vegas, is the demand for labor in the casino and construction industries, especially with the housing boom in the early 2000s (Messerly 2016). Such an employment-based impetus for migration to Las Vegas began, in large part, with the need for workers on the Hoover Dam project in the 1930s, attracting workers from all over the nation (Barber 2010).

Looking at present-day settlement patterns, a recent analysis of U.S. Census data (Aisch, Gebeloff, and Quealy 2014) reports only one in four people living in Nevada in 2012 had been born in Nevada, with 44% of Nevada residents native born or from California and another 8% from other Western states. Of the remaining roughly 50%, the largest group (21%) were foreign born (of predominately Spanish heritage [Pew Research Center 2015]), with Midwesterners making up the next largest percentage (7%). In census years 1995–2000, Nevada had the highest net immigration of any state. This is striking in comparison with California, where over 50% of its population in 2012 was native born. As with the mining boom of the 1800s, much of today's influx to Nevada continues to be from California (Perry 2003). Both Clark County (Las Vegas) and Washoe County (Reno) show the most recent population growth overall, and an analysis of driver's license applications suggests Californians make up one-third of new drivers in the state (Chen 2016). This situation of few native-born inhabitants and the continued migration from California would certainly have an influence on the development of any local speech patterns. So, our key question here is, among those born in Nevada and given the nature of migration into the state, do we see the same vocalic dialect features as have been reported elsewhere in the West and, in particular, California?

VOWEL PATTERNS ACROSS THE UNITED STATES

Our focus is on the defining vowel features of Nevada speech. To contextualize this, it is worth beginning by surveying regional American vowel features more generally. A great deal of recent work in dialectology has centered on differing vowel patterns found in the major U.S. dialect regions. In particular, three major regional patterns have been identified in contemporary American speech—the Northern Cities Shift, the Southern Vowel Shift, and, last and often treated least, "the third dialect" (Labov 1991; Labov, Ash, and Boberg 2006), which includes Western speech. So, what does a Western pattern involve?

By far, the most characteristic Western speech feature is the low back vowel merger, which results in nondistinct productions of word pairs such as *Don~Dawn* and *hock~hawk*. While this merger has been identified in other parts of the United States (for example, Eastern New England), it is a defining vowel feature in the Western states and was widely reported across speakers in the coastal states examined in volume 1 (Fridland et al. 2016). While listeners are typically unable to hear a difference in these vowel classes, work by Di Paolo (1992) in Utah suggested that, at least 25 years ago, speakers actually maintained several phonetic distinctions between the vowels (including F1 and F2, phonation, and duration). In other words, these vowels appeared to be apparent or near-mergers rather than showing complete phonetic overlap. Indeed, while our previous work suggested contemporary Nevadans and Californians by and large show overlapping low vowels in spectral space (F1 and F2), durational differences appear to maintain a phonetic distinction between the two classes (Fridland, Kendall, and Farrington 2014). However, in general, Westerners show comparatively more overlap in both production and perception of these vowels as found by Di Paolo and reported in *The Atlas of North American English* (Labov, Ash, and Boberg 2006).

In addition to the low back vowels, discussion of this dialect region often references lowering and/or retraction in the lax front system, mainly identified in California speech. This pattern is often referred to as the California Vowel Shift (CVS) (Eckert 2008; Kennedy and Grama 2012) but is in many ways similar to the pattern also identified as the Canadian Vowel Shift (Clarke, Elms, and Youssef 1995; Boberg 2005), though evidence for some specific kind of contact-based diffusion of the two shifts has not been reported. The most advanced retraction in California has typically been reported for the /æ/ and /ɛ/ classes, and speakers with advanced retraction typically also demonstrate merger in the low back system. Beyond California, this front lax retraction has also been found to varying degrees in Oregon speech (Becker et al. 2016 [vol. 1]; McLarty, Kendall, and Farrington 2016 [vol. 1]), but not more widely in the Pacific Northwest (e.g., Wassink 2016 [vol. 1]). As we pursue the question about whether there is a basic "Nevada vowel system," we also explore whether these "California" vowel shifts reported are truly unique to California or simply the result of this area being most widely studied.

In addition to the low back merger and the CVS pattern, another regional vowel feature reported in previous literature on Western states' vowels is prevelar raising, primarily of /ɛ/ BEG and /æ/ BAG, a feature found mainly in the Pacific Northwest. First noticed in the early linguistic atlas work by Carroll Reed (1952), a number of recent studies have identified the raising of the front lax vowels before voiced velars as a key feature of Washington State English (Wassink et al. 2009; Freeman 2014; Wassink 2015, 2016 [vol. 1]). Likewise, some prevelar raising has been reported in Oregon as well (Becker et al. 2016 [vol. 1]). However, the extent to which this raising is a feature unique to the Pacific Northwest among the Western States is unclear, as Cardoso et al. (2016 [vol. 1]) also find evidence of such raising (though greatly limited) in the California Bay Area.

Though Nevada shares a border with Oregon, the influence of any Pacific Northwest features has not been documented, and the Pacific Northwest states tend not to be a large source of out-migration to Nevada, though census data suggest some influx from Washington State (Perry 2003). So, while we would expect more dialect similarity with California, it is worth considering whether other Western speech features might be present in Nevada. Beyond these front vowel features, the fronting of the back vowel /u/ is another often cited feature of speech in the West, found as well in other U.S. regions (Labov, Ash, and Boberg 2006; Hall-Lew 2011). In some areas of the West, /o/ fronting has also been identified, though typically only in speakers with advanced /u/ fronting (Luthin 1987; Fridland and Macrae 2008; Becker et al. 2013). So, here, in addition to front lax retraction and the low back vowel merger, we also consider whether and to what degree Nevadans in our data front their back vowels.

METHODS

Our data consist of word list and reading passage recordings from 39 speakers. A number of these speakers were recorded as part of our larger project on vowel production and perception variation in the United States (i.e., Fridland and Kendall 2012), with additional recordings collected by fieldworkers in 2014–15. Though we have five participants from the southern part of the state (e.g., Las Vegas area) and one speaker with both a northern and southern upbringing, the majority are from the Reno-Sparks area in northern Nevada, and we do not have enough southern Nevada speakers to compare intrastate differences. However, our main goal here is to examine Nevadans' speech for evidence of CVS and Pacific Northwest features, so we pool speakers together, acknowledging that our sample is biased toward the north of the state. Our speaker sample is broken down by sex and age groupings in table 7.1. Speakers from outside northern Nevada are indicated in the table. Speakers recorded for the earlier project have a number appended to their first name; all other recordings were collected in 2014–15. Figure 7.1 displays a map centered on Nevada, which highlights the hometowns for the majority of the speakers.

All speakers were recorded with a Tascam digital recorder and a Shure WH30XLR head-mounted microphone in a soundproof booth (with the exception of a few speakers who were recorded in a quiet office setting). These speakers read the same reading passage and word list with the same instructions, to read the passage over before recitation and to pause briefly between each word list item recitation. (For more information about the

TABLE 7.1
Participant Demographics, in Two Age Groups

Young Females			*Young Males*		
Allie	18–25	Las Vegas[a]	Aaron3265	18–25	Reno
Annie	18–25	Reno	Bryan2168	18–25	Reno
Elizabeth	18–25	Sparks	Caleb	18–25	Fallon & Las Vegas[a]
Hayley	18–25	Reno	Connor	18–25	Carson & Incline Village
Jocelyn1675	18–25	Las Vegas[a]	Eric1510	18–25	Reno
Jocelyn M.	18–25	Reno	Ethan	18–25	Reno
Lindsey1595	18–25	Panaca[a]	Johnny4055	18–25	Fallon
Margaret	18–25	Wells	Jonathan	18–25	Gardnerville
Nicole	18–25	Reno	Jordan	18–25	Sparks
Robyn	18–25	Reno	Robert	18–25	Henderson[a]
Shelby	18–25	Reno	Ryan3381	18–25	Reno
			Sam	18–25	Reno
			Travis	18–25	Reno
Older Females			*Older Males*		
Angela	31–40	Reno	Mike	31–40	Reno
Holly	41–50	Reno	Daniel	51–60	Reno
Andrea	51–60	Reno	Glen	51–60	Reno
Cheryl	51–60	Reno	Greg	51–60	Reno
Elaine	51–60	Reno	Ronald	51–60	Reno
Jennifer	51–60	Reno	Steve	51–60	Reno
Kim	51–60	Reno	William	66–70	Hawthorne[a]
Lynda	61–65	Reno			

a. Represents speakers from outside northern Nevada.

word list and reading passage, see Kendall and Fridland 2012 and Kendall 2013, 56–57.)

The recordings were transcribed and force aligned using the FAVE suite (Rosenfelder et al. 2011). FAVE was then used to automatically extract formant measurements. The data were pruned to remove all tokens that did not have primary stress and then normalized using the Lobanov method (Lobanov 1971; Watt, Fabricius, and Kendall 2011) in the Vowels package (Kendall and Thomas 2009) for R (R Development Core Team 2015). Then, the normalized data were further pruned to remove all vowel categories and subcategories not of interest for the present discussion. This includes a number of the typical diphthongs (e.g., /aɪ/ and /aʊ/) and environments known to affect formants but not of interest for our present analysis (such as following rhotics). We consider the following vowels: /i/; /ɪ/; /e/ and a subcategory for pre-/g/ /eg/ (e.g., *vague*); /ɛ/ and subcatego-

FIGURE 7.1
Map of Nevada and Surrounding Areas

ries for pre-/ɡ/ /ɛɡ/ (e.g., *egg*) (referred to elsewhere in this chapter as BEG) and for pre-/ʒ/ /ɛʒ/ (e.g., *measure*); /æ/ and subcategories for prenasal /æN/ (including /æn/ and /æm/, but not /æŋ/, as there are no tokens in our data) and for pre-/ɡ/ /æɡ/ (referred to elsewhere as BAG); /ɑ/; /ɔ/; /ʌ/; /o/ and a subcategory for prelateral /ol/ (e.g., *coal*); /ʊ/; and /u/ along with subcategories for postcoronals /tu/ (e.g., *soup*) and prelateral /ul/ (e.g., *tool*). With the exception of the subcategories just mentioned, all other pre-/ɡ/ and pre-/ʒ/ tokens were included in the main categories for their respective vowels, and all other prelateral and prenasal tokens were excluded. Pre-/ʒ/ /ɛ/ tokens were treated separately from the main /ɛ/ class as they have been noted as raised/tensed in some Western dialects (e.g., Baker, Eddington, and Nay 2009). These tokens can be seen to be slightly centralized in the various plots below. However, for sake of space, we do not consider them in any detail here.

FINDINGS

The guiding question here is, what do contemporary Nevadans do? In other words, given the vowel shifts we know about from previous research in California and the Pacific Northwest, do Nevadan speakers go along with what we expect of Westerners more generally?

In general, looking at the composite Nevadan means from all our contemporary speakers, as presented in figure 7.2, we can see a number of Western vowel features. For one, we find the presence of the definitive Western feature—a merger or, in many cases, near-merger of the low back vowels. In Nevada, the /ɑ/ and /ɔ/ means are largely overlapping in the overall plot, though there is not complete overlap (discussed in more detail below).

Figure 7.3 presents vowel plots separated by speaker age and by sex. Looking at these plots, there is no observable difference in the low back vowel positions across the groups. Following recent practice (e.g., Nycz and Hall-Lew 2013; Fridland, Kendall, and Farrington 2014), we use a Pillai score to assess the degree of vowel merger. A Pillai score provides a measure of distributional overlap for (in our case) speaker-level /ɑ/ and /ɔ/ distributions. A two-way ANOVA testing the influence of age and sex on the Pillai values for /ɑ/ and /ɔ/ for the speakers confirms that the speakers are largely similar in their degree of merger, yielding no significant differences in the degree of merger by age or sex group, although the comparison for

FIGURE 7.2
All Nevadan Speakers, Lobanov Nomalized (n = 39)

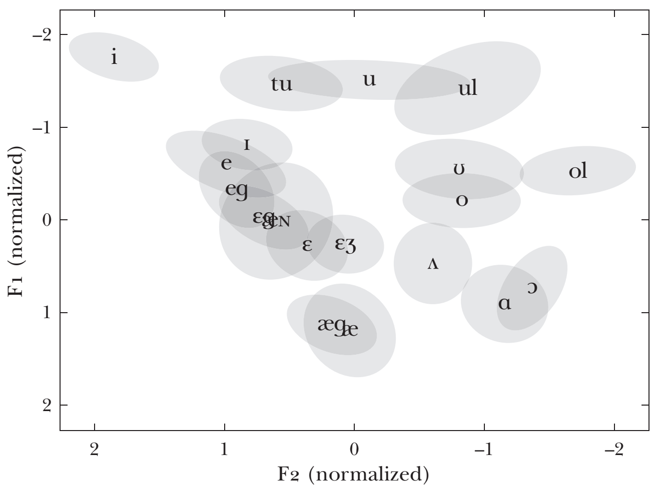
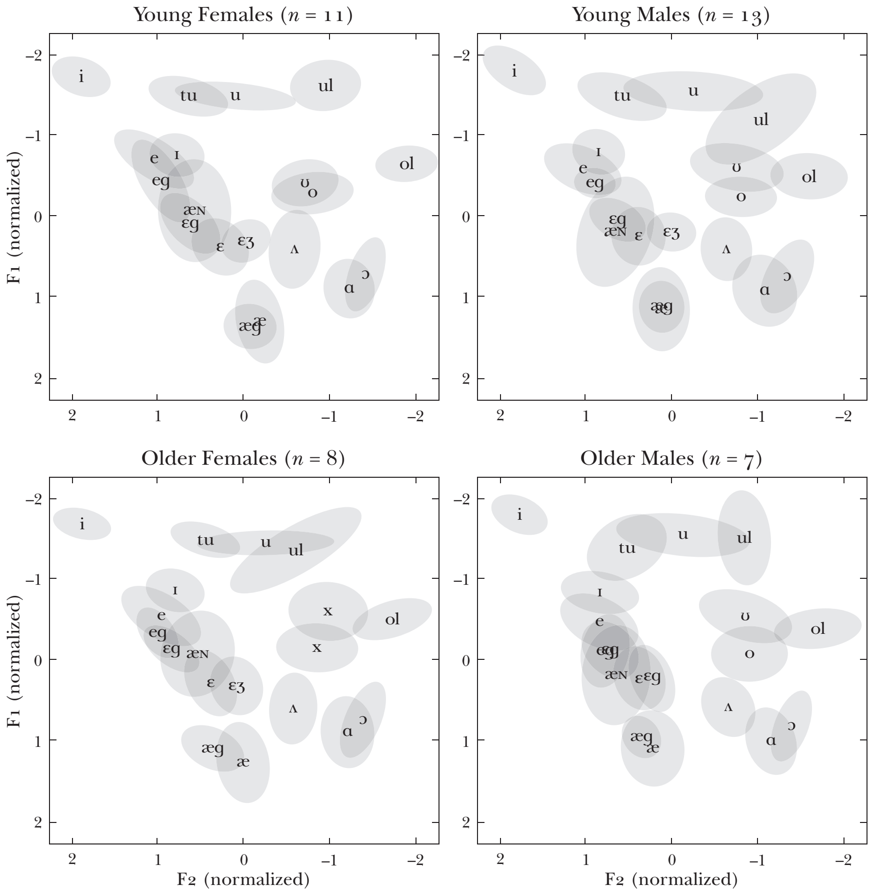


FIGURE 7.3
Nevadan Speakers Separated by Sex and Age

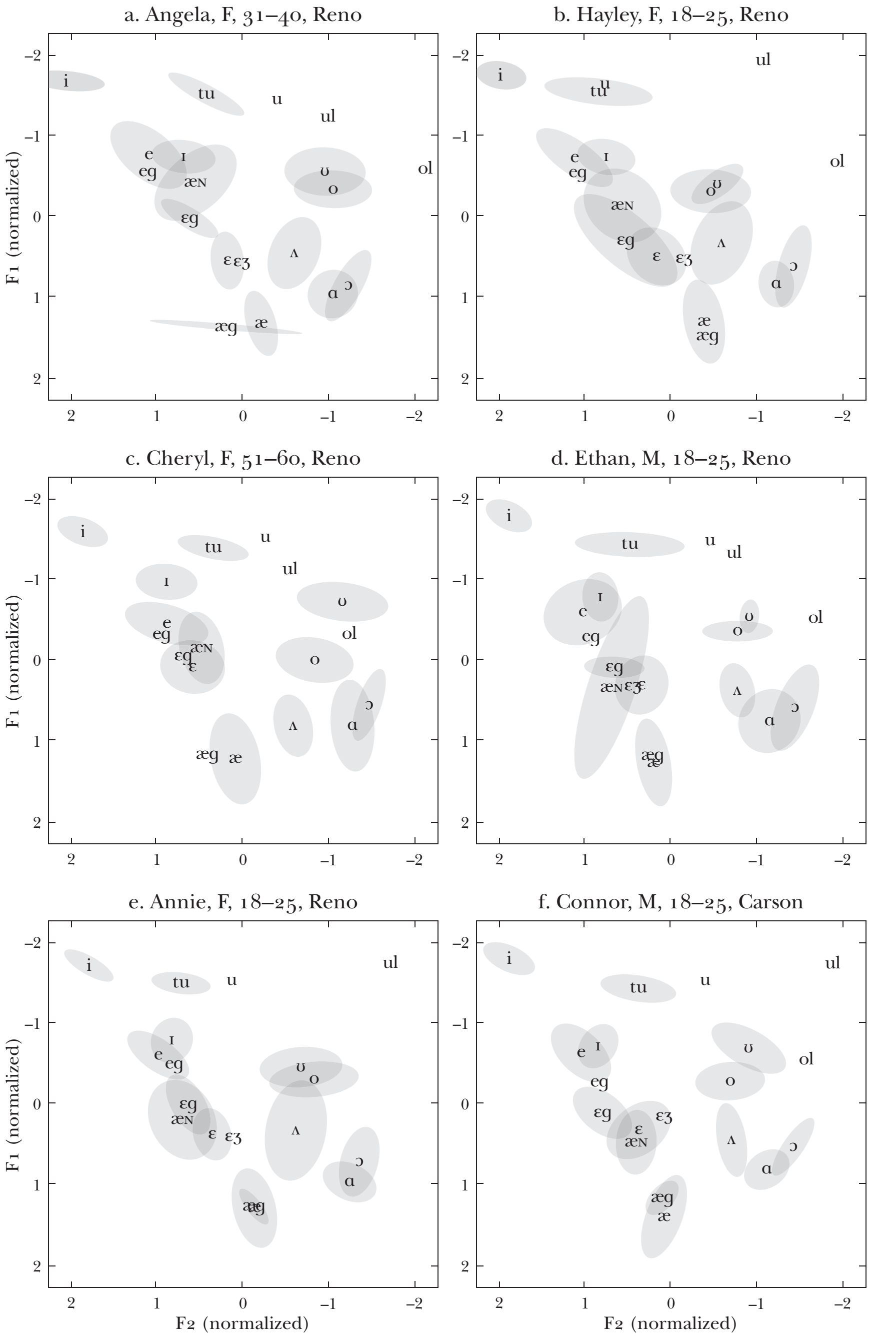


sex differences nears significance, with a trend toward females being more merged than males (sex: $F(1,36) = 3.42$, $p = .0727$; age: $F(1,36) = 0.01$, $p = .9963$).

To examine the low back vowels further, we turn to mixed-effect linear regression, which we use throughout the chapter to examine differences at the vowel token level. Separate mixed-effect regressions were run on the low back tokens' F1 and F2 measures. All models include random intercepts for speaker and for word. Including a random effect for speaker allows the model to better account for individual variability and is increasingly common practice in linguistic and sociolinguistic research (Baayen 2008; Johnson 2009). Including a random effect for word helps to control both for potential larger lexical effects in the data as well as conditioning phonological effects, which were not otherwise included in the statistical models. Each model included fixed-effects to test for vowel category differences (/ɑ/ vs. /ɔ/), sex differences (female vs. male), and age group differences (older vs. young). The models also tested all three two-way interactions (vowel category × sex, vowel category × age, and sex × age) as well as the three-way interaction (vowel category × sex × age). The fixed-effects for the models are provided in the appendix, with table 7.A1 providing results for F2 and table 7.A2 for F1. The models find a marginal effect for F2 for vowel category and a significant interaction between vowel category and sex, with males significantly more backed for /ɔ/ than females. The models yield only marginal effects on F1 for vowel category and sex. This aligns with the impression obtained from figures 7.2 and 7.3 that these categories are nearly but not completely merged. This finding that speakers actually maintain a degree of distinction (at least in production) between these vowels supports Di Paolo's (1992) work as well as our own (Fridland, Kendall, and Farrington 2014) that the low back vowels are, in fact, near-mergers (rather than full mergers, a distinction discussed by Faber and Di Paolo 1995) and accords with a similar finding by Wassink (2015) in Washington State. These statistics appear to capture a level of difference phonetically beyond what people may actually hear, however. While we did not have a same/different task as part of this study so cannot speak to the perception of the low back vowels here in detail, local students at the University of Nevada Reno generally report no perceptual distinction for word pairs like *cot~caught* or *hock~hawk*, indicating that these subtle cue differences are not salient cues in Nevada speech. Likely, the lack of significant differences by age merely indicates that this merger process may be nearing completion in Nevada. Although we also note that the significant interaction between vowel category and sex for F2 indicates that females are more advanced for merger (via /ɔ/ fronting), a subtle indicator that merger may still be a change in progress.

Now, looking at how the front vowels pattern, recall that the CVS pattern involves a split nasal /æ/ system and lax vowel retraction. So, how much of this pattern do we find in our Nevada sample? As can be seen in figures 7.2 and 7.3, Nevadans do show a nasal split for the /æ/ class, and, for most speakers, nonnasal /æ/ is clearly low (and somewhat central) in acoustic position, suggesting retraction. Figure 7.4 displays vowel plots for six individual speakers from our data set to allow us to consider some particular patterns more closely. Figures 7.4a and 7.4b compare Angela, in her late 30s, to Hayley, a 19-year-old, both from Reno. Both show greatly raised /æ/ tokens prenasally and extremely retracted tokens in other contexts. In fact,

FIGURE 7.4
Six Individual Speakers



for both speakers, the main /æ/ class is low central rather than low front in position.

Though not a part of the empirical work of the current study, in earlier research we explored whether retraction is a newer feature of Western speech by comparing contemporary Californian and Nevadan speakers to archival recordings of speakers born in the 1870s–80s (Fridland and Kendall 2017). Comparative analysis suggested a much fronter and higher position for the archival speakers' /æ/ class, suggesting that the contemporary position for /æ/ is fairly modern. Further support of retraction being an incoming new norm comes from several chapters in volume 1 (Fridland et al. 2016), which found a younger and often female lead for /æ/ retraction in California and Oregon (Becker et al. 2016; Cardoso et al. 2016; D'Onofrio et al. 2016). We find this younger lead reflected in our present sample, where the low front vowel is quite centralized for our younger speakers. However, looking at the two speakers in the figures 7.4c and 7.4d, we see less evidence of retraction. In figure 7.4c, the /æ/ class for Cheryl, a speaker in her 50s, appears a bit more front relative to the Hayley (figure 7.4b) and Angela (figure 7.4a), hinting that this retraction may be a fairly new shift. Likewise, male speakers also seem to have a less retracted low front vowel, even in younger age groups, as can be seen in the plot of Ethan, in figure 7.4d, a young male participant.

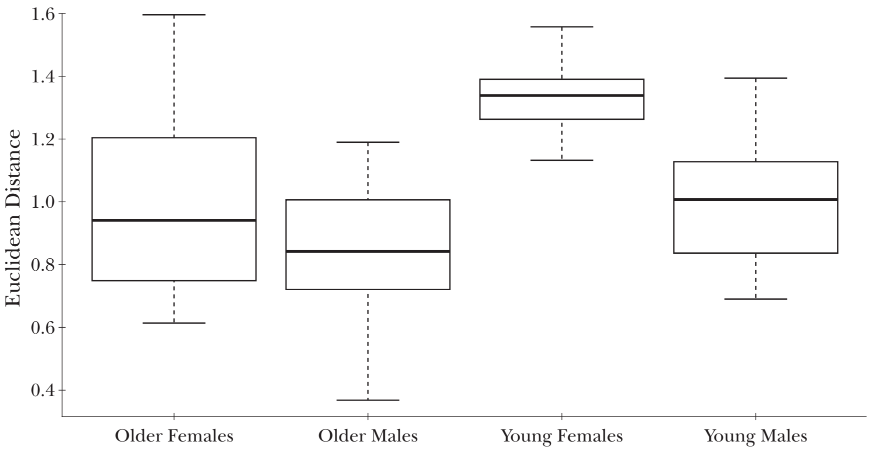
As in our consideration of the low back vowels above, we turn to mixed-effect linear regressions to examine further the question of /æ/ retraction. Separate models are run on F1 and F2, and, again, models include random intercepts for speaker and word. Model results (for the fixed-effects) for /æ/ F2 are included in table 7.A3 and for /æ/ F1 in table 7.A4 in the appendix. The regression examining normalized F2 values for our /æ/ tokens indicates that /æ/ retraction is significantly different in these data by both speaker sex and age group. There is not, however, a significant interaction between sex and age group. Young speakers, with a negative coefficient estimate, are more retracted than older speakers. With a larger F2 value, males are less retracted than females. In addition, considering /æ/ F1, we also find a significant difference by sex (although not age), with males having a higher position for /æ/ as well.

As suspected based on impressionistic examination of the vowel plots, our results confirm that this aspect of the CVS is a feature continuing to make progress among our Nevada speakers, particularly among female speakers. Our findings are quite similar to those reported by D'Onofrio et al. (2016 [vol. 1]), who found significant age differences in the California Central Valley, with more advanced retraction for younger speakers and with males significantly more conservative in retraction compared to females. In the Bay Area, Hall-Lew et al. (2015) and Cardoso et al. (2016 [vol. 1]) also found significant effects for year of birth for /æ/ F2, with read speech showing more advanced retraction in younger speakers, here again led by women. So, a very similar pattern to that found in Northern and Central California has been found here. This suggests that Nevadans, in this case, do share speech norms with their neighbors. We also find a significant difference by sex for /æ/ F1, with females having a lower /æ/ than males. Lowering has also recently been reported among younger speakers in Northern California (Van Hofwegen, Pratt, and D'Onofrio 2016), so it is perhaps not surprising to also find lowering here, given the lax vowel retraction found as well in Nevada speakers. It is not yet clear where these changes originate, though it is certainly possible the large California migration into Nevada brought these shifting vowels with them. However, to establish this, comparable data showing a significant advancement by California speakers (relative to Nevada speakers) would be helpful but is beyond the scope of this study.

What about the retraction of other lax vowels, another feature reported to be present in California speech? Considering /ɛ/, retraction is less clear in the plots than /æ/ retraction, though it appears for many of our speakers that /ɛ/ is also relatively low in their system. However, unlike the /æ/ class, most of our speakers, regardless of age, tend to have a similarly positioned /ɛ/ class. Confirming this impressionistic assessment, mixed-effect regression modeling, using the same random and fixed factors as the models for /æ/ above, also shows no significant difference by sex or by age for either F1 or F2 (although there is a marginal age effect for F1 with young speakers tending toward a lower /ɛ/ class [$\beta = 0.102$, $p = .093$]; results are not included in tabular format for sake of space). In the San Francisco Bay Area, Cardoso et al. (2016 [vol. 1]) also found a significant age, but not gender, difference for /ɛ/ F1, suggesting Nevadans are similar to their coastal peers and that /ɛ/ retraction may be beginning to appear in their speech, but is not as advanced as for /æ/.

In our previous research, the Euclidean distance between speakers' central tendencies for /e/ and /ɛ/ has been a useful regional diagnostic (e.g., Fridland and Kendall 2012; Kendall and Fridland 2012). Examining that speaker-level measure here also uncovers some evidence for social differences in the position of /ɛ/ for our Nevadans. Here we find significant differences for both sex and age group via a two-way ANOVA testing the effects of these two factors on the Euclidean distance measures (sex: $F(1,35) = 10.68$, $p = .0024$; age: $F(1,35) = 10.18$, $p = .0029$). The interaction between sex and age is not significant ($p = .2899$), although a box plot of the data, as shown in figure 7.5, indicates that the main difference among the speaker

FIGURE 7.5
Euclidean Distances between /e/ and /ɛ/



groups is for the young females, who have the largest distance between /e/ and /ɛ/. The fact that this difference is so pronounced when examined in terms of the distance between the mid front vowels suggests that more is going on than just /ɛ/ retraction and that in fact /e/ may be moving into a tenser or higher position as well. We actually see this in figures 7.3a–7.3d, above, when we compare the position of /e/ to /ɪ/ across the plots of the four speaker groups. The young females are the only group to realize /e/ at about the same height as /ɪ/. While /e/ raising has not been reported in the literature, recent conference papers (Van Hofwegen, Pratt, and D'Onofrio 2016; Kohn and Stithem 2016) have mentioned a similar raised /e/ in both California and Kansas, and a raised /e/ in Arizona was reported by Hall-Lew et al. (2017 [this volume]). Van Hofwegen, Pratt, and D'Onofrio suggest that raising is a result of increasing monophthongization of this vowel class among younger speakers, something we have yet to examine. Nonetheless, we note it here as a feature of interest that has not been widely reported but should be examined more extensively as a feature potentially undergoing change.

We also find evidence of a lower position for /ɪ/ in our younger speakers' systems, with mixed-effect regression results (testing the same factors as the models described earlier) indicating a significant difference in age for /ɪ/ F1. These results are given in the appendix in table 7.A5. We do not find any significant differences for F2 (and do not present those results). So, like /ɛ/, our results suggest that /ɪ/ retraction is not greatly advanced in Nevada speakers, though younger speakers show lowered tokens which may suggest an incipient shift toward the CVS model. Looking back at the plots for Hayley, a younger female (in figure 7.4b), compared to Cheryl, an older female (in figure 7.4c), we note how Hayley's /ɪ/ class overlaps with /e/, while Cheryl's /ɪ/ remains higher and separate from her /e/ class. Correlation tests (using Pearson's product-moment correlation) indicate that the positions of the three short vowels, /ɪ/, /ɛ/, and /æ/, are positively correlated such that speakers with a more retracted /æ/ class also exhibit more retracted /ɪ/ (F1: $r = 0.406$, $p = .0104$; F2: $r = 0.313$, $p = .0523$) and /ɛ/ (F1: $r = 0.619$, $p < .0001$; F2: $r = 0.646$, $p < .00001$) classes. /ɪ/ and /ɛ/ also exhibit a strong correlation (F1: $r = 0.622$, $p < .0001$; F2: $r = 0.568$, $p = .0002$). Such results suggest that the so-called CVS is clearly present in the front lax subsystem of Nevadans and that this tendency toward retraction tethers together the front lax vowels more generally. We also note that there appears to be a stronger relationship between /æ/ and /ɛ/ and between /ɛ/ and /ɪ/ than between /æ/ and /ɪ/. This type of correlation may suggest that a pull-chain-type mechanism is at work here, as vowel proximity would encourage tokens of adjacent classes to spread out (retract) as a neighboring vowel retracts.

Turning now to look at the back vowels, earlier work comparing Nevadans and Memphians in degree of and phonetic conditioning for back vowel fronting (Fridland and Macrae 2008) found F2 advancement in both the /u/ and /o/ classes for the Nevadan speakers, with the expected coronal/noncoronal patterning and no fronting of prelateral tokens. Likewise, our current sample of Nevadans also appears to participate quite strongly in /u/ fronting, and in /o/ fronting as well. As can be seen in the earlier plots of younger speakers, such as figures 7.4e and 7.4f, postcoronal /u/ (depicted as /tu/) tokens are quite fronted, and even the main (i.e., nonpostcoronal) /u/ class is also fronted. Only prelaterals remain in the back periphery. Statistical analysis (see the appendix table 7.A6) confirms the pattern visually apparent in the plots, that postcoronal, nonpostcoronal, and prelateral /u/ tokens are significantly different from one another. These results are consistent with most other reports of back vowel fronting in the United States and reflect well-known phonetic effects on F2 of these consonantal contexts (e.g., Labov, Ash, and Boberg 2006; Fridland and Macrae 2008; Hall-Lew 2011).

A mixed-effect regression on the high back vowel data (including /tu/, /u/, and /ul/) finds significant age differences in the data, indicating that, at least in Nevada, back vowel fronting is continuing to progress over time. There is no significant difference by sex. Examining back vowel fronting in San Francisco, Hall-Lew (2011) found younger speakers significantly more advanced in /u/ fronting overall (though not in coronal contexts alone) but found no significant differences by sex or ethnicity. She suggested that this lack of significance in coronal contexts and by sex and ethnicity reflects a feature that is well entrenched and likely close to completion in the Bay Area. Similarly, McLarty, Kendall, and Farrington (2016 [vol. 1]) find /u/ fronting in both older and younger contemporary speakers in Oregon, but little fronting evident in archival data from speakers born at the turn of the twentieth century. While they did not find significant age differences in their contemporary speakers, their archival speakers were significantly backer in /u/ F2. Though differences in our measurement techniques make it hard for direct comparisons between our current data and our work with archival data in Nevada (Fridland and Kendall 2017), data from speakers born in the late 1800s show little evidence of fronting for either /u/ or /o/, likely indicating, as McLarty, Kendall, and Farrington suggest, that fronting is a change that primarily occurred after the turn of the century but before the mid-1900s, when most of the current study's older speakers were born.

The fixed-effects for the regression, which includes a three-way interaction for sex × age × vowel subcategory, are shown in table 7.A6 in the appendix. The model, with significant interactions, is complex, but indicates several significant age effects. With a main effect for age (p = .001789) and a positive coefficient, we see that young speakers are overall more fronted for the high back vowels, although the interactions indicate that this effect is largely due to the young females (the negative coefficient for the interaction for sex × age counteracts the positive, i.e., fronted, main effect for males). Here we also see confirmation of the pattern noted above with coronal tokens significantly more fronted than noncoronal. Interactions also show that younger women, in particular, are more likely to front both coronal and noncoronal tokens compared to older speakers. So, again, here we find the pattern of a young female lead that we report above for several other incoming features. For the mid back vowels /o/ (and /ol/), a similar analysis as for the /u/ class finds that other than a significant (and expected) difference between /o/ and prelateral /ol/ (β = –0.919, p = .00386), these speakers are not significantly different by sex or age groups in F2. These results (not shown in tabular format for sake of space) suggest that while the nonprelateral /o/ is somewhat fronted, it holds a fairly stable position over the generations studied here. Perhaps surprisingly, a similar regression analysis for /o/ F1 finds a significant age difference, with younger speakers raising /o/ compared to older speakers. The fixed-effects for this model are presented in the appendix in table 7.A7. While /o/ fronting has been reported elsewhere in the West, /o/ raising has not been attested, though it may be simply that most studies examine only F2 measures for this variable. Possibly, this raising is tied to the fronting process as /o/ would otherwise encroach on the mid central vowel space (or is, as with /e/ raising found earlier, part of a more generalized mid vowel raising process), but we do not investigate this specifically here and hesitate to speculate about its larger status. Like /e/ raising, this finding points to a potential shift among younger Nevadans, with /o/ raising, more than fronting, advancing in this community. In general, other than a couple of surprises (/e/ tensing, /o/ raising), our data from Nevada suggest that all our speakers, though varied in the degree to which they are affected, show vowel patterns in line with the shifts we outlined earlier. Our data indicate that our Nevadans have a nearly merged low back vowel system, a retracted front lax system, and fronting of /u/ and /o/, with younger speakers showing more participation in both retraction and fronting. These results suggest both similarity with the regional vowel system, particularly that of California, and, despite young leads in a number of features, relatively stable participation in these larger Western norms for both our younger and older speakers.

Beyond CVS patterning in our Nevada sample, though, we also find some hints of another, less well-investigated (and non-Californian) Western feature. In the /ɛ/ class, we see what appears to be prevelar raising in some of our Nevadans—a feature most commonly mentioned in reference to the Pacific Northwest and not often discussed as a feature of Western dialects more generally (see Wassink 2015, 2016 [vol. 1]; Becker et al. 2016 [vol. 1]; McLarty, Kendall, and Farrington 2016 [vol. 1]). While many of our Nevada speakers do not show this pattern (e.g., Cheryl in figure 7.4c), several do show clear separation of their /ɛɡ/ tokens from the /ɛ/ tokens more generally (e.g., Angela in figure 7.4a and Annie in figure 7.4e). Similar to findings reported by Becker et al. (2016 [vol. 1]) in Portland, /ɛɡ/ appears to be most raised among older speakers, in particular, older females. Figure 7.6 presents a box plot showing the amount of /ɛɡ/ raising (measured as the Euclidean distance of each speakers' /ɛɡ/ from their main /ɛ/ class) by speaker sex and age. Older females are clearly in the lead. However, a two-way ANOVA testing the speaker-level Euclidean distance measures for sex, age, and a sex × age interaction finds only marginal differences for the main effects (sex: $F(1,35) = 2.99$, $p = .0926$; age: $F(1,35) = 3.646$, $p = .0644$) and nonsignificance for the interaction ($p = .9632$).

The plots examined earlier showed only limited evidence for prevelar /æ/ raising (/æɡ/), another conditioned raising that has been discussed for Western speakers in recent research reports (Freeman 2014; Wassink 2015). However, a closer examination of our data indicates that there are sociolinguistic differences among our Nevadans. Again /æɡ/ raising appears to be a feature mainly of older speakers, with older females the major users. This is displayed, via a box plot, in figure 7.7. A two-way ANOVA testing the speaker-level Euclidean distance measures for sex, age, and a sex × age interaction, yields significant differences for the main effects (sex:

FIGURE 7.6
Euclidean Distances between /ɛg/ and /ɛ/

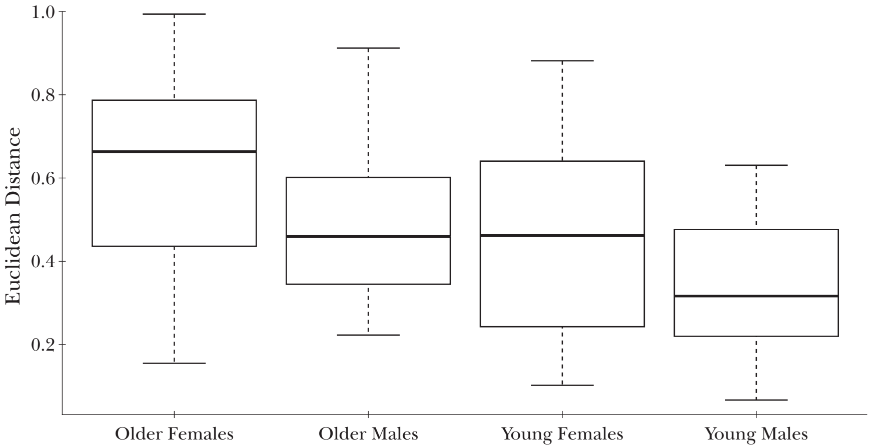
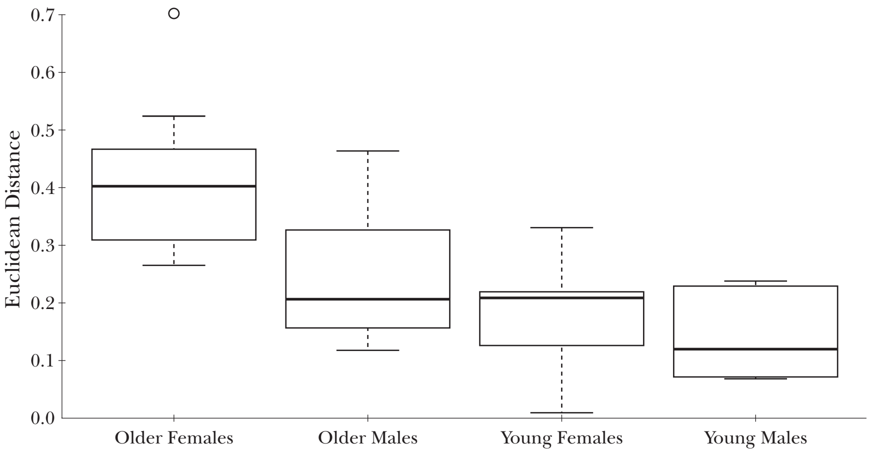


FIGURE 7.7
Euclidean Distances between /æg/ and /æ/



$F(1,35) = 5.12$, $p = .0319$; age: $F(1,35) = 16.57$, $p = .0004$) but nonsignificance for the interaction ($p = .1538$). Interestingly, this indicates that the females continue to lead in /æg/ raising over males, even for the young group, where this does appear to be a receding feature. Overall, this finding is similar to that reported by Becker et al. (2016 [vol. 1]) for Oregon, where younger speakers were more likely to retract the /æ/ and /ɛ/ classes in the CVS pattern and showed very little prevelar raising in comparison to the older speakers.

Freeman (2014) and Wassink (2015) show that Washingtonians also have a retracted /e/ vowel in prevelar /g/ environments (/eg/), often leading to overlap for /eg/ and /ɛg/. This is a small word class (including words like *bagel* and *vague*), and we have limited tokens in our data set—not enough to plot ellipses meaningfully for these tokens or otherwise describe their distribution. Our vowel plots in figures 7.2–7.4 show that, like for Washington, Nevadans do appear to also have retraction in this environment. We see little evidence of actual overlap between /eg/ and /ɛg/, although we note that the older speakers, and in particular older males (see figure 7.3d), show greater evidence of overlap for these tokens than the younger speakers. With little data to leverage for prevelar /e/, we save further consideration for future work.

CONCLUSION

In summary, our investigation of Nevada speech has shown that a Western pattern, namely, front lax retraction, characterizes the speech of Nevada. In addition, we find participation in the broader U.S. pattern of back vowel fronting. For several features, young women lead in the pattern, indicating they likely remain changes in progress. As one conclusory point, these patterns, as well as other recent findings, suggest that we should be cautious in assigning the label "California" to this shift pattern, as it has now been noted in Nevada, Oregon (Becker et al. 2016 [vol. 1]), Colorado (Holland and Brandenburg 2017 [this volume]), Canada (Boberg 2005), and even as far West as Hawaii (Drager et al. 2013). Thus, we do not want to make a claim that California speech has diffused so successfully to such disparate places, although it certainly might have contributed to the pattern in Nevada, as migration patterns are predominately from California.

All our Nevadans also both merge and front—we find a near-merger in low back vowels in all our speakers as well as quite advanced /u/ fronting and more moderate /o/ fronting. Though participation in retraction in the front lax classes ranges across a number of seemingly geographically distant sites, it is clear that the so-called CVS pattern is prevalent in places where the low back merger occurs, hinting that the overlap may be linked to the movement in the front lax system, though this is beyond the scope of the present study. Beyond the front lax retraction, low back merger, and back vowel fronting, we also find evidence of a less studied Western feature, prevelar raising, having some presence in Nevada, at least in a subset of mainly female and older speakers. We also report a new feature, /e/ raising, which has not been widely noted but suggests the front tense system may not be as stable as is often thought. In addition, we found some raising for /o/, particular among younger speakers. So, based on this analysis, it does seem that vowels in Nevada are on the move.

Compared to the archival speakers analyzed in Fridland and Kendall (2017), we confirm a sense that, since the late nineteenth century, speech in Nevada has changed from a more traditionally aligned vowel system to reflect these contemporary patterns, and, echoing some of the suggestions of McLarty, Kendall, and Farrington (2016), this shift toward the modern system seems to have occurred primarily toward the middle of the twentieth century. While age effects for many of the features reported here, such as /æ/ retraction and /u/ fronting, suggest they are still progressing in younger Nevada speech, most of the changes were already present in our older generation speakers. In short, the modern Nevada system looks very different than the system of its ancestors and other regions, though not so different, at least in a global sense, from the speech of its near (and sometimes even far) neighbors.

APPENDIX

Statistical Model Results

7.A1. Fixed-Effects for Low Back Vowels (/ɑ/ and /ɔ/) F2 M-E Model

	Estimate	*Std. Error*	*p-Value*
Intercept	–1.2500	0.0582	—
Vowel (/ɔ/, not /ɑ/)	–0.1347	0.0708	.0645
Sex (male, not female)	0.0653	0.0445	.1495
Age (young, not old)	–0.0129	0.0401	.7491
Vowel (=/ɔ/) × Sex (=male)	–0.0635	0.0300	.0347*
Vowel (=/ɔ/) × Age (=young)	–0.0085	0.0271	.7550
Sex (=male) × Age (=young)	0.0606	0.0569	.2931
Vowel (=/ɔ/) × Sex (=male) × Age (=young)	0.0051	0.0386	.8945

7.A2. Fixed-Effects for Low Back Vowels (/ɑ/ and /ɔ/) F1 M-E Model

	Estimate	*Std. Error*	*p-Value*
Intercept	0.9233	0.0849	—
Vowel (/ɔ/, not /ɑ/)	–0.1884	0.1061	.0832
Sex (male, not female)	0.1057	0.0618	.0934
Age (young, not old)	0.0118	0.0556	.8326
Vowel (=/ɔ/) × Sex (=male)	–0.0340	0.0496	.4932
Vowel (=/ɔ/) × Age (=young)	–0.0297	0.0448	.5066
Sex (=male) × Age (=young)	–0.0675	0.0790	.3970
Vowel (=/ɔ/) × Sex (=male) × Age (=young)	0.0199	0.0637	.7545

7.A3. Fixed-Effects for /æ/ F2 M-E Model

	Estimate	*Std. Error*	*p-Value*
Intercept	0.0428	0.0631	—
Sex (male, not female)	0.2003	0.0753	.0120*
Age (young, not old)	–0.1966	0.0679	.0067**
Sex (=male) × Age (=young)	0.1257	0.0966	.2023

7.A4. Fixed-Effects for /æ/ F1 M-E Model

	Estimate	*Std. Error*	*p-Value*
Intercept	1.2630	0.0916	—
Sex (male, not female)	–0.2020	0.0655	.0041**
Age (young, not old)	0.0520	0.0594	.3875
Sex (=male) × Age (=young)	0.0247	0.0847	.7724

7.A5. Fixed-Effects for /ɪ/ F1 M-E Model

	Estimate	*Std. Error*	*p-Value*
Intercept	–0.8553	0.0454	—
Sex (male, not female)	0.0149	0.0445	.7407
Age (young, not old)	0.1024	0.0400	.0156*
Sex (=male) × Age (=young)	–0.0738	0.0574	.2080

7.A6. Fixed-Effects for /u/ F2 M-E Model

	Estimate	*Std. Error*	*p-Value*
Intercept	–0.4226	0.2174	—
Subclass (/tu/, not /u/)	0.8975	0.2457	.0018**
Subclass (/ul/, not /u/)	–0.1774	0.4971	.7258
Sex (male, not female)	0.1249	0.1217	.3063
Age (young, not old)	0.3480	0.1092	.0017**
Vowel (=/tu/) × Sex (=male)	–0.0282	0.1177	.8109
Vowel (=/ul/) × Sex (=male)	–0.3530	0.2295	.1245
Vowel (=/tu/) × Age (=young)	–0.1712	0.1066	.1090
Vowel (=/ul/) × Age (=young)	–0.6862	0.2060	.0009**
Sex (=male) × Age (=young)	–0.4684	0.1582	.0035**
Vowel (=/tu/) × Sex (=male) × Age (=young)	0.3138	0.1541	.0422*
Vowel (=/ul/) × Sex (=male) × Age (=young)	0.6173	0.2979	.0387*

7.A7. Fixed-Effects for /o/ F1 M-E Model

	Estimate	*Std. Error*	*p-Value*
Intercept	–0.1788	0.0529	—
Subclass (/ol/, not /o/)	–0.3045	0.0998	.0073**
Sex (male, not female)	0.0777	0.0621	.2197
Age (young, not old)	–0.1309	0.0559	.0252*
Sex (=male) × Age (=young)	–0.0285	0.0795	.7224

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REFERENCES

Aisch, Gregor, Robert Gebeloff, and Kevin Quealy. 2014. "Where We Came From and Where We Went, State by State." *New York Times*, Aug 13. http://www.nytimes.com/interactive/2014/08/13/upshot/where-people-in-each-state-were-born.html.

Baayen, R. Harald. 2008. *Analyzing Linguistic Data: A Practical Introduction to Statistics Using R*. Cambridge: Cambridge University Press.

Baker, Wendy, David Eddington, and Lyndsey Nay. 2009. "Dialect Identification: The Effects of Region of Origin and Amount of Experience." *American Speech* 84:1. 48–71. doi:10.1215/00031283-2009-004.

Barber, Phyllis. 2010. "Hoover Dam Construction." *Online Nevada Encyclopedia*. Nevada Humanities. http://www.onlinenevada.org/articles/hoover-dam-construction.

Becker, Kara, Anna Aden, Katelyn Best, Rena Dimes, Juan Flores, and Haley Jacobson. 2013. "Keep Portland Weird: Vowels in Oregon English." Paper presented at the 42 annual meeting on New Ways of Analyzing Language Variation (NWAV 42), Pittsburgh, Pa., Oct. 17–20.

Becker, Kara, Anna Aden, Katelyn Best, and Haley Jacobson. 2016. "Variation in West Coast English: The Case of Oregon." In Fridland et al. 2016, 107–34. doi:10.1215/00031283-3772923.

Boberg, Charles. 2005. "The Canadian Shift in Montreal." *Language Variation and Change* 17.2: 133–54. doi:10.1017/S0954394505050064.

Bright, Elizabeth. 1967. "A Word Geography of California and Nevada." Ph.D. diss., University of California, Berkeley.

Cardoso, Amanda, Lauren Hall-Lew, Yova Kementchedjhieva, and Ruaridh Purse. 2016. "Between California and the Pacific Northwest: The Front Lax Vowels in San Francisco English." In Fridland et al. 2016, 33–54. doi:10.1215/00031283-3772890.

Chen, Adelaide. 2016. "People Moving into Nevada Drive Clark County Population Higher." *Las Vegas Review-Journal*, Mar. 24. http://www.reviewjournal.com/news/las-vegas/people-moving-nevada-drive-clark-county-population-higher.

Clarke, Sandra, Ford Elms, and Amani Youssef. 1995. "The Third Dialect of English: Some Canadian Evidence." *Language Variation and Change* 7.2: 209–28. doi:10.1017/S0954394500000995.

Drager, Katie, M. Joelle Kirtley, James Grama, and Sean Simpson. 2013. "Language Variation and Change in Hawai'i English: KIT, DRESS, and TRAP." In "Selected Papers from NWAV 41," edited by Aaron Freeman. *University of Pennsylvania Working Papers in Linguistics* 19.2. http://repository.upenn.edu/pwpl/vol19/iss2/6/.

Di Paolo, Marianna. 1992. "Hypercorrection in Response to the Apparent Merger of (ɔ) and (ɑ) in Utah English." In "Communicative Accommodation: A New Perspective on 'Hypercorrect' Speech," edited by Malcah Yaeger-Dror. Special issue, *Language and Communication* 12.3-4: 267–92. doi:10.1016/0271-5309(92)90017-4.

D'Onofrio, Annette, Penelope Eckert, Robert J. Podesva, Teresa Pratt, and Janneke Van Hofwegen. 2016. "The Low Vowels in California's Central Valley." In Fridland et al. 2016, 11–32. doi:10.1215/00031283-3772879.

Eckert, Penelope. 2008. "Where Do Ethnolects Stop?" *International Journal of Bilingualism* 12.1-2: 25–42. doi:10.1177/13670069080120010301.

Faber, Alice, and Marianna Di Paolo. 1995. "The Discriminability of Nearly Merged Sounds." *Language Variation and Change* 7.1: 35–78. doi:10.1017/S0954394500000892.

Freeman, Valerie. 2014. "Bag, Beg, Bagel: Prevelar Raising and Merger in Pacific Northwest English." *University of Washington Working Papers in Linguistics* 32. https://depts.washington.edu/uwwpl/vol32/freeman_2014.pdf.

Fridland, Valerie, and Tyler Kendall. 2012. "Exploring the Relationship between Production and Perception in the Mid Front Vowels of U.S. English." In "New Horizons in Sociophonetic Variation and Change," edited by Nanna Haug Hilton, Charlotte Gooskens, Alexandra N. Lenz, and Anja Schüppert. Special issue, *Lingua* 122.7: 779–93. doi:10.1016/j.lingua.2011.12.007.

———. 2017. "Western United States." In *Listening to the Past: Audio Records of Accents of English*, edited by Raymond Hickey, 325–49. Cambridge: Cambridge University Press.

Fridland, Valerie, Tyler Kendall, Betsy E. Evans, and Alicia Beckford Wassink, eds. 2016. *Speech in the Western States*. Vol. 1, *The Coastal States*. Publication of the American Dialect Society 101. Durham, N.C.: Duke University Press. doi:10.1215/00031283-3772868.

Fridland, Valerie, Tyler Kendall, and Charlie Farrington. 2014. "Durational and Spectral Differences in American English Vowels: Dialect Variation within and across Regions." *Journal of the Acoustical Society of America* 136.1: 341–49. doi:10.1121/1.4883599.

Fridland, Valerie [and Toby Macrae]. 2008. "Patterns of /uw/, /ʊ/, and /ow/ Fronting in Reno, Nevada." *American Speech* 83.4: 432–54. doi:10.1215/00031283-2008-030.

Hall-Lew, Lauren. 2011. "The Completion of a Sound Change in California English." In *Proceedings of the 17th International Congress of the Phonetic Sciences (ICPhS XVII): August 17–21, 2011*, edited by Wai-Sum Lee and Eric Zee, 807–10. Hong Kong: City University of Hong Kong. https://www.internationalphoneticassociation.org/icphs-proceedings/ICPhS2011/OnlineProceedings/RegularSession/Hall-Lew/Hall-Lew.pdf.

Hall-Lew, Lauren, Amanda Cardoso, Yova Kementchedjhieva, Kieran Wilson, Ruaridh Purse, and Julie Saigusa. 2015. "San Francisco English and the California Vowel Shift." Paper presented at the 18th International Conference of the

Phonetic Sciences (ICPhS XVIII), Glasgow, Aug. 10–14. http://www.research.ed.ac.uk/portal/files/21806704/Hall_Lew_etal_2015_ICPhS_paper.pdf.

Hall-Lew, Lauren, Mirjam Eiswirth, Mary-Caitlyn Valentinsson, and William Cotter. 2017. "Northern Arizona Vowels." In Fridland et al. 2017, 59–82. doi:10.1215/00031283-4295288.

Holland, Cory, and Tara Brandenburg. 2017. "Beyond the Front Range: The Coloradan Vowel Space." In *Speech in the Western States*. Vol. 2, *The Mountain West* (Publication of the American Dialect Society 102), edited by Valerie Fridland, Alicia Beckford Wassink, Tyler Kendall, and Betsy E. Evans, 9–30. doi:10.1215/00031283-4295277.

Johnson, Daniel Ezra. 2009. "Getting Off the Goldvarb Standard: Introducing Rbrul for Mixed-Effects Variable Rule Analysis." *Language and Linguistics Compass* 3.1: 359–83. doi:10.1111/j.1749-818X.2008.00108.x.

Kendall, Tyler. 2013. *Speech Rate, Pause, and Sociolinguistic Variation: Studies in Corpus Sociophonetics*. Basingstoke, U.K.: Palgrave Macmillan.

Kendall, Tyler, and Valerie Fridland. 2012. "Variation in Perception and Production of Mid Front Vowels in the U.S. Southern Vowel Shift." *Journal of Phonetics* 40.2: 289–306. doi:10.1016/j.wocn.2011.12.002.

Kendall, Tyler, and Erik R. Thomas. 2009. Vowels: Vowel Manipulation, Normalization, and Plotting in R. Version 1.0-3. http://cran.r-project.org/web/packages/vowels/.

Kennedy, Robert, and James Grama. 2012. "Chain Shifting and Centralization in California Vowels: An Acoustic Analysis." *American Speech* 87.1: 39–56. doi:10.1215/00031283-1599950.

Kohn, Mary, and Carly Stithem. 2016. "H/o/me on the Range: Back Vowel Fronting in Kansas." Paper presented at the annual meeting of the American Dialect Society, Washington, D.C., Jan. 7–10.

Labov, William. 1991. "The Three Dialects of English." In *New Ways of Analyzing Sound Change*, edited by Penelope Eckert, 1–44. San Diego, Calif.: Academic Press.

Labov, William, Sharon Ash, and Charles Boberg. 2006. *The Atlas of North American English: Phonetics, Phonology and Sound Change*. Berlin: Mouton de Gruyter.

Lobanov, B. M. 1971. "Classification of Russian Vowels Spoken by Different Speakers." *Journal of the Acoustical Society of America* 68.6: 1636–42. doi:10.1121/1.1912396.

Luthin, Herbert W. 1987. "The Story of California (ow): The Coming-of-Age of English in California." In *Variation in Language: NWAV-XV at Stanford; Proceedings of the Fifteenth Annual Conference on New Ways of Analyzing Variation*, edited by Keith M. Denning, Sharon Inkelas, Faye C. McNair-Knox, and John R. Rickford, 312–24. Stanford, Calif.: Dept. of Linguistics, Stanford University.

McBride, Terri. 2002. "Exploration and Early Settlement in Nevada: Historic Context." Nevada State Historic Preservation Office Report. http://shpo.nv.gov/uploads/documents/McBride_-_Exploration_and_Early_Settlement_in_NV,_2002,_NVSHPO.pdf.

McLarty, Jason, Tyler Kendall, and Charlie Farrington. 2016. "Investigating the Development of the Contemporary Oregonian English Vowel System." In Fridland et al. 2016, 135–57. doi:10.1215/00031283-3772934.

Messerly, Megan. 2016. "Why America Needs Immigrants (especially Nevada)." *Las Vegas Sun*, Feb. 8. http://lasvegassun.com/news/2016/feb/08/why-america-needs-immigrants-especially-nevada/.

Nycz, Jennifer, and Lauren Hall-Lew. 2013. "Best Practices in Measuring Vowel Merger." *Proceedings of Meetings on Acoustics* 20: 1–19. doi:10.1121/1.4894063.

Perry, Marc J. 2003. "State-to-State Migration Flows: 1995 to 2000." Census 2000 Special Reports. https://www.census.gov/prod/2003pubs/censr-8.pdf.

Pew Research Center. 2015. "From Ireland to Germany to Italy to Mexico: How America's Source of Immigrants Has Changed in the States, 1850–2013." Pew Research Center, Washington, D.C. http://www.pewhispanic.org/2015/09/28/from-ireland-to-germany-to-italy-to-mexico-how-americas-source-of-immigrants-has-changed-in-the-states-1850-to-2013/.

R Development Core Team. 2015. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. http://www.R-project.org/.

Reed, Carroll E. 1952. "The Pronunciation of English in the State of Washington." *American Speech* 27.3: 186–89. doi:10.2307/453476.

Reed, Carroll E., and David W. Reed. 1972. "Problems of English Speech Mixture in California and Nevada." In *Studies in Linguistics in Honor of Raven I. McDavid, Jr.*, edited by Lawrence M. Davis, 135–43. Auburn: University of Alabama Press.

Rosenfelder, Ingrid, Joe Fruehwald, Keelan Evanini, and Jiahong Yuan. 2011. FAVE (Forced Alignment and Vowel Extraction) Program Suite. http://fave.ling.upenn.edu.

Van Hofwegan, Janneke, Teresa Pratt, and Annette D'Onofrio. 2016. "Retraction in the Front Vowel System of California's Central Valley." Paper presented at the annual meeting of the American Dialect Society, Washington, D.C., Jan. 7–10.

Warner, Ted J. 1992. "Nevada, Pioneer Settlements in." In *Encyclopedia of Mormonism*, 1006–7. New York: Macmillan.

Wassink, Alicia Beckford. 2015. "Sociolinguistic Patterns in Seattle English." *Language Variation and Change* 27.1: 31–58. doi:10.1017/S0954394514000234.

———. 2016. " The Vowels of Washington State." In Fridland et al. 2016, 77–105. doi:10.1215/00031283-3772912.

Wassink, Alicia, Robert Squizzero, Rachel Schirra, and Jeffrey Conn. 2009. "Effects of Gender and Style on Fronting and Raising of /æ/, /e:/, and /ɛ/ before /g/ in Seattle English." Paper presented at the 38th annual meeting on New Ways of Analyzing Variation (NWAV 38), Ottawa, Oct. 22–25.

Watt, Dominic, Anne Fabricius, and Tyler Kendall. 2011. "More on Vowels: Plotting and Normalization." In *Sociophonetics: A Student's Guide*, edited by Marianna Di Paolo and Malcah Yaeger-Dror, 107–18. New York: Routledge.

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