

## Vowels in contact: Mexican Heritage English in Chicago

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### 1 Introduction

What happens to language at the intersection of Spanish- and English-speaking cultures? This has become a question of practical as well as theoretical importance as Spanish-speaking immigrants settle in ethnic heritage communities throughout the U.S. In addition to their role as ethnic community members, these speakers are also members of the larger regional community, attending English speaking schools and generally participating in American culture. These communities offer residents a variety of influences as they construct their social identities, and provide an uncommon opportunity for language researchers to determine how a speaker's language environment and orientation toward the community affect the construction of a linguistic identity (Fought, 2002). Since speakers from the same geographic community may not relate to the community in the same way, an issue for language researchers has been to determine how the speech of individuals reflects differences in personal and group identities (e.g. Labov, 1972). Sociolinguistic work in the variationist paradigm has found that speakers' linguistic identities are established locally, and that conflicting norms are resolved in a variety of ways (Eckert, 2000; Mendoza-Denton, 1999), thus speakers participating simultaneously in distinct speech communities are of particular interest.

Language contact settings enable us to study the social mechanisms underlying the initiation and propagation of language change; however, a crucial first step in the investigation is the characterization of the language varieties that arise from contact. This characterization helps to establish a metric for comparing language varieties and determining how individual speakers are aligning themselves to their speech communities. The current study takes this first step through the spectrographic analysis of the English vowels of Mexican heritage English (MHE) speakers in Albany Park, an ethnically diverse neighborhood in Chicago. MHE speakers generally live in Mexican ethnic communities,

and are linguistically unique in that they speak with what is often described as a Spanish accent. This in spite of the fact that they are native speakers of English, often reporting limited or no proficiency in Spanish. This variety of English is especially interesting since it is maintained as a dialect separate from the regional (matrix) dialect, indicating the presence of a strong social identity component. Making use of a thorough characterization of the vowel space, the current study provides a foundation for an inquiry into speakers' linguistic alignments to their social setting.

In this work the vowels of MHE speakers are first contrasted with those of Mexican students in English as a second language courses (hereafter L2E speakers) from the same community. Unlike some earlier studies on Spanish-influenced English, speech samples have been categorized as either MHE or L2E allowing us to analyze the vowels of MHE speakers as a coherent group distinct from non-native English speakers. Having delimited the vowels of MHE, we then compare them to those of the regional Northern Midlands dialect ascribed to Chicago speakers, and determine the degree to which MHE reflects the larger regional norms. Finally, we make a brief comparison of these MHE speakers in Chicago with two earlier phonetic studies of similar populations from other regions of the U.S. This comparison suggests that MHE reflects the influence of Spanish as well as the regional English variety, but that the degree to which the factors exercise their influence may depend on the community under study.

Our use of the term MHE in this study reflects a preference for this terminology on the part of our participants. Most of the linguistic studies of the speech of Mexican Americans in ethnic based communities of the U.S. have referred to this variety as "Chicano English." However, none of the people we interviewed for the current work said they would identify themselves using the term "Chicano." The participants in our study who were familiar with the term felt it was generally used in the American Southwest, and was politically charged - not a term that they associate with Mexican-Americans generally.

## 2 Methods

In this section we analyze the spectral features of the vowels of both MHE and L2E speakers from the Chicago Albany Park neighborhood and compare them to the regional non-ethnic dialect.

### *Participants*

MHE is defined in this study as the native language of speakers whose parents emigrated to the U.S. from Mexico, and who were educated exclusively in U.S. schools (Chicago schools for this study). These speakers report English as their dominant language and vary in their Spanish proficiency from none to native-like fluency. Ten female MHE speakers age 18-48 were recruited for the study. The L2E speakers have emigrated to the U.S. from Mexico, and began formal training in English beyond age 16. Eleven female L2E speakers age 20-50 were recruited for the study. Participants were recruited from the Chicago Albany Park community, a multi-ethnic, lower working class community located on the northwest side of Chicago.

Chicago non-ethnic English is categorized as the Northern Midlands dialect which exhibits the well-known Northern Cities Vowel Shift (NCVS). The spectral data for the vowels of 48 adult female speakers of this dialect is taken from Hillenbrand, et al. (1995), a study of speakers in Western Michigan who participate in the NCVS. The vocalic data is taken from wordlist reading of hVd words.

### *Stimulus Materials*

All participants read 179 individual words from a monosyllabic pseudo-randomized wordlist presented using computer presentation software. The wordlist consisted of consonant-vowel-consonant (CVC) words containing 11 vowels of American English (i, ɪ, e, ε, æ, a, ʌ, ɔ, o, ʊ, u) in a variety of phonetic contexts. Words with vowels in prenasal and preliquid position and diphthongs were excluded from analysis, leaving 92 tokens included in the analysis. These tokens, arranged by vowel are given in Table 1. Because the wordlist was constructed to include a variety of lexical frequencies and phonetic environments for each vowel, the number of words for each vowel varies, with a minimum of six tokens available for the analysis.

Table 1. Vowels analyzed

Vowel	# tokens	Token from CVC wordlist
i	11	be, keep, beast, she, these, each, deep, feed, street, heed, deed
ɪ	12	it, big, give, dish, lid, kiss, hid, wish, this, sick, dig, rip
e	10	space, make, paid, tape, jade, bait, late, fade, age, they
ε	8	death, fetch, head, sled, leg, less, text, wet
æ	9	cab, have, bad, glad, tax, gap, had, math, fact
a	7	hot, pod, lot, mob, job, dock, nod
ʌ	8	rust, thud, such, luck, love, smug, much, shrug
ɔ	6	walk, dog, thawed, gawk, cough, log
o	7	boat, poke, both, code, hope, most, toad
ʊ	6	should, hook, good, cook, book, hood
u	8	loop, who'd, loose, you, prude, hued, choose, tube

### *Recordings*

Each speaker was recorded reading the wordlist while wearing a Shure WH20 dynamic head-mounted microphone. Recordings were made using a Marantz model PMD 670 digital recorder at a 22.05 kHz sampling rate.

### **3 Procedures**

For each vowel token, three acoustic measurements were taken: vowel duration, and first and second formant frequencies at the temporal midpoint of the vowel. Phonetic alignment of the word productions was automated using Triggerwave, an alignment tool developed at Northwestern University which incorporates SONIC automated speech recognition software developed at The Center for Spoken Language Research, University

of Colorado at Boulder. After phonetic alignment, extraction of vowel duration, F1, and F2 was performed using a program script written for Praat 4.6.25. This speech analysis software provided a time-aligned waveform, f0 trace, and wide-band spectrogram with formant tracks for formants 1 – 5. Formant tracking was computed using LPC analysis over a 50 ms window with a 12.5 ms frame interval. Formant values are provided in Hertz, with no normalization of values since all speakers were adult females, and are not expected to differ significantly in their vocal tract characteristics.

Reliability of the automated technique for determining formant values was assessed using a subset of tokens analyzed by four Northwestern University Linguistics Department graduate students experienced in phonetic analysis. Sixty different CVC tokens from each of three speakers were analyzed by hand for first and second formant values and compared to automated results. Agreement within 10% of the formant frequency in Hertz between the raters and the automated procedure was above 94%. This level of accuracy is suitable since any outliers (>1.5 interquartile range) for a particular vowel are inspected and hand-checked after the automated procedure.

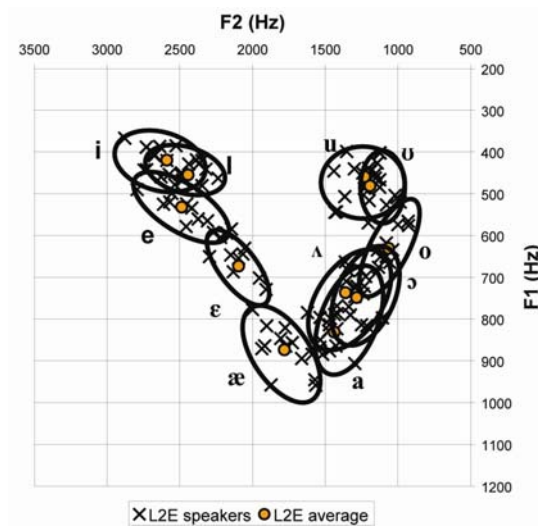
Formant value outliers (>1.5 times the interquartile range for a speaker's productions of a particular vowel) were inspected and eliminated when judged to be misreadings or non-responses. The L2E speakers produced a number of misreadings and non-responses due to the inclusion of low lexical frequency words and contractions in the list (L2E speaker average misread words: range 1-13, mean 8.25 tokens; 9% of tokens). Although speakers were instructed to say "I don't know" when they encountered words they were unsure of, non-standard pronunciations that were not consistent with other productions of that vowel for the speaker (often found in words of low lexical frequency), were considered misreadings and excluded. Applying the same conservative standards for elimination of tokens, MHE speakers had a much lower rate of misreading and non-response (MHE speaker average: range 0-2, mean .60 tokens; 0.7% of tokens). Outliers for all subjects that were not judged misreadings were inspected for anomalies and measured by hand. The hand-inspected values were included in subsequent analyses.

#### 4 Results

##### *L2E*

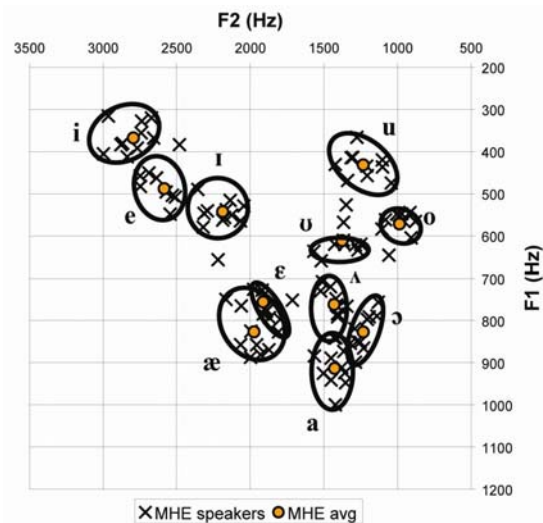
A summary of the mean values for the first and second formants of the L2E speakers' vowels is presented in Figure 1. The X's represent the mean values of the indicated vowels for each participant, with the central circle representing the mean value of all speakers for the vowel. Ellipses surround all speaker means excluding outliers. Outliers with formant values exceeding 1.5 times the interquartile range for the particular vowel were not included within the ellipses for illustrative purposes, but were included in the analyses.

Figure 1. Vowel plot for L2E speakers (N=11)

*MHE*

A summary of the mean values for the first and second formants of the MHE speakers' vowels is presented in Figure 2. As above, the X's represent the mean values of the indicated vowels for each participant, with the central circle representing the mean value of all speakers for the vowel. Ellipses surround all speaker means excluding outliers. Outliers with formant values exceeding 1.5 times the interquartile range for the particular vowel were not included within the ellipses for illustrative purposes, but were included in the analyses.

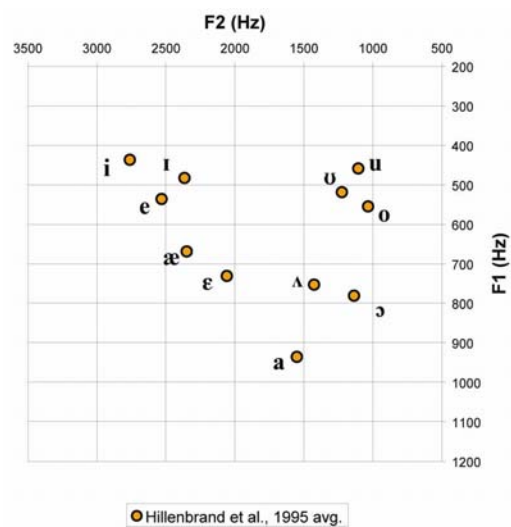
Figure 2. Vowel plot for MHE speakers (N=10)



### Non-ethnic Speakers

As mentioned previously, spectral data representative of the Chicago non-ethnic dialect was obtained from Hillenbrand, et al. (1995) which provides mean vowel formant data from 48 female speakers of the Northern Midlands dialect. Figure 3 provides a summary of the mean values for the first and second formants extracted from *hVd* word tokens measured at the vowel steady state (details of the analysis are provided in the study). Mean values are provided for comparison to the populations in the current study.

Figure 3. Vowel plot for non-ethnic female speakers (Hillenbrand, et al., 1995)



## 5 Discussion

### *L2E*

Figure 1 shows how the English vowel space for L2E speakers is characterized by a large degree of adjacent vowel overlap in the high and back regions. Apparently there is little distinction being made between productions of |i| and |ɪ| and |u| and |ʊ| for these non-native speakers. This results in the stereotypically Spanish-accented English in which *bit* is pronounced as *beat*, and *look* is pronounced as *Luke*. This extreme overlap is also apparent among the back vowels where little distinction is made between |a|, |ʌ|, and |ɔ|. Even |o| is involved in this grouping, with a high degree of overlap. In addition to the areas of overlap, we see that the position of |æ| for these speakers corresponds more closely to a Spanish |a| than the |æ| of American English. The L2E speakers have apparently collapsed categories for several adjacent English vowels as they attempt to produce the eleven vowels explored in this study. As might be expected for speakers coming from a language containing a five vowel inventory, their English vowels have been heavily influenced by their experience with Spanish.

### *MHE*

In contrast to the vowel space of the L2E speakers discussed above, the plot in Figure 2 shows distinct separation of all vowels in the MHE vowel inventory. As might be expected from these native speakers of English, they have spectrally resolved their vowel productions resulting in very little overlap of adjacent vowels.

### *Regional Influences*

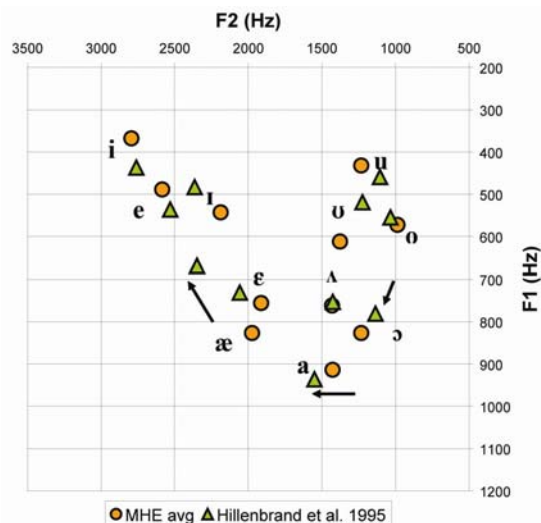
Sociolinguistic studies have shown repeatedly that insular (geographically as well as socially), close-knit communities are more likely to maintain dialects distinct from the larger regional population in which they are situated, and that more mobile members of these communities will exhibit features of the matrix dialect to a greater extent than their less mobile counterparts (Fought, 2002). With regard to vowel production in MHE, studies have found that speakers in Mexican ethnic communities in the U.S. produce vowels that do not consistently reflect those of their surrounding geographic communities (Gordon, 2000; Frazer, 1996; Wolfram, et al., 2004; Roeder, 2006).

To facilitate comparison, Figure 4 provides vowel mean values of F1 and F2 for MHE and for the regional non-ethnic variety. The vowel space depicted in Figure 4 displays a raising and fronting of |u| and |i| for the MHE system relative to the non-ethnic system, which taken together with the lower positions of |ɪ| and |ʊ| relative to the corresponding non-ethnic vowels, may indicate an effort on the part of these speakers to spectrally differentiate the lax vowels from their tense counterparts. Further, this may be related to the influence of Spanish on MHE since this differentiation is between vowels that are extremely overlapped in the vowel space of the L2E speakers.

Next we consider three vowels of the NCVS indicated with arrows in Figure 4. The positions of |ɔ| and |a| for MHE are surprising since |ɔ| for MHE appears to be somewhat lower than the shifted version, but |a| is not fronted. This finding runs counter to expectations for a chain shift in which the adjacent vowels are either pushed or pulled to positions that maintain a maximal separation. Further study of the individual speakers' vowel plots should shed light on the relationship between these two vowels and whether the mean values are indicative of the relationship between the two positions for the MHE system generally, or if individual speakers are maintaining intervocalic distance, but vary in the overall position for the two vowels.

A striking result for the MHE system is the lack of raising for |æ| which is a strong marker of the NCVS. In Figure 4 we see that the non-ethnic |æ| is quite raised and fronted relative to |ɛ|, while MHE exhibits a considerably less shifted version. Because of its salience as a marker of the non-ethnic vowel system, this may be a particularly interesting vowel to pursue in studying the regional influences on the community of MHE speakers. The degree to which |æ| is raised may correlate with a speaker's relationship with non-ethnic speakers.

Figure 4 Mean formant values for MHE and NCVS vowels. Arrows indicate the direction of shift for |ɔ|, |a|, and |æ|, with the arrow heads pointing toward the shifted vowel.



Comparing results across studies that are not completely consistent in their methodologies is less than ideal, but looking at two earlier studies of the vowel space of MHE speakers from other regions of the U.S. may offer some promising avenues for future research on regional differences in MHE. Godinez and Maddieson (1985) focused on the effect of bilingualism on the resultant English vowels of Chicano English in Los Angeles. They found no significant differences in the vowel space of male monolingual and bilingual Chicano speakers, but did find |ɪ|, |ɛ|, |æ| and |ʊ| higher and fronter for the Chicano speakers compared to the General California non-ethnic speakers. In addition, |ʊ|

for Chicano speakers was back relative to the California speakers. Results from the current study show Chicago MHE speakers patterning much closer to their regional dialect overall than to the California MHE speakers. In this particular comparison, we see no evidence for a supra-regional MHE, but instead see how the regional norms vary in their influence on the resultant MHE.

In a more recent study similar to the current work, Roeder (2007) studied the vowel systems of MHE speakers in Lansing, Michigan. These speakers live in the same dialect region as those of the current study, and the spectral data is taken from a similar wordlist reading paradigm. By extracting the data from the 15 female MHE speakers of the Roeder study, we are able to compare the vowel space of these speakers with the current study. We find that the Lansing MHE speakers pattern closely with the regional dialect in |æ| raising and |a| fronting, but also exhibit lower |ɪ| and |ʊ|, similar to Chicago MHE. This finding supports the idea that the lowering of |ɪ| and |ʊ| is due to a Spanish language influence, which is producing a feature that does not reflect the regional dialect, but instead is specific to MHE speakers exposed to the NCVS. The Chicago MHE speakers do, however, produce a more raised |i|, and fronted |u| relative to the NCVS, and interestingly, do not exhibit as much raising of |æ| – one of the more salient features of the NCVS. These results contrast with the Lansing MHE speakers who produce a raised |æ| that is consistent with the NCVS, but do not pattern with the Chicago speakers' high vowel productions. It appears that these features (raised |i|, fronted |u|, lower |æ|) may be associated with Chicago MHE, and this local effect may reflect the differences between the Mexican ethnic communities and their relationship to the corresponding non-ethnic community in the two cities.

## 6 Conclusion

The study provides empirical evidence demonstrating the contrast between the vowel systems of Mexican L2E speakers and MHE speakers in a single Chicago community. Spectral vowel plots of the two systems indicate that L2E speakers are not producing distinct vowel categories for all the vowels of English. These speakers exhibit a great deal of adjacent vowel overlap both high and back in the vowel space. Contrasting L2E vowels with those of MHE speakers from the same community, we find that MHE speakers have well-differentiated vowel categories, as would be expected from these native speakers of English. The vowels of these MHE speakers however do not pattern completely with the vowels of the regional non-ethnic dialect. Not only do the MHE speakers not participate fully in the vowel shift associated with the non-ethnic dialect, but they also appear to be producing larger spectral contrasts for |i|/|ɪ| and |u|/|ʊ| pairs. Comparisons to other sociophonetic studies indicate that in spite of the Spanish vowel influences, there is not evidence of a supra-regional MHE. Instead, the data suggests that the local dialect affects the resultant vowels, producing a form of MHE distinct from the regional system.

By providing a comprehensive account of the vowel space for Chicago MHE speakers, and establishing the differences between this variety of American English and L2E, the study provides a foundation for further sociophonetic work on how social identity is indexed by vowel production. The brief comparisons of Chicago MHE from the Albany Park community to other regions suggest that the results of language contact in

ethnic communities involve many factors other than language internal ones, and that the social orientation of speakers to their communities will contribute a great deal to the differences in individuals' speech. The data from this study allows us to make meaningful inquiry into how the construction of social identity for these ethnic community members relates to their alignment toward the communities available to them.

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