American English: Southern Michigan

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As Ladefoged (1999) points out in his description of American English, there is considerable diversity in the phonetic characteristics of English spoken in North America, such that the commonly used phrase 'General American English' is not entirely meaningful. The description of American English provided by Ladefoged was based on a southern California dialect. The purpose of this report is to augment that account with a brief description of southern Michigan speech patterns. According to Labov and colleagues (e.g. Labov, Yeager & Steiner 1972, Labov 1994), southern Michigan, particularly in its urban areas, is part of a relatively large dialect region in the inland northeast United States called 'Northern Cities'. According to Labov, the Northern Cities dialect cuts an irregular swath through a chain of cities in the inland northeast extending, roughly, from upstate New York (e.g. Syracuse, Rochester, Buffalo), through northern Ohio (e.g. Cleveland, Toledo), southern Michigan (e.g. Detroit, Kalamazoo, Grand Rapids), northwest Indiana (e.g. Gary, Hammond), northeast Illinois (e.g. Chicago, Rockford) and south-central Wisconsin (e.g. Milwaukee, Madison). Speakers from neighboring regions such as northwest Vermont, northwest Pennsylvania, and north-central/northeast Indiana appear to show some features of the dialect. Labov contends that the vowel shifts that characterize the Northern Cities dialect are observed in their most advanced forms in the largest urban areas of the region, such as Detroit, Buffalo, and Rochester.

Since the features that distinguish southern Michigan speech patterns from those of most other regions of North America chiefly involve differences in vowel production, this report will focus primarily on the vowel system. The description is based in large part on recordings of 139 talkers (45 men, 48 women, and 46 children) analyzed by Hillenbrand, Getty, Clark & Wheeler (1995). The great majority of the speakers in that study (87%) were raised in southern Michigan, while all but a few of the remainder were raised in other areas of the inland northeast such as northern Ohio, upstate New York, northeast Illinois, and south-central Wisconsin. The speakers were predominantly white and almost exclusively middle class. The adults ranged in age from 19 to 50 years, but the great majority were college students in their early- to mid-twenties. The children consisted of boys (N = 27) and girls (N = 19) from Kalamazoo, Michigan, averaging slightly under 11 years of age. The recorded examples that accompany this report, and which form the basis of the phonetic transcriptions that follow, were provided by a 23-year-old woman who was raised in Grand Rapids.

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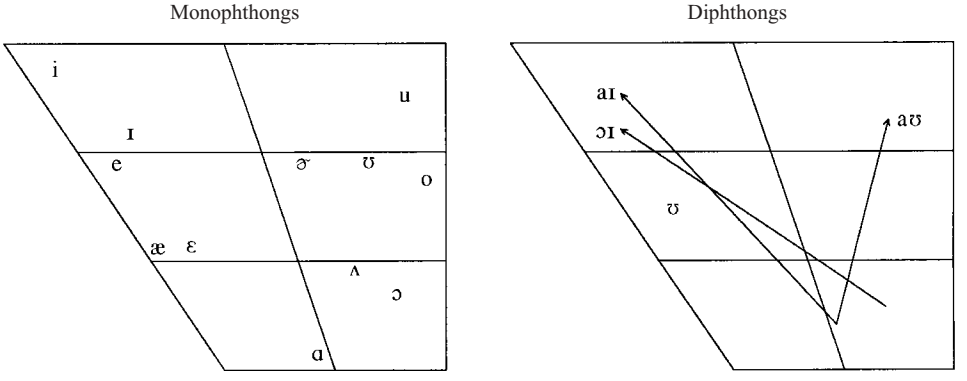
Consonants

	Bilabial	Labio-dental	Dental	Alveolar	Post-alveolar	Palatal	Velar	Glottal
Plosive	p b			t d			k g	
Affricate					tʃ dʒ			
Nasal	m			n			ŋ	
Fricative		f v	θ ð	s z	ʃ ʒ			h
Approximant				ɹ		j	w	
Lateral Approximant				l				

/p/	'pie'	/t/	'tie'	/k/	'kite'
/b/	'buy'	/d/	'die'	/g/	'guy'
/m/	'my'	/n/	'nigh'	/ŋ/	'hang'
/f/	'fie'	/θ/	'thigh'	/h/	'high'
/v/	'vie'	/ð/	'thy'	/tʃ/	'chin'
		/s/	'sigh'	/dʒ/	'gin'
		/z/	'zoo'	/ʃ/	'shy'
/w/	'why'	/ɹ/	'rye'	/ʒ/	'azure'
		/l/	'lie'	/j/	'you'

The consonant inventory, stress patterns, and major phonological rules described by Ladefoged for southern California apply as well to southern Michigan.

Vowels



Vowel diagrams for monophthongs and diphthongs are shown above. Note that a contrast is made between /ɑ/ (*cot*) and /ɔ/ (*caught*), distinguishing southern Michigan from many other regions of North America in which these vowels have largely or entirely merged (e.g. Labov 1994, Ladefoged 1999). Figure 1 shows formant values from Hillenbrand et al. (1995). To provide a frame of reference, average formant values are also shown from the familiar

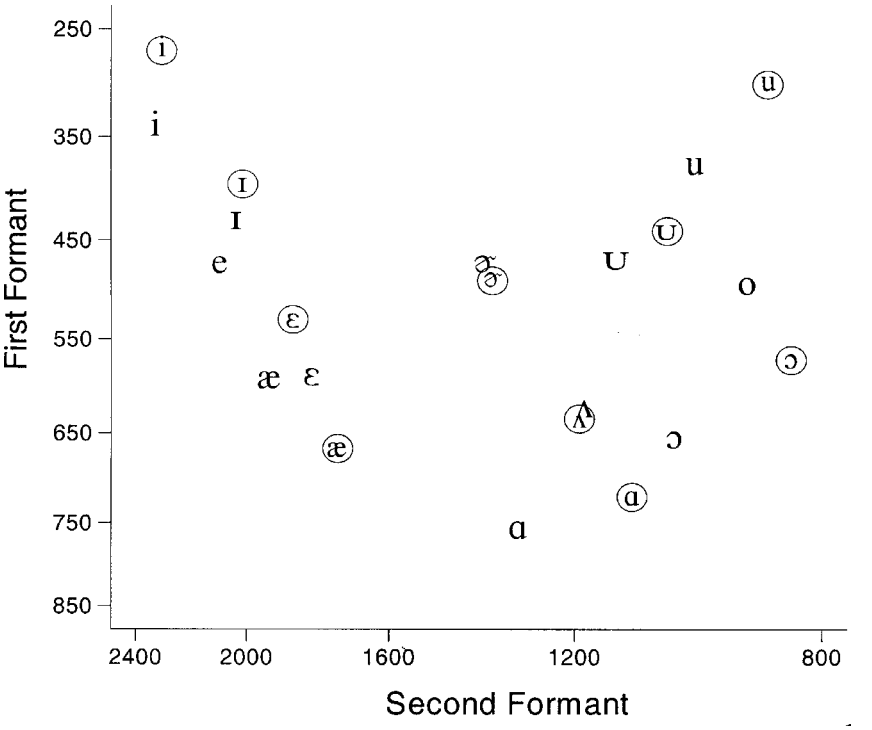


Figure 1 Formant frequencies for F_1 and F_2 for adult male talkers from Hillenbrand et al. (1995; southern Michigan) and from Peterson & Barney (1952; mid-Atlantic). The smaller symbols enclosed in circles are from Peterson & Barney. Formant values have been converted to a Bark scale and the origin is in the upper right.

and widely cited study of vowels from a mixed but largely mid-Atlantic speaker group by Peterson & Barney (1952). All formant values have been converted to a bark scale, and the origin has been placed in the upper right. For both sets of data, formant values were measured at a time when the formant pattern was maximally steady, based on visual inspection of a spectrogram. To improve the clarity of the figure, formant values are shown for men only (N = 33 for Peterson & Barney), although the major features seen in this figure do not differ across the three speaker groups. No data are available for /e/ (as in *bait*) and /o/ (*boat*) from Peterson and Barney.

With the notable exception of /æ/ (*bat*) and /ɛ/ (*bet*), vowels occupy similar relative positions in the two vowel systems. The Peterson & Barney data show the pattern that is seen in most English dialects in which /æ/ occupies a position considerably lower and slightly further back than /ɛ/. One of the most prominent features associated with the southern Michigan data is the raising and fronting of /æ/ and the lowering of /ɛ/. The shifts in the relative positions of /æ/ and /ɛ/ shown here are actually relatively modest in relation to some Northern Cities speech patterns (Labov 1994). Other differences include: (1) the back vowels /u/ (*boot*), /ʊ/ (*book*), /ɔ/ (*caught*), and /ɑ/ (*cot*) occupy positions that are lower and more advanced than those of Peterson & Barney; especially prominent are the very low and advanced positions occupied by /ɑ/ and /ɔ/; and (2) the high front vowels /i/ and /ɪ/ are lower than Peterson & Barney. (Labov also reports a backward shift in /ʌ/ as a feature of the Northern Cities pattern, but no evidence is seen for this in our southern Michigan data.) According to Labov (1994), a variety of contextual factors modulate the phonetic realization of Northern Cities vowels. For

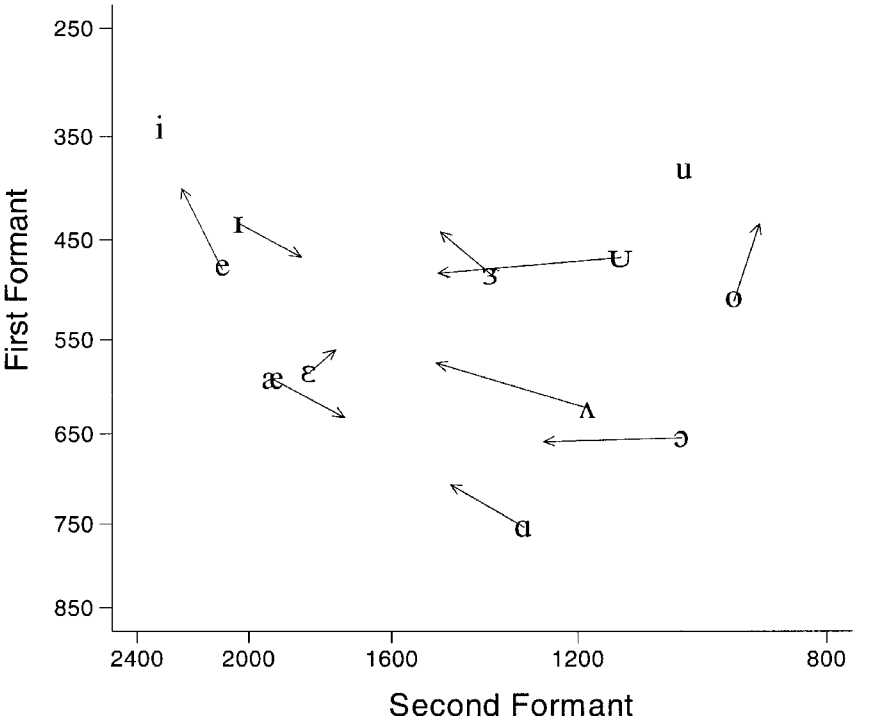


Figure 2 Spectral-change patterns for the Hillenbrand et al. (1995) vowels. The figure was formed by drawing arrows from the average [F_1,F_2] measurements measured at 20% of vowel duration (the tail of the arrow) to the corresponding values measured at 80% of vowel duration. Measurements are shown for the adult male talkers only. The scaling of formant values and orientation of the axes is identical to figure 1.

example, the raising and fronting of /æ/ is greater preceding a nasal consonant or following an obstruent cluster (see Labov 1994 for details).

Spectral change and duration

It has been well recognized for many years that the nominally monophthongal English vowels /e/ and /o/ tend to be diphthongized, with /e/ showing an offglide in the direction of /i/, and /o/ moving toward /u/. In our southern Michigan data, there is significant spectral movement associated with many other nominally monophthongal vowels (see Nearey & Assmann (1986) for a description of similar spectral movement patterns in Canadian English vowels). Figure 2 shows the spectral change patterns associated with the Hillenbrand et al. (1995) vowels. The figure was formed by drawing arrows from the average [F_1,F_2] values (again, for men only) measured at 20% of vowel duration (the tail of the arrow) to the corresponding average values measured at 80% of vowel duration. Similar but (on average) somewhat attenuated spectral movements have been observed in more complex phonetic environments than the /hVd/ syllables that form the basis of figure 2 (see Hillenbrand, Clark & Nearey 2000). There is clear evidence implicating a key role for these spectral changes in perception, with formant movements serving to disambiguate spectrally similar vowel pairs such as /æ/–/ɛ/, /u/–/ʊ/, and /e/–/ɛ/ (e.g. Nearey & Assmann 1986, Hillenbrand & Nearey 1999).

American-English vowels also show systematic differences in average duration. Especially important are the many pairs and clusters of vowels with similar spectral patterns but different

Table 1 Pairs of spectrally similar American English vowels that differ in average duration. Shown in parentheses are ratios of the longer vowel to the shorter vowel as measured in /hVd/ syllables by Hillenbrand *et al*. (1995).

/i/	>	/ɪ/	(1.26)
/e/	>	/ɛ/	(1.36)
/æ/	>	/ɛ/	(1.39)
/ɔ/	>	/ɑ/	(1.05)
/o/	>	/ʊ/	(1.23)
/ɑ/	>	/ʌ/	(1.35)
/u/	>	/ʊ/	(1.23)

average durations. Table 1 summarizes the most important of these duration differences. To give a rough idea of the magnitude of these duration differences, the table shows average ratios measured from the /hVd/ syllables recorded by Hillenbrand et al. (1995). Similar patterns of durational differences have been reported for connected speech (e.g. Crystal & House 1988, van Santen 1992; see also Klatt 1976). Synthesis work shows that duration can play an important role in the perception of some vowels (e.g. /ɑ/–/ɔ/–/ʌ/ and /æ/–/ɛ/) but appears to be of little or no importance for others (e.g. /i/–/ɪ/, /u/–/ʊ/ and /ɪ/–/e/–/ɛ/) (Hillenbrand, Clark & Houde 2000).

Broad transcription

ðə 'noɹθ 'wɪnd æn ðə 'sʌn wɚ dɪs'pjutɪŋ wɪtʃ wəz ðə 'stɹɔŋgɚ, wɛn ə 'tɹævlɚ ˌkem ə'lɔŋ 'ɹæpt ɪn ə 'woɹm 'klok. ðe ə'gɹid ðət ðə 'wʌn hu 'fɚst sək'sidəd ɪn 'mekɪŋ ðə 'tɹævlɚ 'tek hɪz 'klok ˌɔf ʃʊd bi kən'sɪdɚd 'stɹɔŋgɚ ðən ði 'ʌðɚ. 'ðɛn ðə 'noɹθ 'wɪnd 'blu əz 'hɑɹd əz hi 'kʊd, bət ðə 'moɹ hi 'blu, ðə moɹ 'klosli dɪd ðə 'tɹævlɚ 'fold hɪz 'klok ə'ɹaʊnd hɪm; ænd ət 'læst ðə 'noɹθ 'wɪnd ˌgev 'ʌp ði ə'tɛmpt. 'ðɛn ðə 'sʌn 'ʃaɪnd ˌaʊt 'woɹmli, ɛn ɪ'midiətli ðə 'tɹævlɚ ˌtʊk 'ɔf hɪz 'klok. æn ˌso ðə 'noɹθ 'wɪnd wəz ə'blaɪdʒ tə kən'fɛs ðət ðə 'sʌn wəz ðə 'stɹɔŋgɚ əv ðə 'tu.

Narrow transcription

ðə 'nɔə˞θ 'wɪnd æn ðə 'sʌn wɚ dɪs'pjuɾɪŋ wɪtʃ wəz ðə 'stɹɔŋgɚ, wɛn ə 'tʰɹævlɚ ˌkʰem ə'lɔŋ 'ɹæpt ɪn ə 'wɔə˞m 'kʰlok. ðə ə'gɹɪd ðət ðə 'wʌn hu 'fə˞st sək'sɪdəd ɪn 'mekɪŋ ðə 't̊ʰɹævlɚ 'tʰek hɪz 'kʰlok ˌɔf ʃʊd bi kʰən̊'sɪdə˞d 'stɹɔŋgɚ ðən ði 'ʌðɚ. 'ðɛn ðə 'nɔə˞θ 'wɪnd 'blu əz 'hɑə̯˞d əz hi 'kʰʊd, bət̚ ðə 'mɔə˞ hi 'blu, ðe mɔə˞ 'kʰlosli dɪd ðə 'tʰɹævlɚ 'fold hɪz 'kʰlok ə'ɹaʊnd hɪm; ænd ət 'læst ðə 'nɔə˞θ 'wɪnd ˌgev 'ʌp ði ə'tʰɛmpt̚. 'ðɛn ðə 'sʌn 'ʃaɪnd ˌaʊt 'wɔə˞mli, æn ɪ'midiətli ðə 'tʰɹævlɚ ˌtʰʊk 'ɔf hɪz 'kʰlok. æn ˌso ðə 'nɔə˞θ 'wɪnd wəz ə'blaɪdʒ tə kʰən'fɛs ðət ðə 'sʌn wəz ðə 'stɹɔŋgɚ ʌv ðə 'tʰu.

Orthographic version

The North Wind and the Sun were disputing which was the stronger, when a traveler came along wrapped in a warm cloak. They agreed that the one who first succeeded in making the traveler take his cloak off should be considered stronger than the other. Then the North Wind blew as hard as he could, but the more he blew the more closely did the traveler fold his cloak around him; and at last the North Wind gave up the attempt. Then the Sun shined out warmly, and immediately the traveler took off his cloak. And so the North Wind was obliged to confess that the Sun was the stronger of the two.

Acknowledgements

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References

CRYSTAL, T. H. & HOUSE, A. S. (1988). The duration of American-English vowels: An overview. *Journal of Phonetics* **16**, 263–284.

HILLENBRAND, J. M., CLARK, M. J. & HOUDE, R. A. (2000). Some effects of duration on vowel recognition. *Journal of the Acoustical Society of America* **108**, 3013–3022.

HILLENBRAND, J. M., CLARK, M. J. & NEAREY, T. M. (2000). Effects of consonant environment on vowel formant patterns. *Journal of the Acoustical Society of America* **109**, 748–763.

HILLENBRAND, J. M., GETTY, L. A., CLARK, M. J. & WHEELER, K. (1995). Acoustic characteristics of American English vowels. *Journal of the Acoustical Society of America* **97**, 3099–3111.

HILLENBRAND, J. M. & NEAREY, T. M. (1999). Identification of resynthesized /hVd/ syllables: Effects of format contour. *Journal of the Acoustical Society of America* **105**, 3509–3523.

KLATT, D. H. (1976). Linguistic uses of segmental duration in English: Acoustic and perceptual evidence. *Journal of the Acoustical Society of America* **59**, 1208–1221.

LADEFOGED, P. (1999). American English. In *Handbook of the International Phonetic Association*, 41–44. Cambridge: Cambridge University Press.

LABOV, W. (1994). *Principles of Linguistic Change*. Cambridge, MA: Blackwell Publishers.

LABOV, W., YAEGER, M. & STEINER, R. (1972). A quantitative study of sound change in progress. Report on National Science Foundation Contract NSF-FS-3287.

NEAREY, T. M. & ASSMANN, P. (1986). Modeling the role of vowel inherent spectral change in vowel identification. *Journal of the Acoustical Society of America* **80**, 1297–1308.

PETERSON, G. & BARNEY, H. L. (1952). Control methods used in a study of the vowels. *Journal of the Acoustical Society of America* **24**, 175–184.

VAN SANTEN, J. P. H. (1992). Contextual effects on vowel duration. *Speech Communication* **11**, 513–546.