# Nasometric Values For Three Dialectal Groups Within The Atlantic Provinces of Canada

## *Valeurs nasométriques de trois groupes dialecticaux des provinces de l'Atlantique au Canada*

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### Abstract

The purpose of this study was to obtain normative nasalance scores (the ratio of nasal and nasal-plus-oral acoustic energy) for adult speakers from three dialectal regions within the Atlantic Provinces of Canada: Moncton, New Brunswick, St. John's, Newfoundland, and Halifax, Nova Scotia. Further objectives were to determine if differences in nasalance scores similar to those observed by Seaver et al. (1991) (i.e., region and gender) exist, and to determine if Nasometer placement or number of reading trials influenced nasalance scores. Results showed no significant differences for nasalance scores between the three dialect groups, between males and females, before and after replacement of the Nasometer, or after repeated trials, with the exception of the Nasal Sentences Passage. These results suggest that the influence of dialectal differences upon nasalance scores is negligible for the three Canadian dialects studied.

### Résumé

*Cette étude avait pour but d'établir une valeur «nasalance» normatives (rapport entre l'énergie acoustique nasale et l'énergie nasale plus l'énergie orale) pour des orateurs adultes des trois régions dialecticales des provinces de l'Atlantique, soit Moncton (Nouveau-Brunswick), St. John's (Terre-Neuve) et Halifax (Nouvelle-Écosse). Elle devait aussi déterminer si des variations des valeurs «nasalance», comme celle rapportées par Seaver et ses collaborateurs (1991) (à savoir, selon la région et le sexe), existent réellement, et établir si l'emplacement du nasomètre ou le nombre de relevés modifient les valeurs obtenues. Les résultats ne révèlent aucune variation significative des valeurs «nasalance» pour les trois groupes dialecticaux entre les hommes et les femmes, avant et après remplacement du nasomètre ou au terme de plusieurs essais, sauf en ce qui concerne le passage nasal des phrases. Ces résultats donnent à penser que les différences dialecticales ont une influence négligeable sur les valeurs «nasalance» pour les trois dialectes du Canada examinés.*

In assessing a client's linguistic proficiency, the distinction between language disorders and language differences must be considered (Taylor, 1986). The majority of assessment instruments provide normative data only for certain 'standard' dialect regions, sometimes making it difficult for the speech-language pathologist to reliably determine if a client has a true language disorder, or simply speaks a nonstandard dialect. Sociolinguistic research into the spoken varieties of English has shown that dialects may differ according to their phonetic, phonological, lexical, morphological, syntactic or semantic properties (Labov, 1973; Taylor, 1986; Chambers, 1975). In the development of new assessment techniques we must be careful to consider how dialects differ and establish normative data accordingly.

Velopharyngeal malfunction is often diagnosed using perceptual judgments of nasal resonance. Until recently, instrumental techniques to supplement clinical judgments of velopharyngeal incompetency were either intrusive (e.g. endoscopy) or unavailable to most clinicians (radiography, ultrasound). The recent introduction of the Nasometer by Kay Elemetrics has provided speech-language pathologists with an easily accessible non-intrusive means for confirming clinical judgments of velopharyngeal difficulties.

Dalston, Warren & Dalston (1991a) conducted a study which investigated the sensitivity of the Nasometer to act as a diagnostic tool for identifying individuals with velopharyngeal impairment. Nasometric data were obtained from 117 patients while they read or repeated a standardized passage that contained no nasal consonants. It was found that the Nasometer could correctly identify most patients previously categorized, on a perceptual level, as having hypernasal speech. With a cutoff nasalance score of 32%, the Nasometer data agreed with clinical judgments of hypernasality 93% of the time. Results are somewhat less impressive when the Nasometer was used to assess hyponasal speech (Dalston, Warren & Dalston, 1991b). Some patients who had been clinically judged to be hyponasal obtained relatively high nasalance scores; however, when subjects who manifested some nasal emission were removed from the analysis, the Nasometer was 90% successful in correctly identifying hyponasal speech.

A study by Litzaw and Dalston (1992) recently investgated whether nasalance scores of 30 normal adult speakers was influenced by speaker gender. No significant differences were found between nasalance scores of men and women across the three standard reading passages.

In a study by Seaver, Dalston, Leeper & Adams (1991), the extent to which nasalance scores are affected by regional differences in speech was investigated. These authors noted that the normative data provided in the instruction manual for the Nasometer (Kay Elemetrics, 1989) did not take dialect into account, and they hypothesized that the speech patterns of a particular dialect area might influence nasalance scores. Given that some dialects of English are often considered to be more 'nasal' than others, it follows that nasalance scores obtained from speakers of highly nasalized dialects might be significantly higher than scores from speakers of less nasal dialects. To test this hypothesis, Seaver et al. (991) obtained nasalance scores from 148 subjects grouped informally into four dialectal regions: a) Mid-Western, USA b) Mid-Atlantic, USA c) Southern, USA, and d) Ontario, Canada. It was found that the Mid-Atlantic subjects had significantly higher nasalance scores on the production of specific passages than the other dialect groups. Accordingly to Seaver et al., these findings indicate that nasalance scores may need to be regionally normed.

Leeper, Rochet, & MacKay (1992) recently obtained normative nasalance data for both English and French dialects across several regions in Canada (i.e., Eastern Ontario, Quebec, Southern Ontario, and Edmonton, Alberta). They report significant differences in nasalance scores obtained from speakers of different ages, different languages (i.e. English and French), and some regions of the country. Nasalance scores for the youngest speakers (7-12, 13-19) were lower than those obtained from the oldest speakers (65-84, 85+). Nasalance scores obtained from English speakers were generally higher than for French speakers, and nasalance scores obtained in Alberta were significantly lower than those obtained in other parts of the country. In contrast to Litzaw and Dalston (1992), Leeper et al. also found significant differences in nasalance scores by gender. Females generally demonstrated higher nasalance scores than males in both French and English.

The Seaver et al. (1991) and Leeper et al. (1992) studies are important in that they attempt to account for dialectal differences for normal speakers across regions of North America. However, the experimental protocols used may have lacked adequate procedures for categorizing speech patterns. Neither study used a trained linguist in their dialectal categorization. Subjects in the Seaver et al. study were classified during "casual observation and/or subject reporting whether a subject has a speech pattern that was characteristic of one of the participating regions." (Seaver et al., 1991, p. 34). In the Leeper et al. study, subjects were simply categorized by whether they spoke French or English, and by which of three Canadian cities they lived in. If the system of dialectal classification used in these studies had been more stringent, a greater number of regional differences in nasalance scores may have been found.

The main objective of this study was to collect nasalance scores from adult speakers of English from three dialectal regions within the Atlantic Provinces of Canada to determine if significantly different nasalance scores exist for these dialect groups. The regions examined were: a) Moncton, New Brunswick b) St. John's, Newfoundland, and c) Halifax, Nova Scotia. Moncton was chosen as one of the dialect regions to be investigated because it has the largest francophone influence in Atlantic Canada, and it might be expected that the nasal vowels of French might increase nasalance scores in the English used in this mainly bilingual community. St. John's was chosen because the dialects of Newfoundland are the most distinct in Canada. Halifax was chosen because the dialect spoken there represents the "standard" dialect of Atlantic Canada. Subjects would only be included in one of these dialectal groups if their speech patterns fit dialectal norms as determined by linguistic classification.

Additional objectives of the study were to determine if speaker gender, Nasometer placement, or repeated readings of a particular passage played a role in nasalance scores obtained for these dialectal groups. None of the previous studies using the Nasometer have investigated placement effects. Given that the fitting of the sound separator is done manually and is adjusted for each subject's comfort, it is possible that nasalance scores may be influenced by the distance between the microphones and the subject's airways. Results concerning the effect of gender on nasalance scores are inconsistent, with Litzaw and Dalston (1992) finding no gender differences, and Leeper et al. (1992) finding a gender effect. Seaver et al. (1991) found that subjects' nasalance scores were consistent across repeated trials, and we wanted to see if these findings could be replicated.

## Method

### Subjects

University students between the ages of 18-33 years ($\underline{M}$ = 22.6 years) were recruited for the study. All subjects reported no history of speech, language or hearing problems, and passed a hearing screening, in at least one ear, at 25dB for the octave frequencies ranging from 500-8000 Hz. Initial classification into dialectal groups was determined from biographical profiles (see Appendix A). All subjects had

lived at least the first ten years of their life in one of the three cities, had lived at least three quarters of their life in this same city, visited their home town at least once a year if they had moved, and spoke English as their primary language.

The second phase of dialectal classification required subjects to read using a conversational style of speech, a 50-word list developed specifically for this study (see Appendix B). The list consisted of words which were chosen to test phonetic/phonological distinctions or neutralizations that have been noted in previous dialectal research of the Atlantic Provinces (Paddock, 1982; Colbourne, 1982; Clarke, 1989). It was understood that since subjects were tested in Halifax, and not in their home towns, they might accommodate their speech to a more "standard" dialect pattern (Chambers, 1992), and consequently, many of the dialectal distinctions characteristic of St. John's and Moncton might not be used. Accents, or phonological characteristics of dialects, are notoriously difficult to overcome (Chambers, 1992) however, and for this reason it was decided to use solely phonological criteria to distinguish the three dialects.

The phonological criteria used for classification into dialect group were determined by first listening to the speech of one speaker from each dialect area. Using narrow phonetic transcription, a linguist and graduate student independently transcribed the word list read by these three speakers. The linguist formulated criteria for dialectal classification from this data. Consensus was obtained on the final classification of each subject. Specific phonological criteria which distinguished one speaker's word productions from another were noted. These criteria were then used to classify two additional speakers from each geographical region, where the linguist and trained graduate student were blind to the speaker's home town. The criteria and protocol established at this point were then applied to all subjects participating in the study (see Appendix C for the list of phonological criteria distinguishing each region). Any subject whose speech could not be similarly classified by both the linguist and graduate student was excluded from the data analysis. Table 1 shows the subjects who were accepted after this final dialectal categorization stage and who went on to provide nasalance data. Eighteen subjects from Moncton were accepted, 16 from Halifax, and 18 from St. John's.

**Table 1. Subjects by gender and dialect group.**

| | Male | Female | Total |
|---|---|---|---|
| Moncton | 6 | 12 | 18 |
| Halifax | 5 | 11 | 16 |
| St.John's | 5 | 13 | 18 |
| Total | 16 | 36 | 52 |

## Instrumentation

Nasalance Scores were generated using the Nasometer (Kay Elemetrics model 6200). The oral and nasal acoustic components of speech are measured by microphones which are located above and below a sound separator resting on the subject's upper lip. The signal from each microphone is filtered and digitized, and the data are processed on an IBM computer to produce a signal which is the ratio of nasal to nasal-plus-oral acoustic energy. The resulting "nasalance" score is this ratio multiplied by 100.

## Reading Passages

Three standardized passages, provided by the Kay Elemetrics Nasometer manual, were used as stimuli for this study. The *Nasal Sentences Passage* contains three times as many nasal consonants as would be expected in standard American English (31%), and is used to detect hyponasality in a subject's speech. The *Rainbow Passage* contains the same approximate percentage of nasal consonants (13.5%) found in standard American English. The *Zoo Passage* excludes nasal consonants entirely (0%), and is used to detect hypernasality in a subject's speech.

## Procedure

In the experimental session the subjects first read the same list of 50 words using a conversational style of speech which was used for dialectal group categorization (see Appendix B). The Nasometer testing was then conducted. The headgear with the attached sound separator was placed and adjusted for each subject as instructed in the manual. With the sound separator resting on the subject's upper lip, each subject read each of the stimuli (i.e., Rainbow, Zoo, and Nasal Sentences) twice. Presentation of the passages was randomized. In order to assess whether a placement effect existed, the Nasometer was removed from the subject after the first two sets of stimuli were read, and then replaced for a third and final reading. The influence of such an instrumental manipulation has not been assessed in previous studies. The multiple trials of each reading passage were collected to determine if nasalance scores remained consistent across repeated readings of a passage.

Subjects were both audio- and videotaped during the entire experimental session. Videotaping was done to ensure that placement of the sound separator was approximately the same for each subject and each reading. The audiotaped word list reading was used in the second phase of dialectal categorization.

The Nasometer's software package (version 1.7) was used to calculate the mean and standard deviation of the

**Table 2. Means and standard deviations of the nasalance scores of the three dialect groups studied.**

| | | | Nasal Sentences | | Rainbow Passage | | Zoo Passage | |
|---|---|---|---|---|---|---|---|---|
| Dialect | Sex | N | Mean | SD | Mean | SD | Mean | SD |
| Halifax | M | 5 | 66.9 | 5.5 | 38.2 | 6.6 | 13.6 | 5.9 |
| | F | 11 | 67.7 | 5.0 | 40.7 | 5.2 | 18.2 | 7.8 |
| | ALL | 16 | 67.5 | 5.0 | 39.9 | 5.6 | 16.8 | 7.4 |
| Moncton | M | 6 | 63.0 | 5.7 | 34.3 | 2.7 | 9.0 | 1.4 |
| | F | 12 | 67.0 | 6.2 | 37.1 | 5.4 | 12.2 | 4.8 |
| | ALL | 18 | 65.7 | 6.2 | 36.2 | 4.8 | 11.2 | 4.2 |
| St. John's | M | 5 | 61.3 | 7.0 | 35.2 | 8.4 | 13.4 | 7.4 |
| | F | 13 | 63.9 | 5.5 | 35.7 | 5.5 | 12.1 | 7.6 |
| | ALL | 18 | 63.2 | 5.9 | 35.5 | 6.2 | 12.5 | 7.3 |
| Combined | M | 16 | 63.7 | 6.2 | 35.8 | 5.9 | 11.9 | 5.4 |
| | F | 36 | 66.2 | 5.7 | 37.7 | 5.7 | 14.0 | 7.2 |
| | ALL | 52 | 65.4 | 5.9 | 37.1 | 5.8 | 13.4 | 6.7 |

sampled nasalance scores during the reading passages. The mean values were used to derive group mean and standard deviation values.

## Results

Table 2 presents the nasalance and standard deviation scores by gender and dialect. A multivariate analysis of variance (MANOVA) was used to investigate the contribution of dialect to nasalance scores for the three passages. The MANOVA analysis revealed no significant differences due to dialect [$F(6,96) = 1.69$, $p = .1308$] for the three regions examined in this investigation.

An analysis of variance (ANOVA) was employed to investigate the contribution of gender to nasalance scores. No significant differences were found between scores for males versus females [$F(3,44) = 0.8748$, $p = .4614$].

A repeated measures analysis of variance (ANOVA) was used to determine if significant differences occurred between the three readings for each passage. No significant differences were found between readings of the Zoo Passage [$F(2, 50) = .7994$, $p = .4553$] or Rainbow Passage [$F(2, 50) = 1.3215$, $p = .2759$]. Significant differences were found for the Nasal Sentences [$F(2, 50) = 4.1961$, $p = .0207$], however. This difference occurred between the first and third readings [$F(1, 51) = 8.48$, $p = .0053$] only.

The lack of significant differences between the readings of all passages which occurred before and after the Nasometer was refitted indicates that there is no placement effect. Because a significant difference occurred for only one set of reading trials for one passage, these differences were assumed to pose little impact upon the scores obtained, and the data were collapsed across reading passages for the other comparisons.

## Discussion

The purpose of this study was to determine if nasalance scores for three dialect groups in the Atlantic Provinces were different and to determine if speaker gender, Nasometer placement or repeated reading trials played a role in the nasalance scores obtained. Results failed to show significant differences in nasalance scores: (a) across the three dialects assessed, (b) between male and female speakers, (c) after removal and replacement of the Nasometer, and (d) across the three trials of each reading passage with the exception of the Nasal Sentences.

The lack of a significant placement effect suggests that the speech-language pathologist does not need to be overly concerned about manual placement of the plate of the Nasometer from subject to subject, provided that manual instructions are followed.

The lack of a significant change in nasalance scores across repeated trials of the three passages suggests that subjects' nasalance scores on a particular reading passage remain consistent through time. These results, paired with similar findings in Seaver, et al. (1991), suggest that nasalance scores obtained during different clinical visits are most likely comparable, provided that equipment instructions are followed.

While the present study found that gender did not have a significant effect on nasalance scores, the nasalance data obtained for males and females were similar to those obtained in previous studies. Overall, females were found to have higher nasalance scores than males, a difference which was borne out on all reading passages in all dialect groups, with the exception of the Zoo Passage for subjects from St. John's.

In terms of absolute percentages, the nasalance scores obtained in this study are very similar to those reported by Seaver et al. (1991), even though statistical differences between dialect groups were found in that study. Nasalance scores in their study ranged from 57-66 on the Nasal Sentences Passage, 32-41 on the Rainbow Passage and 11-22 on the Zoo Passage. In the present study, scores ranged from 61-68 on the Nasal Passage, 34-41 on the Rainbow and 9-18 on the Zoo Passage. The differences found by Seaver et al. may be due to either their larger sample size (N=148) or to a real difference in the degree of nasalization found in the Mid-Atlantic dialect of English.

Seaver et al. (1991) used the cut-off nasalance score of more than 32% on the Zoo Passage to indicate mild hypernasality and possible velopharyngeal impairment. It is interesting to note that the mean values obtained for the Zoo Passage in both the Seaver et al. and the present study were usually two standard deviations from the minimal criteria for hypernasality (>32%). These data then suggest that it would be unlikely for a clinician to misdiagnose the presence of hypernasality because of a dialectal difference in nasalance scores.

A unique aspect of the present investigation is that a trained linguist was used to categorize subjects into one of three dialect groups. Seaver et al. (1991) relied on "casual observation and/or subject reporting" to determine if subjects used a particular dialect, while Leeper et al. (1992) used "self report" criteria to establish their dialectal boundaries. The fact that the present study used a stringent dialectal classification procedure, and still no dialectal differences in nasalance scores were found, suggests that dialect is probably a negligible factor in the interpretation of nasalance scores within the Canadian Atlantic Provinces.

The findings of this study suggest two points of significant clinical value. First, speech clinicians need not be concerned about confusing dialect and nasalance scores when assessing velopharyngeal incompetency in English speakers within Atlantic Canada. Additional data are needed to determine nasalance norms for English dialects in other regions of Canada in order to confirm the data gathered in the present investigation. Secondly, Nasometer placement appears to have minimal impact on nasalance scores obtained, provided the clinician follows placement procedures outlined in the Nasometer user manual.

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## *References*

Chambers, J. K. (1975). *Canadian English: Origins and structures.* Toronto: Methuen.

Chambers, J.K. (1992). Dialect acquisition. *Language, 68,* 673-705.

Colbourne, W. (1982). *A sociolinguistic study of Long Island, N.D.B.* Unpublished manuscript. Memorial University of Newfoundland: Linguistics Department.

Clarke, S. (1989). *A book of notes to accompany lectures in linguistics 2210.* Unpublished manuscript. Memorial University of Newfoundland: Linguistics Department.

Dalston, R. M., Warren, D., & Dalston, E. (1991a). The use of nasometry as a diagnostic tool for identifying patients with velopharyngeal impairments. *Cleft Palate Journal, 28,* 184-188.

Dalston, R. M., Warren, D., & Dalston, E. (1991b). The identification of nasal obstruction through clinical judgments of hyponasality and nasometric assessment of speech acoustics. *American Journal of Orthodontics and Dentofacial Orthopedics, 100,* 59-65.

Kay Elementrics (1989). Nasometer Instruction Manual. Pine Brooke, N.J.

Kuehn, D.P., and Dalston, R.M. (1989). Cleft palate and studies related to velopharyngeal function. In H. Winitz (Ed.), *Human communication and its disorders* (pp. 1-106).

Labov, W. (1973). *Sociolinguistic patterns.* Philadelphia: University of Pennsylvania Press.

Leeper, H.A., Rochet, A.P., & MacKay, I.R.A. (1992). Characteristics of nasalance in Canadian speakers of English and French. *Proceedings of the 1992 International Conference on Spoken Language Processing,* Banff, Alberta.

Litzaw, L.L., & Dalston, R. M. (1992). The effect of gender upon nasalance scores among normal adult speakers. *Journal of Communication Disorders, 25,* 55-64. Norwood, N.J.: Ablex.

Paddock, H. (1982). *Languages in Newfoundland and Labrador* (2nd version). Memorial University of Newfoundland: Linguistics Department.

Paddock, H. (1985). *Book of lectures for linguistics 2210 by correspondence.* Unpublished manuscript. Memorial University of Newfoundland: Linguistics Department.

Seaver, E.J., Dalston, R.M., Leeper, H.A., & Adams, L.E. (1991). A study of nasometric values for normal nasal resonance. *Journal of Speech and Hearing Research, 34,* 715-721.

Taylor, O. *Treatment of communication disorders in culturally and linguistically diverse populations.* San Diego: College-Hill Press.

## Appendix A

### BIOGRAPHICAL DATA

Name:_____ Age:_____ Education: _____

1. Place of birth? (Town/Province)
2. Name of town/prov. in which you grew up?
3. Length of time lived in your home town?_____
4. How long have you lived in Halifax? _____
5. How often do you return to your home town?
   a) Once a year
   b) Twice a year
   c) More than twice a year. If so how often?
6. Length of periodic visits in total to your home town for a given year? (Circle your answer)
   a) Less than a month.
   b) One month
   c) One-Two months
   d) If longer, give approximate length of time
7. Number of times you have moved more than 50km (Approx. 25 miles).
8. List the locations you have lived in longer than 6 months to 1 year.

1. _____
2. _____
3. _____
4. _____
5. _____

9. Is English your first language? YES or NO
10. Do you speak any other languages? YES or NO

    Name them:

    1. _____
    2. _____
    3. _____

11. Did both your parents speak English 100% of the time in the home? YES or NO

    If "no", identify languages spoken and approximate percentage spoken

## Appendix B

### WORD LIST

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | yesterday | 14. | south | 27. | can't | 40. | bye |
| 2. | aunt | 15. | married | 28. | calm | 41. | redden |
| 3. | poor | 16. | Saturday | 29. | Dartmouth | 42. | here |
| 4. | car | 17. | heart | 30. | port | 43. | will |
| 5. | pit | 18. | bait | 31. | pants | 44. | wives |
| 6. | tie | 19. | pin | 32. | little | 45. | pet |
| 7 | water | 20. | air | 33. | houses | 46. | clear |
| 8. | shout | 21. | part | 34. | height | 47. | hair |
| 9. | hide | 22. | film | 35. | sort | 48. | tomato |
| 10. | fill | 23. | tea | 36. | afternoon | 49. | yellow |
| 11. | half | 24. | quiet | 37. | wash | 50. | fell |
| 12. | if | 25. | toy | 38. | law | | |
| 13. | kiln | 26. | egg | 39. | about | | |

## Appendix C

### DIALECT CHARACTERISTICS

**St. John's, Newfoundland**

1. Neutralization of ɪ/ɛ distinction:
   eg., *pin*——> [pɛn] *pen*——> [pɛn]
   *pit*——> [pɛt] *pet*——> [pɛt]

2. [ɪ] sometimes made higher ([i]):
   e.g., *pin* ——> [pin]

3. Words ending in CN cluster get extra syllable:
   e.g., *film* —> [filəm]

4. Intervocalic /t/ and /d/ often not a flap
   e.g., *water* ——> [ wɑtər]

5. Presence of low central vowel ([a]):
   e.g., *car*——> [kar]
   *part*——> [part]
   *Dartmouth* —> [dar?məΘ]

6. Many vowels drawn out:
   a) Monophthongs become diphthongs:
      e.g., *glass* ——> [ glæəs] or [gləæs]
   b) Diphthongs become triphthongs:
      e.g., *houses* ——> [haəwzəz]
      *south* ——> [sΛəwΘ] or [səΛwΘ]

7. "Softening" of word final consonants by preaspiration.
   e. g., *pit* —>[pɪʰt]

**Moncton, New Brunswick**

1. Minimal use of [a]

2. Strong regressive nasalization:
   e.g., *pants* ——> [pɛ̃nts]
   *can't* ——> [kɛ̃nt]

3. Nasalized vowels are raised: ( /æ/ —> [ɛ̃] /___ n)
   e.g., *can't* —> [kɛ̃nt]
   *pants* —> [pɛ̃nts]

4. /ɑ/ realized as [a]:
   e.g., *wash* —> [waš]
   *law* —> [la]

5. [Λw] sometimes used before voiced obstruents:
   e.g., *houses* —> [hΛwzəz]

6. Word final consonants omitted or unreleased.
   e.g., *pit* —> [pɪt ], [pɪ?]

**Halifax, Nova Scotia**

1. Use of low central vowel [a]:
   e.g., *car* —> [kar]
   *part* —> [part]
   *Dartmouth* —> [dar?məΘ]

2. Some regressive nasalization.
   e.g. *pants* —> [pæ̃nts]