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Dialect Standardization in Merida, Yucatan: The Case of (b d g)

ABSTRACT: The Spanish of the Yucatan peninsula in Mexico is known in the literature as a distinctive regional dialect. Yucatan Spanish displays lexical, morpho-syntactic and phonological variation that differentiates it from other varieties of Mexican Spanish. Among the phonological variants in the dialect is the use of occlusive [b d g] in contexts where standard varieties would employ approximate [β ð γ]. The present study investigates the use of voiced stops via multivariate statistical analysis of sociolinguistic interviews. Results indicate that younger speakers are rapidly standardizing their pronunciation of (b d g), adopting pan-Hispanic [+continuant] norms for these variables. This standardization coincides with increased contact with more prestigious varieties of Spanish, through increased access to education and via both face-to-face interaction and the media. Standardization also reflects a decrease in the use of the Maya language in Yucatan, as more speakers enter the mainstream of monolingual Spanish culture.

KEYWORDS: Yucatan, variation, sociolinguistics, dialectology, standard, voiced stops.

RESUMEN: El español de la península yucateca, en México, se conoce en la literatura como un dialecto regional distintivo. El español yucateco presenta variación léxica, morfo-sintáctica y fonológica que lo distingue de otras variedades del español mexicano. Entre las variantes fonológicas es el uso de las oclusivas [b d g] en contextos en que las variedades estándares emplearían las aproximantes [β ð γ]. Este estudio investiga el uso de las oclusivas sonoras por medio del análisis estadístico multivariante de entrevistas sociolingüísticas. Los resultados indican que los hablantes jóvenes están estandarizando rápidamente su pronunciación de (b d g), adoptando las normas panhispánicas [+ continua] para estas variables. Este proceso de estandarización coincide con un mayor contacto con variedades más prestigiosas del español, por medio de mayor acceso a la educación y por interacción personal y los medios de comunicación. También refleja una disminución en el uso de la lengua maya en Yucatán, ya que más hablantes van asimilándose a la cultura monolingüe en español.

PALABRAS CLAVE: Yucatán, variación, sociolingüística, dialectología, estándar, oclusivas sonoras.

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1. Introduction

Yucatan Spanish (YS) has been identified in the literature as an indigenous contact variety that is rapidly undergoing standardization, as speakers reject regional linguistic forms in favor of pan-Hispanic norms (Klee 2009, Michnowicz 2009). One of the regional phonological features that characterize YS is the appearance of voiced stops [b d g] in contexts where other varieties would favor a fricative or an approximate [β ð ɣ] (García Fajardo 1984; Lope Blanch 1987; Michnowicz 2008, 2009; Yager 1982). Examples comparing standard Spanish and YS are seen in Table 1:

TABLE 1
(b d g) in YS and Standard Spanish

YS	Standard Spanish	Orthography
[a.'bi.a]	[a.'βi.a]	'había'
[mo.'ber.me]	[mo.'βer.me]	'moverme'
['pwe.do]	['pwe.ðo]	'puedo'
['to.do]	['to.ðo]	'todo'
['di.go]	['di.ɣo]	'digo'
['sal.go]	['sal.ɣo]	'salgo'
['soj.ba.ren̪.'de.ro]	['soj.βa.renn̪.'de.ro]	'soy barrendero'

At the same time, previous studies indicate that stop [b d g] is not categorical in YS, and varies according to phonetic context and the characteristics of the speaker (Lope Blanch 1987, Michnowicz 2009, Yager 1982). The present study expands on previous work (e.g. Michnowicz 2009) in seeking to determine what are the internal (linguistic) and external (social) factors that condition the use of voiced stops in YS, while addressing the question of standardization, that is an increasing use of [+continuant] [β ð ɣ] among some speakers. The rest of the article is outlined as follows: Section 2 presents an overview of (b d g) across Spanish dialects, before reviewing the literature on YS. Section 3 presents the methodology for the present study, detailing the sociolinguistic interviews that make up the corpus and the methods for multivariate statistical analysis (Varbrul). Section 4 presents the results of the distributional and statistical analysis of linguistic and social factors carried out with GoldVarb X (Sankoff/Tagliamonte/Smith 2005). Section 5 discusses the results, and contextualizes them within the sociolinguistic context of Merida, Yucatan. Section 6 presents final conclusions.

2. An overview of voiced stops in Spanish dialects

2.1. *Voiced stops in Spanish*

Numerous studies have examined the voiced stops (b d g) in a variety of Spanish dialects (Amastae 1986, 1989, 1995; Anton 1998; Bakovic 1994; Barlow 2003; Branstine 1991; Danesi 1982; González 2006, 2002; Hammond 1975; Harris 1984; Pérez 2007; Lewis 2002; Lozano 1979; Mascaró 1991; Michnowicz 2009; Piñeros 2002; Roldán/Soto-Barba 1997; Williams 1977, among others). Standard varieties of Spanish, as defined by the variety taught in schools and used in the media, display a phonetically conditioned alternation for the voiced stops /b d g/. In these varieties, stop [b d g] surface in utterance initial position (i.e. the beginning of a breath group, Bakovic 1994) and following nasal consonants. Stop [d] also surfaces after a liquid. Elsewhere, a continuant variant surfaces (Hualde 2005). These [+continuant] variants, represented as [β ð ɣ], have been traditionally referred to in the literature as fricatives, although in most dialects they are actually approximates, and could be transcribed in a way that indicated greater aperture than the standard fricative symbols, e.g. [β̞ ð̞ ɣ̞] (Hualde 2005: 43). For the sake of simplicity, in the present study the symbols will appear without their accompanying diacritics, and [β ð ɣ] should at all times be understood to refer to approximate articulations. The term 'approximates' will also be used, regardless of the terminology (i.e. *fricatives*) employed in the original studies in the literature.

A theoretical debate has arisen regarding the underlying nature of voiced stops in Spanish. Traditional accounts, for example Harris (1969), suppose an underlying obstruent, which is then spirantized in surface form. This is certainly true historically, where /b d g/ arose from a chain reaction in Late Spoken Latin/Early Romance that resulted in the voicing of Latin voiceless stops, e.g. Latin /lu.pu/ > Spanish /lo.bo/ 'lobo' (Penny 2002). Concomitant with the voicing of Latin /p t k/, existent Latin /b d g/ were spirantized, and often lost all together, e.g. Latin /re.ga.le/ > Spanish /re.al/ 'real' (Penny 2002: 76). Later, through processes of lenition, Old Spanish /b d g/ (< Latin /p t k/) weakened to approximates in certain phonetic contexts, likely beginning in consonant clusters and later expanding to post-vocalic position (Penny 2002: 96-97). Penny (2002: 96-97) notes that this change was complete, at least for /b/, by the sixteenth century. Thus at the time of the Spanish conquest and colonization of America, speakers would have perhaps brought with them a changing system, in which stops were increasingly being spirantized in a variety of contexts, such as intervocalically. Some have used this fact to argue that varieties of Latin American Spanish that allow stops in a wider variety of contexts than the standard (such as following any consonant) therefore represent an earlier, conservative stage of development (Amastae 1995: 274).

Another possibility, raised by Barlow (2003), among others (e.g. Bakovic 1994, Danesi 1982, Lozano 1979) is that the underlying form is either underspecified or specified as [+continuant], whereby the surface stops [b d g] obtain through a process of fortition of the underlying approximants. Barlow appeals to questions of model simplicity, child language acquisition and other fortition processes in Spanish (e.g. initial glide fortition in Mexican Spanish, see also Lozano 1979) to argue that for dialects with standard patterns of stop-continuant alternation, the continuant form is basic. With regard to dialects that may evidence a higher rate of stops, such as Bogotano Spanish (Amastae

1995), or as we shall see, Yucatan Spanish, Barlow (2003) concedes that the underlying form may be occlusive, given that children will internalize the pattern that they are exposed to. While the theoretical debate regarding underlying form lies outside the scope of the present investigation, data from Yucatan Spanish can provide evidence of divergent underlying systems across Spanish dialects, as well as possible evidence of systematic change following a shift in surface frequencies, as will be seen in section 5.

2.2. *Voiced stops in Yucatan Spanish*

In spite of some scholars that have reported increased rates of weakening or elision of /b d g/ in YS (Suárez 1945), most studies concur that voiced stops surface more often as occlusives in Yucatan than in many other dialects of Spanish. Still, the picture that emerges from the literature is not consistent, and ranges from extreme reports of categorical occlusives to more nuanced variation. Among those that stress the differences in YS vis-à-vis other varieties is Alvar (1969: 165), who states "[...] en general, puede decirse que los dos alófonos castellanos de cada uno de los fonemas /b/, /d/, /g/ se realizan simplemente como b, d, g oclusivas; las correspondientes articulaciones fricativas son virtualmente desconocidas [...]".

Alvar (1969) notes that most of his informants produced only stop variants of (b d), while (g) showed more variation, while still surfacing most often as [g]. García Fajardo (1984) in her study of YS in Valladolid also reports that stops are more frequent than fricatives (p. 38), with some speakers producing categorical stops for (b d). Her results indicate that middle aged and lower class speakers generally produce more stops than younger or higher class speakers. Stop [b d] were more common among women, while men showed a slightly higher frequency of stop [g] (pp. 38-41). In spite of the overall preference for stops, García Fajardo (1984) also reports occasional relaxed articulations. Yager (1982), on the other hand, reports that while stop variants are widespread in his data, speakers show a slight preference for [+continuant] realizations, and speakers also produced weakened variants, as in /pes.ka.do/ > [pes.kao] "*pescado*" (p. 58). Likewise, Lope Blanch (1987) reports that occlusive variants are not as frequent as some previous studies would suggest, with overall frequencies of 50% [b], 40% [d] and 30% [g], although he states that those frequencies mask a large amount of individual variation among speakers (p. 79). Reviewing the literature thus leads to two conclusions. First, individual variation seems to be an important factor in the frequency of stop variations. Second, chronologically the studies outlined above can suggest a change in progress that leads to a higher instance of standard approximate variables and a reduction in the regional stop variant. This possibility will be addressed further in section 5.0.

Scholars are also divided regarding the possible role of Maya language influence on stop [b d g] in YS. Mediz Bolio (1951: 19) argues for direct contact-induced influence, stating "[...] los yucatecos hablamos el español con fonética maya, directamente impuesta [...]". Most subsequent research proposes a confluence of factors that allow for a dual effect of processes internal to Spanish and possible conditioning influence of Maya (Cassano 1977, Yager 1982). Michnowicz (2009), based on a comparison of YS and other contact varieties, argues that stop [b d g] in YS are the product of incomplete acquisition (in the sense of Thomason/Kaufman 1988) and fossilized L2 features, and not the result

FIGURE 1
Stop [d] produced by female speaker, age 69, monolingual Spanish-speaker, middle class

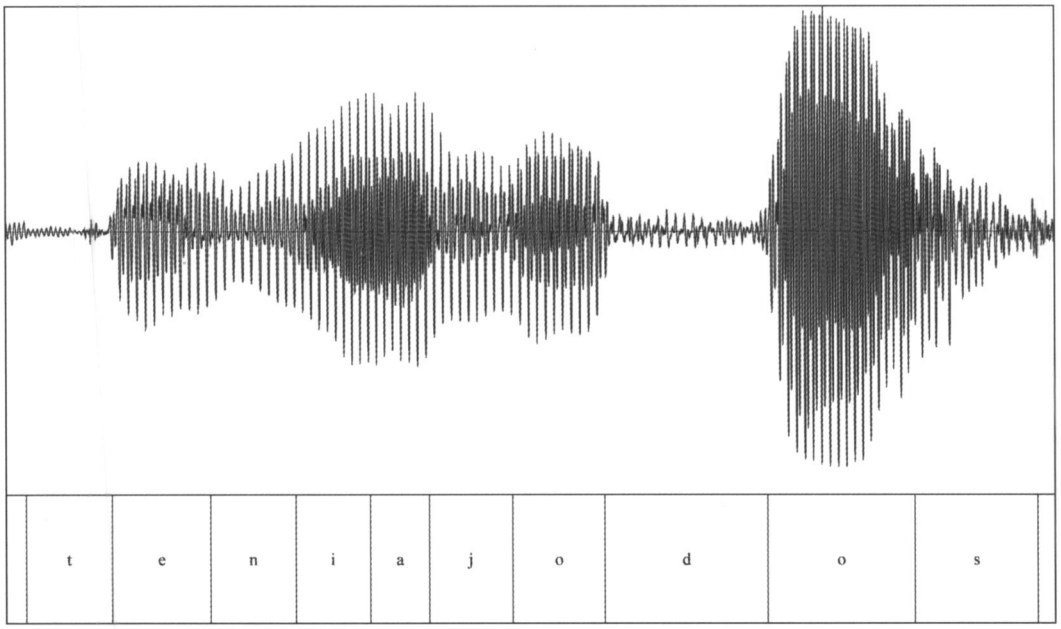
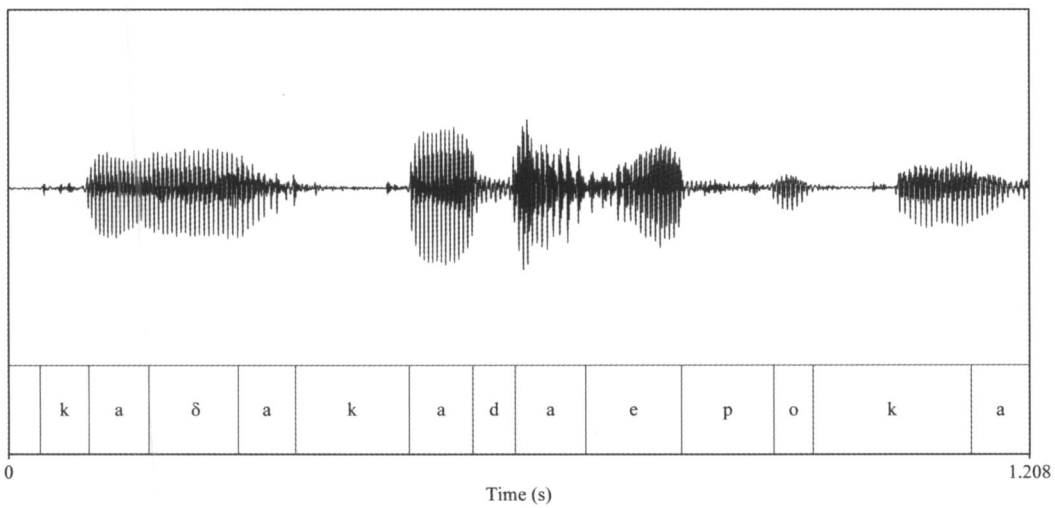


FIGURE 2
Alternating approximate [δ] and stop [d] produced by female speaker, age 69, monolingual Spanish-speaker, middle class



of direct influence from Maya. The rest of this study will follow Michnowicz's (2009) conclusions regarding contact influence, and readers are referred to that article for a more in-depth analysis of the role of Mayan-Spanish bilingualism.

Acoustically, stops and approximants can be distinguished by the presence or absence of airflow as seen on a waveform. Stop consonants will display a period of silence caused by the occlusion at the point of articulation (labial, dental, velar), while voiced approximants will blend in with the surrounding vowels (Kent/Read 1992: 38). Figures 1 and 2 display sample waveforms extracted from the sociolinguistic recordings for the present study. Figure 1 shows a stop variant [d] in the phrase *tenía yo dos*, spoken by a 69 year old, Spanish monolingual, middle class female. The occlusion of (d) in *dos* is clearly distinguishable from the surrounding vowels.

Figure 2 shows the waveform for the phrase *cada, cada época,* produced by the same speaker as in Figure 1. Here, two tokens of (d) can be observed, the first approximate [ð] and the second stop [d]. As can be seen, stop and approximate articulations vary widely within the same speaker, phrase, and across identical words (*cada*).

3. Methodology

Data for the present study consist of a corpus of 40 sociolinguistic interviews conducted by the author with native speakers in and around Merida, Yucatan. Participants were contacted through the "friend of a friend" method (Milroy/Gordon 2003), and were interviewed using Labovian interview techniques. An attempt was made by the researcher to reduce to the extent possible the *observer's paradox* (Labov 1984), and thereby obtain as natural a speech sample as possible. The fact that the researcher had lived in Merida previously, was connected with a well-known American university program in the city, and personally knew many of the participants or their family members aided in achieving this goal. Likewise, participants were encouraged to guide the conversation, and frequent topics included family, local traditions, childhood, and how the city of Merida had changed in the recent past. Participants were recorded for one-half hour or more. Participants were categorized by gender, age and parents' language(s), with the following distribution: 19 men, 21 women; 11 younger speakers, 13 middle aged speakers, and 16 older speakers; and 16 with monolingual Spanish-speaking parents, 5 with monolingual Maya-speaking parents, and 19 with parents who are/were Spanish/Maya bilinguals.

In the present study, parents' language(s) was found to stand in for a variety of social constructs, such as social class and bilingualism (Spanish/Maya). Models that included social class or participant language showed strong interaction between the two factors; fluent Maya-speakers were almost always of lower social class[1], while monolingual Spanish-speakers were always of higher social class. The model with parents' language(s) successfully captured the social differences between participants, while at the same time avoiding any interaction that may have been problematic for the analysis. For these speakers of YS, participants whose parents are/were monolingual Spanish-speakers are all of higher social

[1] The one exception is a fluent Maya speaker with a college education who works as a Maya language teacher. The use of 'parents' language(s)' as a factor group circumvents the difficulty of placing speakers such as this one into a social class vs. language background ranking.

class and are also, necessarily, monolingual Spanish-speakers.[2] Conversely, participants whose parents are/were (essentially) monolingual Maya-speakers are of lower social class and bilingual speakers of Maya and Spanish. Note also that there are only five speakers in this category, reflecting the difficulty in finding monolingual Maya-speakers near Merida, even among older generations. Among speakers whose parents are/were bilingual speakers, there is more of a mix. While some of these speakers belong to the lower social class and also speak some Maya, many of them belong to a higher social class and are monolingual Spanish-speakers. This group, therefore, represents a transitional generation in Yucatan, as more and more people of indigenous background enter the socioeconomic mainstream, obtain more education and speak only or primarily Spanish.

A total of 20,157 tokens were extracted from the corpus and coded categorically as either [-continuant] (stops) or [+continuant] (approximants). Although the alternation of (b d g) in Spanish is a gradient phenomenon (Quilis 1981), sociolinguistically a wide range of [+continuant] variants are considered 'standard', and the important distinction in YS is 'stop' versus 'non-stop'. The nature of each token was determined impressionistically by the author. In the rare case that the occlusiveness of a token could not be determined auditorily, a spectrogram and waveform were consulted, as seen in Figures 1 and 2. In practice, this was rarely necessary, as stop (b d g) are fairly salient in Spanish in contexts where not expected, and a full acoustic analysis of voiced stops in YS is reserved for future study. Tokens were then coded for linguistic (preceding segment, following segment, position in word) and social (speaker gender, age and parents' languages) factors. Data were analyzed via distributional and multivariate step-up/step-down statistical analysis using GoldVarb X (Sankoff/Tagliamonte/Smith 2005). Details of the analyses are presented in the next section.

4. Results

4.1. *Distributional analysis*

The original corpus consisted of 8571 tokens of (b), 9599 of (d) and 1987 of (g), for a total of 20,157 voiced stop tokens. For analysis, however, contexts in which stop [b d g] and approximate [β ð ɣ] neutralize were removed – following nasals, a pause or (d) following liquid /l/ voiced stops surface almost categorically as [b d g] (Hualde 2005). This left a total of 16,057 tokens for analysis (7460 (b), 7018 (d) and 1579 (g)). Since neutralizing contexts were removed, all of the tokens of (b d g) analyzed here would surface as approximates in 'standard' varieties of Spanish.

Table 2 gives the overall frequencies for each variable. (b) is the most frequently occlusive variable, with 42% [b] realization. Following is (d) at 32% [d] and finally (g), with 28% [g].

The overall distribution of voiced stops in Mérida shows that (b) is weakened at a lesser rate than (d g). This result coincides with the distribution reported by Amastae (1995: 269) for Colombian Spanish, as well as patterns found in other Romance varieties (see Marotta

[2] Some of these speakers had studied other languages in school, primarily English or French. Important for the present study, however, is that none of them speak Maya.

TABLE 2
Overall frequency

Variable	Stop	Approximate	Total
(b)	42% n = 3152	58% n = 4308	100% n = 7460
(d)	32% n = 2275	68% n = 4743	100% n = 7018
(g)	28% n = 445	72% n = 1134	100% n = 1579

2008: 246 for Tuscan Italian). Research has indicated that the duration of a stop plays a role in spirantization, with longer duration favoring increased occlusiveness (Soler/Romero 1999). The greater resistance of (b) to spirantization may be related to the longer duration of the bilabial stop, at least compared to coronals (see Jun 1995). Each variable evidences a small drop in overall frequency from that reported by Lope Blanch (1987: 70), who found 50% [b], 40% [d] and 30% [g]. The present results indicate a substantial drop from the claim made by Alvar (1969: 165) that stop variants are virtually categorical in YS.

TABLE 3
Stop frequency by preceding segment

Preceding segment	[b]	[d]	[g]
Atonic vowel	45% n = 1770/3947	38% n = 1292/3413	26% n = 215/817
Tonic vowel	35% n = 909/2586	21% n = 512/2409	26% n = 114/439
Liquid*	47% n = 161/341	47% n = 166/356	34% n = 84/249
Semivowel	68% n = 23/44	33% n = 2/6	58% n = 7/12
/s/	52% n = 268/512	37% n = 293/788	40% n = 25/62
Stop consonant	51% n = 19/37	22% n = 10/46	—
Other consonant	68% n = 2/3	—	—

*The liquid category only includes /r ɾ/ for (d)

Table 3 shows the stop frequency for each variable by preceding segment. Michnowicz (2009) includes a preliminary version of this preceding/following segment analysis, expanded here to include the role of prosodic accent on vowels and specific consonant features. While an overall pattern can be discerned, for example each stop is generally more likely to surface following consonants than vowels, frequencies demonstrate that the three stop consonants often behave in subtly different ways. For preceding vowels, [b] and [d] occur more following atonic vowels (e.g. *lavar, ciudad*) than tonic vowels (*lavo, todo*), whereas [g] shows no difference. The observed pattern for (b) and (d) is likely related to the effect of following vowel stress, since Spanish does not allow two

consecutive tonic syllables within the same word, as discussed below. Note also that the low frequency of [d] following tonic vowels includes past participles in *-ado, -ido*, a context that favors weakening or deletion of (d) in most varieties of Spanish (Hualde 2005, Lipski 2004). Finally, a preceding semivowel, although not common, strongly favors stop [b] and [g], and moderately conditions [d]. This coincides with previous findings in other dialects that a preceding consonant or semivowel conditions a stop realization of (b d g) (Amastae 1989, Lipski 2004).

TABLE 4
Stop frequency by following segment

Following segment	[b]	[d]	[g]
Atonic vowel	35% n = 861/2490	27% n = 1322/4885	28% n = 182/652
Tonic vowel	47% n = 1236/2603	45% n = 761/1678	26% n = 143/556
Semivowel	50% n = 399/795	48% n = 181/376	31% n = 47/150
Consonant	42% n = 656/1572	14% n = 11/79	33% n = 73/221

The frequencies for each variable by following segment are found in Table 4. Both [b] and [d] occur more frequently with following tonic vowels (e.g. ***vida, día***) and semivowels (e.g. ***viuda***, ***diario***) indicating that for these variables stops occur more often in accented syllables, since Spanish generally does not permit a syllable final consonant followed by a syllable initial vowel (Hualde 2005). Thus nearly all tokens of (b d g) will be in the same syllable as a following (tonic) vowel. In YS a tonic syllable favors a stop realization for (b d), a result that concurs with Amastae's (1986: 7-8) finding for Bogotano, Northern Mexican and Mexican-American varieties. On the other hand (g) presents very similar frequencies of [g] regardless of accent position. Finally, [b] and [g] are more favored in consonant clusters (i.e. with following consonant – e.g. ***broma, grande***), as opposed to (d) that overwhelmingly surfaces as [ð] in that context. Consonant clusters in tonic syllables have been shown to favor occlusion in other dialects as well (Amastae 1986).

TABLE 5
Stop frequency by position in the word

Position in word	[b]	[d]	[g]
Initial	46% n = 1384/2984	38% n = 1269/3359	29% n = 108/363
Medial	39% n = 1768/4476	27% n = 1006/3659	28% n = 337/1216
Final*	—	25% n = 78/316	—

*(b) and (g) do not generally appear in word-final position in native Spanish words

As seen in Table 5, all three variables present more stops in word initial position, although for (g) the difference is minimal. This result coincides with studies that have found that word initial position is more resistant to weakening processes than other positions (Amastae 1986: 7-8). Likewise, the lowest frequency of [d] is found word-finally, a position that favors weakening or deletion across Spanish dialects (Canfield 1981: 11), as well as cross-linguistically (Kirchner 1998: 8).

TABLE 6
Stop frequency by speaker gender

Gender	[b]	[d]	[g]
Men	41% n = 1505/3649	28% n = 951/3337	25% n = 185/556
Women	43% n = 1647/3811	36% n = 1324/3681	31% n = 260/838

Table 6 presents the first extra-linguistic factor analyzed here, speaker gender. Frequencies indicate that women produce more stop variants for all three variables. The difference is greatest for (d), followed by (g) and (b). These results partially coincide with those of García Fajardo (1984: 38-41), who found that women produce more [b d]. Possible explanations for this pattern are addressed in section 5.

TABLE 7
Stop frequency by speaker age

Age	[b]	[d]	[g]
Young (18-29)	32% n = 598/1884	23% n = 451/1994	11% n = 44/414
Middle (30-49)	44% n = 1056/2380	38% n = 847/2222	34% n = 169/502
Older (50-89)	47% n = 1498/3196	35% n = 977/2802	35% n = 232/663

Age as a factor in YS (bdg) was addressed in Michnowicz (2009) as a function of lifetime exposure to Maya and Maya-influenced Spanish. Here, age will be further correlated with exposure to standard varieties of Spanish, via education and the media, among other factors (see section 5). For speaker age groups, each variable shows the same pattern of a sharp drop in stop frequency from middle-age to young speakers. For speakers over age 30, there is a small decrease in [b] and [g] from the oldest group, and slight increase in [d]. It is among the youngest speakers that the 'standard' approximates [β δ γ] are most frequent, although it should be noted that these speakers still produced 1/4 to 1/3 of their tokens as non-standard stops for (b) and (d). Still, the trend that emerges is one of increased use of standard variants among speakers under age 30, especially for members of higher social classes (see frequencies for younger speakers from monolingual Spanish-speaking families in Figure 3).

TABLE 8
Stop frequency by speakers' parents' language(s)

Parents' language(s)	[b]	[d]	[g]
Spanish only	40% n = 1202/3027	27% n = 748/2816	24% n = 150/622
Bilingual (Spanish/Maya)	42% n = 1475/3514	35% n = 1171/3364	27% n = 203/742
Maya only	52% n = 475/919	42% n = 356/838	43% n = 92/215

As outlined in section 3, the language(s) spoken by a speaker's parents successfully captures a range of social characteristics of the speakers themselves. For all variables, speakers whose parents were monolingual Spanish-speakers (who are also all of higher socio-economic class and monolingual speakers of Spanish) use 'standard' approximants more than the other groups. Speakers whose parents spoke only Maya (who are also of lower socio-economic class and are bilingual speakers of Maya themselves) produced the highest frequencies of stop [b d g]. Finally, the speakers with bilingual (Spanish/Maya) parents present a more complicated picture. Socially speaking, these speakers may belong to either the higher or lower social classes, and may or may not speak fluent Maya themselves. Here, children of bilingual parents show intermediate values for stops, although they pattern more with children of Spanish monolinguals for (b) and (g), with (d) frequencies in between the two monolingual groups. Readers are referred to Michnowicz (2009) for further discussion of Maya language contact in YS.

4.2. *Multivariate analysis*

In order to ascertain which of the linguistic and social variables outlined in section 4.1 contribute significantly to the observed variation of (b d g) in YS, data were analyzed via multivariate statistical analyses (step-up/step-down multiple regression) with GoldVarb X (Sankoff/Tagliamonte/Smith 2005). GoldVarb (i.e. *varbrul*) analyses provide three important types of evidence for interpreting the effect of different factors on the observed variation (Tagliamonte 2006). These include: which factors are significant at the .05 level (significance), what is the relative strength of each factor group (range), and the order of the factors within each factor group, demonstrating which factors in each group favor or disfavor the variant being studied (constraint hierarchy) (Tagliamonte 2006). The results of the step-up/step-down analyses for (b d g) are found in Table 9.

First, we will examine the three lines of evidence presented by each of the three analyses, using Table 9 (b) as an example. The following factor groups were found to make a significant contribution to the production of stop [b]: preceding segment[3], fol-

[3] Note that for (b), a preceding stop consonant or /s/ favors the occlusive [b] with similar frequencies and weights; a separate analysis was run combining these two factors into a group "obstruent", which favored [b] with a factor weight of .60; the rest of the factor weights remained virtually identical. The main analysis with stops and /s/ separate was maintained here, however, for purposes of consistency among

TABLE 9
Multivariate analyses of the internal and external factors selected as significant to the probability of stop variants. Factor groups not selected as significant indicated with square brackets

Factor Group	Factor weights		
	[b]	[d]	[g]
Preceding segment			
Semivowel	.74	.49	.69
Stop consonant	.69	.38	Knockout
/s/	.59	.54	.60
Liquid*	.56	.63	.58
Atonic vowel	.52	.53	.49
Tonic vowel	.44	.42	.45
Range	*30*	*25*	*24*
Following segment			
Semivowel	.57	.69	[.57]
Tonic vowel	.53	.59	[.47]
Consonant	.53	.32	[.55]
Atonic vowel	.42	.45	[.49]
Range	*15*	*37*	—
Position in word			
Initial	[.51]	.54	[.50]
Medial	[.49]	.44	[.50]
Range	—	*7*	—
Gender			
Women	[.51]	.56	.54
Men	[.49]	.44	.45
Range	—	*12*	*9*
Age			
50+	.55	.54	.60
30-49	.52	.56	.59
18-29	.38	.38	.25
Range	*17*	*18*	*35*
Parents' language(s)			
Maya only	.59	.60	.65
Bilingual (Spanish/Maya)	.49	.53	.49
Spanish only	.48	.43	.46
Range	*11*	*17*	*19*

*The factor 'liquid' only includes /r/ for the analysis of [d].
[b]: total N = 7460; corrected mean = 0.42; log likelihood = –4910.67; $p = 0.000$
[d]: total N = 7018; corrected mean = 0.31; log likelihood = –4102.005; $p = 0.000$
[g]: total N = 1579; corrected mean = 0.26; log likelihood = –867.815; $p = 0.012$

lowing segment, speaker age and parents' language(s). The other factor groups, indicated by an asterisk and square brackets around the factor weights, were not found to be significant to the production of [b]. The range is a measure of the strength of the factor group relative to the other groups, and is computed by subtracting the lowest factor weight from the highest within a factor group (e.g. for preceding segment, 74 - 44 = range of 30) (Tagliamonte 2006). So, for [b], the factor group with the strongest effect on [b] production is preceding segment (range = 30), followed by speaker age (range = 17), following segment (range = 15) and parents' language(s) (range = 11). Range is not computed for non-significant factors. Comparing the factor group ranges for [b] indicates that preceding segment has almost twice as strong of an effect as the next most important factor group, speaker age, and three times the effect as parents' language(s). Finally, the constraint hierarchy within each group indicates which factors favor [b], disfavor [b] or are neutral to the production of [b]. A general rule of thumb is that factor weights greater than .5 favor the application value, [b], while factor weights less than .5 disfavor [b], although as Tagliamonte (2006) notes, it is really the weighting of each factor relative to the others that should be observed. Following the rule of thumb above, we see that within the preceding segment factor group, a preceding semi-vowel strongly favors [b] (.74), followed by a stop consonant (.69), /s/ (.59) and a liquid (.56). A preceding atonic vowel is fairly neutral regarding the production of either [b] or [β] (.52), while a tonic vowel disfavors [b] (.44) – and therefore favors the other variant, [β].

While each of the variables (b d g) present a slightly different set of significant factors, constraint hierarchies and factor weights, some commonalities emerge from the data. Factor groups chosen as significant for all three variables include: preceding segment, speaker age, and parents' language. Stop variants of (b d g) are favored generally by preceding consonants and semi-vowels ([d] being the exception, where semi-vowels are more neutral or slightly disfavoring). Regarding age, factor weights demonstrate that for all variables, speakers over age 30 favor [b d g] more than speakers under age 30, who favor [β δ γ] more. Likewise the language(s) spoken by participants' parents show the same pattern across variables, with the children of monolingual Maya-speakers favoring [b], the children of Spanish/Maya bilinguals being neutral or slightly disfavoring [b], and the children of monolingual Spanish-speakers disfavoring [b] – thereby favoring 'standard' [β].

Other factor groups were selected as significant for two of the three variables, such as following segment for (b d) and speaker gender for (d g). For the third variable, these factor groups show a non-significant trend in the same direction. For (b d), stop variants were favored by following tonic vowels and semi-vowels. For (d g), women produced significantly more stops than did men.

4.3. *Summary of results*

The results presented above indicate that stop [b d g] in Yucatan Spanish is conditioned by a range of linguistic and social factors, including: the preceding segment, with

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the variables, given that stops and /s/ do not have the same effects on (d) and (g).Thank you to Manuel Díaz-Campos for helping to clarify this issue.

preceding consonants and glides favoring [b d g]; speaker age, with older speakers using more regional [b d g] and younger speakers favoring 'standard' [β δ γ]; speaker gender, with men generally favoring approximate variants and women producing more occlusives; and the language(s) spoken by the speakers' parents, with the children of Maya-only speakers favoring [b d g], the children of bilingual speakers being relatively neutral, and speakers from monolingual Spanish-speaking families favoring standard [β δ γ]. Again, parents' language(s) in the present corpus also indicates, to some degree, social class, so that in general higher class speakers produce more 'standard' approximates, while lower class speakers use more regional occlusives. The following section offers an explanation of the results presented here.

5. Discussion

First, voiced stops in YS occur in contexts not permitted in 'standard' varieties of Spanish (such as following non-nasal consonants or in intervocalic position). As noted in Michnowicz (2009), the contexts in which YS favors [b d g], however, are, generally speaking, an extension of those permitted in more standard dialects. So instead of occlusives only following nasal consonants (and [d] following laterals), YS allows stops following any consonants (see also Michnowicz 2009). Amastae (1989) reports a similar pattern for Highland Colombian Spanish, and post-consonantal stops also occur in Costa Rica, El Salvador, Honduras, Venezuela, and previously in Nicaragua (Lipski 2004). In YS, fortified stops occur in strong positions within the word or syllable, such as word initial position and in tonic syllables (as seen before tonic vowels). Likewise, contexts that favor weakening across Spanish dialects, such as participles ending in *-ado, -ido* and word final position, also resist fortition in YS.

Second, the role of Maya language influence on voiced stops in Yucatan Spanish has previously been established to be one of indirect, fossilized L2 features (Michnowicz 2009). Bilingual speakers with monolingual Maya-speaking parents produced significantly more stop variants than those whose parents were bilingual or spoke only Spanish. Importantly, the Maya language has been receding in Yucatan for at least the last several decades, as indicated in Figure 3. Except for a drop in the 1980 census that may be due to sampling methods that year, Yucatan has witnessed a steady decline in the number of Maya speakers and an increase in the number of those speakers that also speak Spanish, so that by 2005 only 29% of the population reported speaking Maya, and 93% of those also speak Spanish (Instituto Nacional de Estadística y Geografía n.d.)[4].

The most important language-external factor is speaker age, with younger speakers producing significantly fewer stop [b d g] than do older speakers. Klee (2009) has identified Yucatan as one of three major regions with strong indigenous language influence that are now undergoing rapid standardization (the others are the Andean region and Paraguay). She states that "[…] within the past twenty to thirty years, younger generations are increasingly adopting non-contact variants in place of […] regional features."

[4] All Mexican census results are taken from the INEGI website, where data from individual *censos* and *conteos* are available: http://www.inegi.org.mx.

FIGURE 3
Total Maya speakers and bilingual speakers as a percentage of the total population of Yucatan (Instituto Nacional de Estadística y Geografía n.d.)

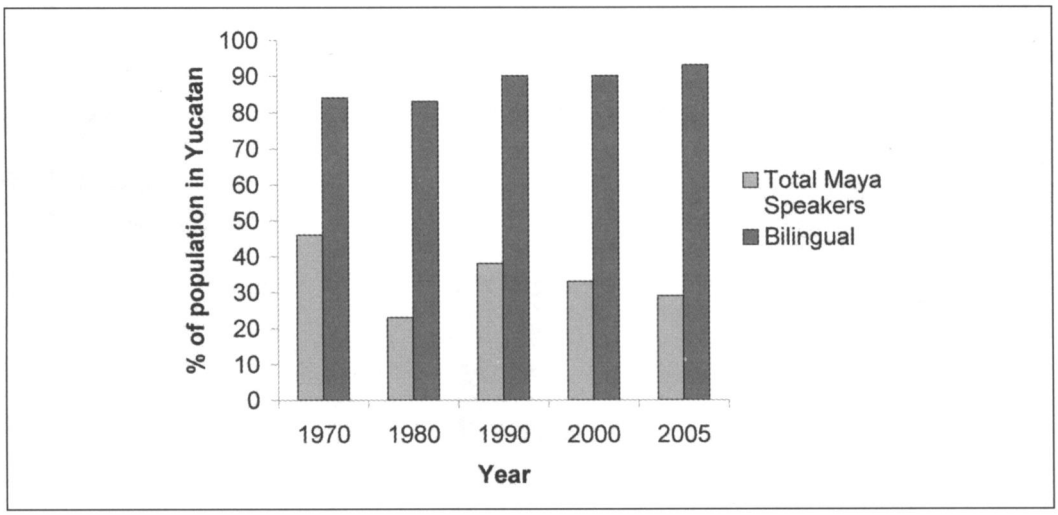


FIGURE 4
Percentage of population in Yucatan without any formal education (Instituto Nacional de Estadística y Geografía n.d.)

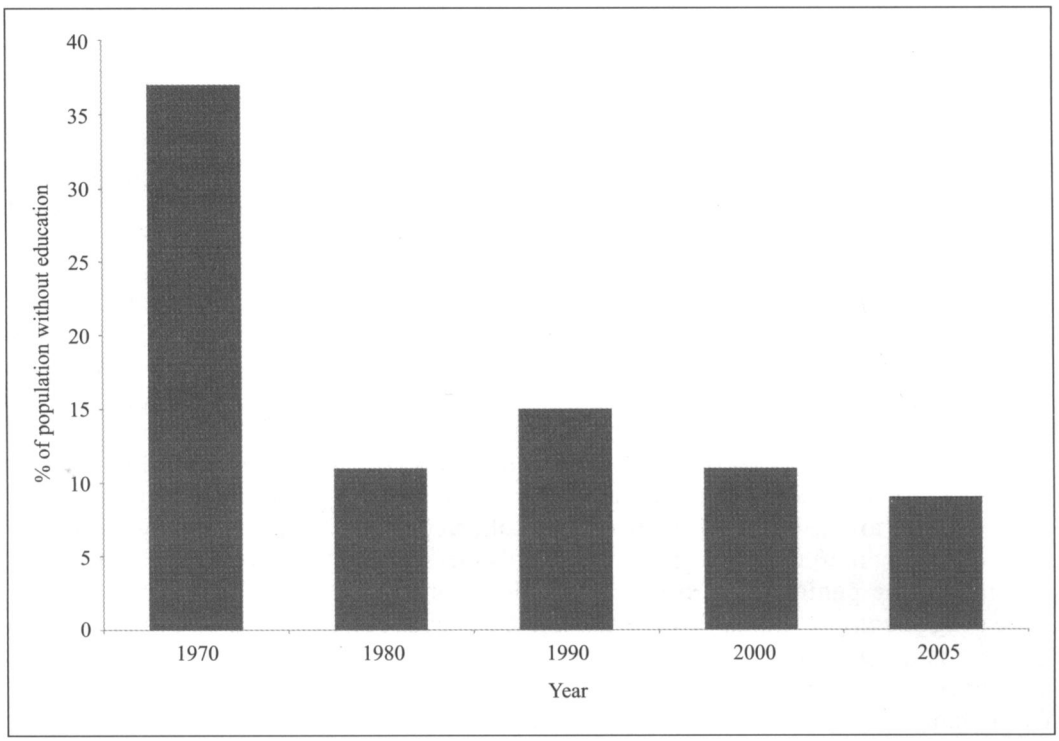
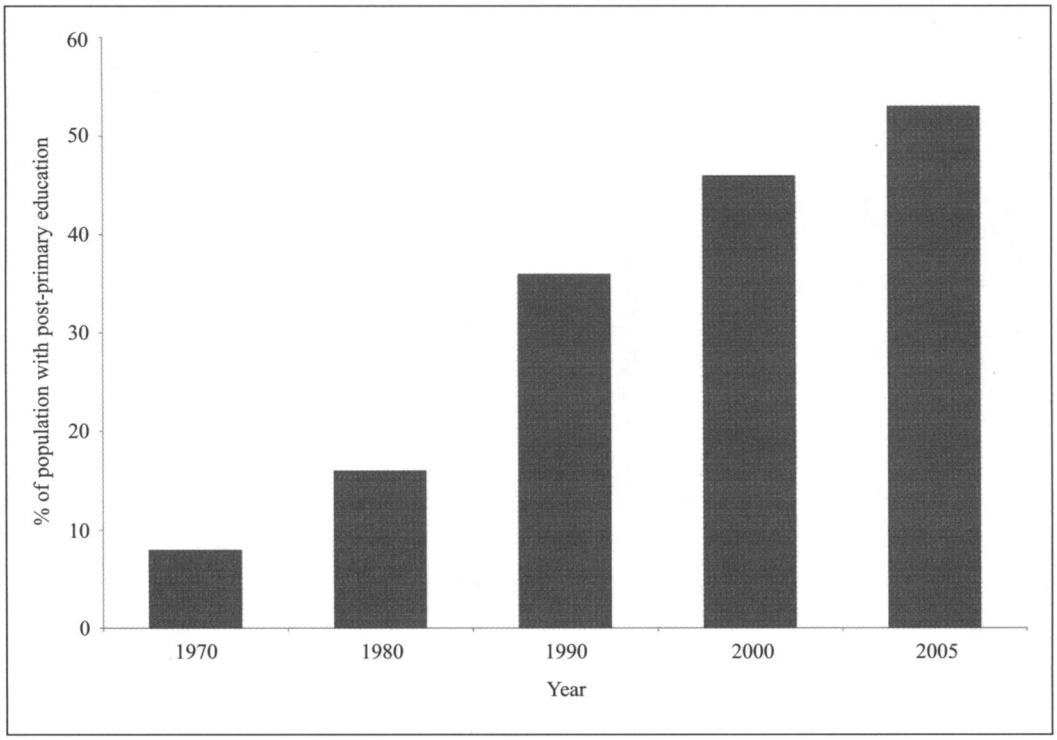


FIGURE 5
Percentage of population in Yucatan with post-primary education (Instituto Nacional de Estadística y Geografía n.d.)



(Klee 2009: 60-61) This trend is clearly seen in the present data, where younger speakers strongly favor pan-Hispanic standard norms for (b d g). Klee (2009: 60) cites "[…] increased access to education and thus to Spanish […]" as one of the main forces driving the standardization of contact varieties. That an increase in standard approximate [β ð ɣ] has coincided with increased educational opportunities in Yucatan is seen clearly in Figure 4 and 5. Since 1970, there has been a sharp drop in people without any formal education in Yucatan, while during the same time period the number of people with post-primary education has risen steadily (Instituto Nacional de Estadística y Geografía n.d.).

Increased infrastructure, such as roads and means of transportation, also play a role in situations of indigenous language shift and dialect contact (Klee 2009: 60). Prior to the 1960's, travel from Yucatan to the rest of Mexico was very difficult, and involved travel by boat to one of the Gulf Coast ports followed by an overland journey to Mexico City. It was not until the early part of the 1960's that rail and air service were established that linked the peninsula with the rest of the country (Quezada 2001: 239), further increasing *yucatecos*' exposure to Spanish from throughout Mexico and beyond. A related point is the preference for standard [β ð ɣ] by men in the present study, a significant difference for (d g), and a trend for (b). While it is frequently argued that women tend to favor standard or prestigious language forms, in reality 'gender' as operationalized in

sociolinguistic studies most often reflects speakers' social mobility or network ties rather than biological sex (see Eckert 1989). For YS, the gender difference seems to reflect speakers' social network ties. Strong network ties, created when speakers share multiple connections to one another through family, neighborhood, religious institutions, etc. encourage conservative speech styles (Penny 2004: 64). Likewise, strong connections within a community are reflected in the use of regional dialect forms (Milroy 1987). Weak network ties, on the other hand, can lead to speakers adopting non-regional forms through processes of dialect accommodation and leveling (Kerswill 2002, Penny 2004: 65) In Yucatan, it is men who most often interact with speakers of other varieties, through work or travel, while women have traditionally interacted more frequently with their neighbors, family and friends. One lower class speaker observes the sociolinguistic mixing that occurs in the peninsula:

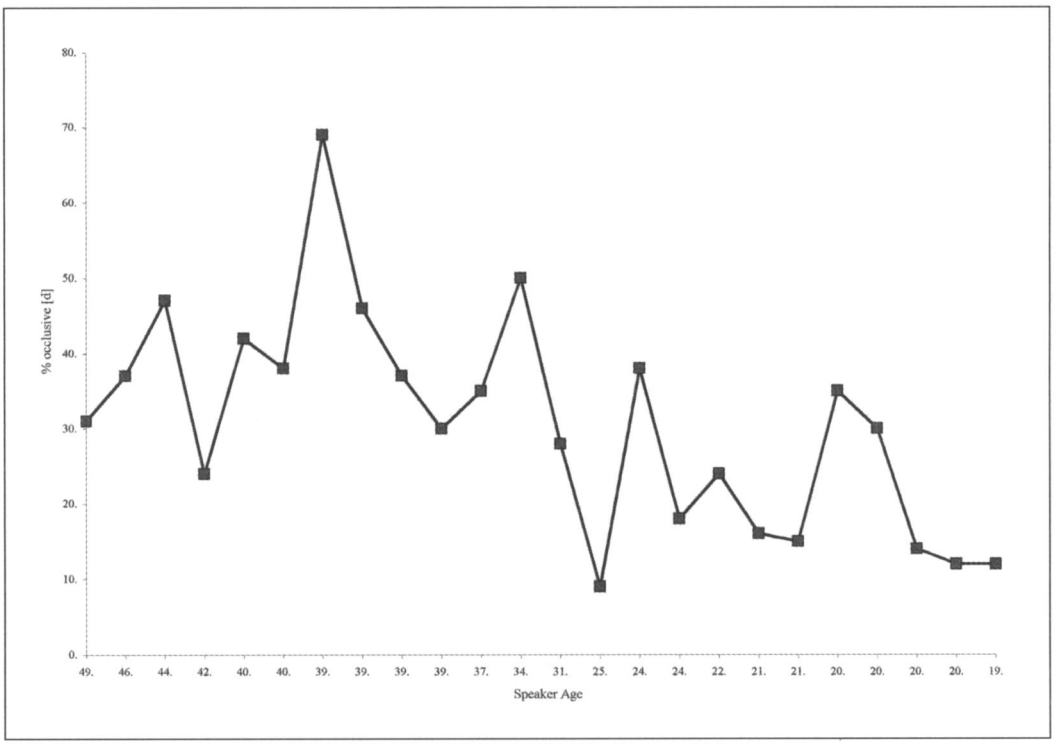
> [...] mucha de la gente de acá, muchos ya fueron a vivir en Cancún y muchos de México ya fueron a vivir en Cancún. Así es que ya está vuelto Cancún con Mérida y México, Guadalajara. Mucha gente ya fue allá, claro. Así es... hay mucha gente que se va a trabajar en Cancún. Deja a su familia, llega en [sic] Cancún [...].

As this speaker notes, in these multi-dialectal work zones throughout the peninsula and beyond, men's speech is subjected to the forces of leveling, while women are left behind to care for the children. One result of the difference in mobility is that men use more standard [β δ γ] than women.

Another factor mentioned by Klee (2009: 60) in standardization is "[...] increased access to communications systems and mass media in Spanish." While most language change appears to occur due to face-to-face interactions, mass media can increase the exposure that speakers have to other, perhaps more prestigious, varieties of the language (Labov 2001). Trudgill (1986: 55) notes that television in particular can produce a "softening up" effect on speakers, through the changing of attitudes toward another variety (see also Carvalho 2004). While hard data is difficult to come by, it may be significant that in 1960, Yucatan was one of only six Mexican states without television stations (all in the southeast), with the first station not beginning broadcasts until 1963 (Sánchez Ruiz 1990) Later, in 1970, a national affiliate of *Telecadena Mexicana Canal 13* began broadcasting in Merida ("História de la Television Yucateca | Trece TV" n.d.), which further brought Yucatecans into contact with more prestigious varieties of Mexico City Spanish. In a newspaper article in *El Diario de Yucatán* in April 2010, Jorge Ignacio Covarrubias, Secretary of the North American Academy of the Spanish Language, mentioned the important role that Spanish-language soap operas, *telenovelas*, may play in dialect contact: "En los países de habla hispana [las telenovelas] ayudan a enriquecer, a ampliar el vocabulario, a hacer que los hispanohablantes conozcan otras maneras de decir las cosas y, en definitiva, a favorecer la comunicación." (Ratner-Arias 2010) In addition to improved access to education, increased exposure to national media also coincides with a decline in the rates of stop [b d g] in YS.

Thus residents of Yucatan, in the past cut off from the rest of Mexico, now enjoy increased levels of education, access to national and international media in more standard varieties of Spanish, as well as important face-to-face contact through increased domestic tourism stemming from the archeological ruins in Yucatan and the develop-

FIGURE 6
Individual speaker frequencies of occlusive [d]



ment of the *Riviera Maya* in the neighboring state of Quintana Roo, as well as immigration resulting from an increase in businesses and factories throughout the state (Biles 2004). For example, Merida experienced a 46% increase in immigration from Mexico City during the 1990s (Instituto Nacional de Estadística y Geografía n.d.).

A comparison of individual speaker frequencies further demonstrates this trend. Figure 6 details middle aged and younger speaker frequencies for stop [d]. As Figure 6 indicates, there is a large amount of individual variation regarding (d), with frequencies ranging from a high of 69% [d] to a low of 9%. In spite of this individual variation, two important trends emerge. First, no speaker under age 30 exceeds 38% [d], and 73% produce less than 30%. Second, no speaker over age 30 produces less than 24% [d], and 85% produce [d] at a rate of 30% or more. In the present corpus, speakers under age 30 were born after 1975, and thus grew up in an environment of increased education, media, and face-to-face dialect contact with speakers of other varieties of Spanish, as outlined above.

Solomon (1999: 135-136) notes that her informants in Valladolid, Yucatan indicated that stop [b d g] are salient and stigmatized variables in the dialect. Regarding YS in general, Pfeiler (1993: 6, cited in Solomon 1999: 136) states that receptionists in Merida are at times instructed to speak with the more prestigious dialect of central Mexico. The present study suggests that increased contact with national, prestigious varieties of Spanish

that maintain a standard stop-approximate alternation for (b d g), as well as the correlation of [b d g] with people of Maya-speaking background may be leading to the standardization of this feature for younger speakers of YS.

Returning to the question posed at the beginning of this article regarding the underlying form of (b d g), it was mentioned that data from YS can provide evidence of divergent underlying systems across Spanish dialects, as well as possible evidence of systematic change following a shift in surface frequencies. While it appears clear that a fortition analysis best fits the data for standard Spanish (see Barlow 2003), for varieties where stops are (or were) favored in expanded phonetic contexts, such as YS or Bogotano Spanish (Amastae 1995), the possibility of underlying stops must be entertained, at least for some speakers. In these cases, a spirantization analysis may be warranted (see Barlow 2003). At the same time, as approximate [β δ γ] are increasingly heard and used among younger speakers, it is likely that the underlying system for most YS speakers will come to reflect the new surface reality, in which case a fortition analysis would again best explain the observed pattern among younger generations.

6. Conclusions

This article has demonstrated that younger speakers in Merida, Yucatan are standardizing their use of (b d g) through increased rates of approximate variants, at the expense of the regional variants [b d g]. The preference for [b d g], described as almost categorical 40 years ago (Alvar 1969), is quickly giving way to [β δ γ], with young speakers in particular leading this change. Additionally, it provided a possible explanation for the reduction in regional [b d g]; that is, after a long period of isolation, the increasing interconnectedness of Yucatan with the rest of Mexico and the Spanish-speaking world via education, media, immigration and tourism has led to higher levels of contact with more prestigious varieties of the language. As Klee (2009: 62) notes, "[m]odernization and globalization combined with negative attitudes toward indigenous languages have brought about language shift [...].at the same time these factors are bringing regional varieties of Spanish into contact with other dialects." Yucatan Spanish provides an ideal living laboratory to investigate questions of language shift, dialect contact and standardization. While at present it seems that Yucatan Spanish may suffer the same fate as many other regional varieties of Mexican Spanish and be overrun by Mexico City Spanish (see Lipski 2004: 303), more studies are required on this often overlooked dialect in order to determine its future development.

References

Alvar, Manuel (1969): "Nuevas notas sobre el español de Yucatán", in: *Iberoromania*, 1, 159-189.
Amastae, Jon (1986): "A syllable-based analysis of Spanish spirantization", in: Silva-Corvalán, Carmen/Jaeggli, Osvaldo (eds.): *Studies in Romance linguistics*. Dordrecht: Foris, 2-23.
— (1989): "The intersection of S-aspiration/deletion and spirantization in Honduran Spanish" in: *Language variation and change* 1, 2, 169-183.
— (1995): "Variable spirantization: constraint weighting in three dialects", in: *Hispanic Linguistics* 6, 267-286.

Antón, Marta M. (1998): "Del uso sociolinguístico de las oclusivas posnucleares en el español peninsular norteño", in: *Hispania* 81, 4, 949-58.
Bakovic, Eric (1994): "Strong onsets and Spanish fortition", in: *MIT working papers in linguistics* 23, 21-39.
Barlow, Jessica A. (2003): "The stop-spirant alternation in Spanish: converging evidence for a fortition account", in: *Southwest Journal of Linguistics* 22, 1, 51-86.
Biles, James J. (2004): "Export-oriented industrialization and regional development: a case study of maquiladora production in Yucatán, Mexico", in: *Regional studies* 38, 5, 519-534.
Branstine, Zoann (1991): "Stop/Spirant alternations in Spanish: on the representation of contrast", in: *Studies in the linguistic sciences* 21, 1-1.
Canfield, D. Lincoln (1981): *Spanish pronunciation in the Americas*. Chicago: The University of Chicago Press.
Carvalho, Ana M. (2004): "I speak like the guys on TV: palatalization and the urbanization of Uruguayan Portuguese", in: *Language variation and change* 16, 2, 127-151.
Cassano, Paul (1977): "La influencia del maya en la fonología del español de Yucatán", in: *Anuario de Letras* 15, 95-113.
Danesi, Marcel (1982): "The description of Spanish /b,d,g/ revisited", in: *Hispania* 65, 2, 252-258.
Eckert, Penelope (1989): "The whole woman: sex and gender differences in variation", in: *Language variation and change* 1, 3, 245-267.
García Fajardo, Josefina (1984): *Fonética del español de Valladolid, Yucatán*. México: Universidad Nacional Autónoma de México.
González, Carolina (2002): "Phonetic variation in voiced obstruents in North-Central Peninsular Spanish", in: *Journal of the International Phonetic Association* 32, 1, 17-31.
— (2006): "Efecto de la posición en la oración y la frecuencia léxica en/d/final en español del País Vasco", in: Face, Timothy L./Klee, Carol A. (eds.): *Selected Proceedings of the 8th Hispanic Linguistics Symposium*. Somerville, MA: Cascadilla Proceedings Project.
Hammond, Robert M. (1975): "Phonemic restructuring of voiced obstruents in Miami-Cuban Spanish", in: Aid, Frances/Resnick, Melvyn/Saciuk, Bohdan (eds.): *Colloquium on Hispanic Linguistics*. Washington, D.C.: Georgetown University Press, 42-51.
Harris, James W. (1969): *Spanish phonology*. Cambridge, MA: MIT Press.
— (1984): "La espirantización en castellano y la representación fonológica autosegmental", in: *Working Papers in Linguistics* 1, Universitat Autònoma de Barcelona, 149-167.
"História de la Television Yucateca | Trece TV", (n.d.): <http://www.televisionyucateca.com/199-1-Historia.html> (April 21, 2010)
Hualde, José Ignacio (2005): *The sounds of Spanish*. New York: Cambridge University Press.
Instituto Nacional de Estadística y Geografía (n.d.): "Censos y conteos de población y vivienda". <http://www.inegi.org.mx/est/contenidos/Proyectos/ccpv/default.aspx?s=est&c=16638> (April 21, 2010).
Jun, Jongho (1995): "Place assimilation as the result of conflicting perceptual and articulatory constraints", in: *WCCFL* 14, 221-237).
Kent, Ray D./Read, Charles (1992): *The acoustic analysis of speech*. San Diego: Singular.
Kerswill, Paul (2002): "Koineization and accommodation", in: Chambers, Jack K./Trudgill, Peter/Schilling-Estes, Natalie (eds.): *The handbook of language variation and change*. Oxford: Blackwell, 669-702.
Kirchner, Robert M. (1998): *An effort-based approach to consonant lenition*. Doctoral Dissertation. Los Angeles: University of California Los Angeles.
Klee, Carol A. (2009): "Migration and globalization: Their effects on contact varieties of Latin American Spanish", in: Lacorte, Manuel/Leeman, Jennifer (eds.): *Español en los Estados Unidos y en otros contextos: Cuestiones sociolingüísticas, políticas y pedagógicas*. Madrid/Frankfurt: Iberoamericana/Vervuert, 39-66.

Labov, William (1984): "Field methods of the project on linguistic change and variation", in: Baugh John/Sherzer Joel (eds.): *Language in use.* Englewood Cliffs, NJ: Prentice-Hall, 28-53.
— (2001): *Principles of linguistic change: social factors*. Oxford: Wiley-Blackwell.
Lewis, Anthony M. (2002): "Contrast maintenance and intervocalic stop lenition in Spanish and Portuguese: when is it alright to lenite?", in: *Amsterdam Studies in the Theory and History of Linguistic Science Series 4*, 160-172.
Lipski, John (^{3}2004): *El español de América*. Madrid: Cátedra.
Lope Blanch, Juan M. (1987): *Estudios sobre el español de Yucatán*. México: Universidad Nacional Autónoma de México.
Lozano, María del Carmen (1979): *Stop and spirant alternations: fortition and spirantization processes in Spanish phonology*. Bloomington, IN: Indiana University Linguistics Club
Marotta, Giovanna (2008): "Lenition in Tuscan Italian (Gorgia Toscana)", in: Brandão de Carvalho, Joaquim/Scheer, Tobias/Ségéral, Philippe (eds.): *Lenition and Fortition.* Berlin: de Gruyter, 235-271.
Mascaró, Joan (1991): "Iberian spirantization and continuant spreading", in: *Catalan Working Papers in Linguistics 1991*, 167-179.
Mediz Bolio, Antonio (1951): *Interinfluencia del maya con el español de Yucatán*. Mérida, México: Editorial Zamna.
Michnowicz, Jim (2008): "Final nasal variation in Merida, Yucatan", in: *Spanish in Context* 5, 278-303.
— (2009): "Intervocalic voiced stops in Yucatan Spanish: a case of contact-induced language change?", in: Lacorte, Manuel/Leeman, Jennifer (eds.): *Español en los Estados Unidos y en otros contextos: Cuestiones sociolingüísticas, políticas y pedagógicas.* Madrid/Frankfurt: Iberoamericana/Vervuert, 67-84.
Milroy, Lesley/Gordon, Matthew (2003): *Sociolinguistics: method and interpretation*. Oxford: Wiley-Blackwell.
Milroy, Lesley (1987): *Language and social networks*. Oxford: Wiley-Blackwell.
Penny, Ralph (2002): *A history of the Spanish language*. Cambridge: Cambridge University Press.
— (2004): *Variation and change in Spanish*. Cambridge: Cambridge University Press.
Pérez, Hernán (2007): "Estudio de la variación estilística de la serie /b-d-g/ en posición intervocálica en el habla de los noticieros de la televisión chilena", in: *Estudios de fonética experimental* XVI, 227-259.
Pfeiler, Barbara (1993): "Lenguaje e identidad en Yucatán", in: *Unicornio*, *Suplemento Cultural de Por Esto*, 3-6. Mérida, México.
Piñeros, Carlos-Eduardo (2002): "Markedness and laziness in Spanish obstruents", in: *Lingua* 112,5, 379-413.
Quezada, Sergio (2001): *Breve historia de Yucatán*. México: El Colegio de México.
Quilis, Antonio (1981): *Fonética acústica de la lengua española*. Madrid: Gredos.
Ratner-Arias, Sigal (2010, April 4): "Las telenovelas contribuyen a la difusión del español", in: *Diario de Yucatán* April 4, 2010. Mérida, México. <http://www.yucatan.com.mx/noticias/versionimprimible.asp?cx=17$0100000000$4278437> (April 20, 2010).
Roldán, Yasna/Soto-Barba, Jaime (1997): "El V.O.T. de /p-t-k/ y /b-d-g/ en el español de Valdivia: un análisis acústico", in: *Estudios filológicos* 32, 27-33.
Sánchez Ruiz, Enrique (1990): "Hacia una cronología de la televisión Mexicana", in: *Business solutions from AllBusiness.com*. <http://www.allbusiness.com/sector-61-educational-services/133891-1.html> (April 21, 2010).
Sankoff, David/Tagliamonte, Sali/Smith, Eric (2005): *Goldvarb X: A variable rule application for Macintosh and Windows.* University of Toronto: Department of Linguistics. <http://individual.utoronto.ca/tagliamonte/Goldvarb/GV_index.htm> (March 5, 2011).

Soler, Antonia/Romero, Joaquín (1999): "The role of duration in stop lenition in Spanish", in: *Proceedings of the XIVth international congress of phonetic sciences,* 483-486.
Solomon, Julie (1999): *Phonological and syntactic variation in the Spanish of Valladolid, Yucatán.* Doctoral Dissertation. Palo Alto, CA: Stanford University Press.
Suárez, Victor ([2]1945): *El español que se habla en Yucatán: apuntamientos filológicos*. Mérida, México: Universidad de Yucatán.
Tagliamonte, Sali (2006): *Analysing sociolinguistic variation*. New York: Cambridge University Press.
Thomason, Sarah/Kaufman, Terrence (1988): *Language contact, creolization, and genetic linguistics*. Berkeley: University of California Press.
Trudgill, Peter (1986): *Dialects in contact*. Oxford: Blackwell.
Williams, Lee (1977): "The voicing contrast in Spanish", in: *Journal of phonetics* 5, 2, 169-184.
Yager, Kent D. (1982): *Estudio del cuadro consonántico del español de Mérida, Yucatán con consideraciones de posible influencia maya*. Master's Thesis. Santa Barbara, CA: University of California, Santa Barbara.