

Atlantic Spanish variation: acoustic analysis of consonants across five coastal cities in Hispanic America, integrating sociolinguistic variables

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Submitted: 09/04/2025; Accepted: 25/08/2025; Published online: 19/12/2025.

Citation: Weiland, V. (2025). Atlantic Spanish variation: acoustic analysis of consonants across five coastal cities in Hispanic America, integrating sociolinguistic variables. *Loquens*, 12, e125. <https://doi.org/10.3989/loquens.2025.e125>

ABSTRACT: This study empirically examines pronunciation patterns in five Hispanic American coastal cities: Camagüey (Cuba), Consuelo (Dominican Republic), Caracas (Venezuela), Buenos Aires (Argentina), and Punta Arenas (Chile). Using data from the *Tierras Altas y Bajas de Hispanoamérica* (TiAlBa) corpus, it analyzes the realization of /s/ (<s>), /x/ (<j>, <g> before front vowels), and intervocalic /d/ (<d>) with respect to linguistic and sociolinguistic factors. The results show that the variables conditioning pronunciation differ across the target consonants. The diatopic variable emerges as the most decisive, with significant effects for all three. In contrast, age and gender do not exert a significant influence. With regard to the linguistic factors –speech style (read word list, read text, guided interview), phonological context, and syllable stress– the effects differ across the consonants, as multiple variables prove significant for each consonant but in different constellations.

Keywords: Atlantic Spanish; corpus phonology; consonant variation; sociolinguistic variables.

RESUMEN: *Variación del español atlántico: análisis acústico de consonantes en cinco ciudades costeras de Hispanoamérica, integrando variables sociolingüísticas.* Este estudio examina empíricamente los patrones de pronunciación en cinco ciudades costeras hispanoamericanas: Camagüey (Cuba), Consuelo (República Dominicana), Caracas (Venezuela), Buenos Aires (Argentina) y Punta Arenas (Chile). Con datos del corpus *Tierras Altas y Bajas de Hispanoamérica* (TiAlBa), se analiza la realización de /s/ (<s>), /x/ (<j>, <g> antes vocales anteriores) y /d/ intervocálica (<d>), en relación con factores lingüísticos y sociolingüísticos. Los resultados muestran que las variables que condicionan la pronunciación difieren según el consonante estudiado. La variable diatópica emerge como la más decisiva, con efectos significativos en los tres casos, mientras que la edad y el género no ejercen una influencia significativa. En lo que respecta a los factores lingüísticos –estilo de habla (lista de palabras leída, texto leído, entrevista guiada), contexto fonológico y acento prosódico– los efectos varían según el consonante, ya que varias variables resultan significativas en cada uno, aunque en distintas combinaciones.

Palabras clave: español atlántico; fonología de corpus; variación consonántica; variables sociolingüísticas.

1. INTRODUCTION

Numerous studies over the past century have controversially debated the influence of Andalusian on American Spanish, particularly in the context of the *andalucismo* vs. *antiandalucismo* debate (Wagner, 1920; Henríquez Ureña, 1993; Lapesa, 1956; Galmés de Fuentes, 1957; Catalán, 1958; Guitarte, 1959; Menéndez Pidal, 1962; see Rosenblat, 1969 or Noll, 2005a, 2021 as a summary). Prominence is especially given to the following phonetic features in spoken Spanish: *seseo* (lack of dental fricative [θ]), realization of predorsal /s/, weakening of /s/, neutralisation of /r/ and /l/ in coda position, aspiration of /x/, elision of /d/ in intervocalic position and *yeísmo* (merger of /k/ and /j/; Galmés de Fuentes, 1957, p. 291; Noll, 2005a, p. 96). Through the concepts of ‘español atlántico’ (Catalán, 1958, pp. 233-242) and ‘tierras marítimas’ or ‘tierras de la flota’ (Menéndez Pidal, 1962, p. 142), Catalán (1958) and Menéndez Pidal (1962) identify these linguistic features as shared characteristics of coastal regions, emphasizing the significant influence of maritime trade routes. In doing so, they underscore the crucial role of these routes in shaping the development of spoken American Spanish (Becker, 2021).

Even if contemporary research attributes the characteristics of Spanish pronunciation in the Americas to the interaction of multiple factors, rather than assuming a direct lineage from Andalusian (Noll, 2005b, pp. 99-100), the capitalization of ‘Atlantic Spanish’ (sp. ‘*español atlántico*’) remains relevant to this day. Yet, the most plausible explanation for similarities in the Spanish of these coastal regions is the interplay of multiple factors: the influence of Andalusian varieties in coastal areas and Madrilénian varieties in interior regions since the 16th century (Menéndez Pidal, 1962, pp. 134-142), the varying prestige of different Spanish variants (Chela-Flores, 2000, p. 51), and the formation of a Koiné, which led to the leveling of linguistic variation (Noll, 2005b, pp. 99-100).

This study examines and compares the pronunciation characteristics of spoken Spanish in five coastal cities of Hispanic America, drawing on empirical corpus data as its analytical foundation. It takes into account the pronunciation of /s/ in syllable- and word-final position, intervocalic /d/, and /x/ (graphemes <j> and <g> before front vowels). The data are part of the *Tierras Altas y Bajas de Hispanoamérica* (TiAlBa) corpus, which offers a solid empirical basis for examining pronunciation patterns by incorporating not only linguistic and diatopic factors but also sociodemographic variables. Furthermore, the corpus data account for spoken Spanish across varying levels of self-monitoring (Labov, 1972). To achieve this, following the protocol *Fonología del Español Contemporáneo* (FEC, Pustka, *et al.*, 2018), three types of speech samples were collected from each speaker: a read word list and text as well as a semi-structured interview (s. Section 3). This methodological approach enables an in-depth examination of pronunciation patterns, not only in spontaneous speech but also in more controlled linguistic settings, ensuring that all relevant phonological contexts are considered within the protocol.

The five selected points of investigation are Camagüey (Cuba) and Consuelo (Dominican Republic) in the Antilles, Caracas (Venezuela) on the Caribbean mainland coast, Buenos Aires (Argentina) on the Atlantic coast in the east, and Punta Arenas (Chile), the southernmost point of investigation in Patagonia. The study examines the pronunciation of syllable- and word-final /s/, intervocalic /d/, and /x/ to identify similarities and differences across these varieties and to determine the factors driving phonological variation. A central aim is to assess whether the Caribbean varieties share common features and how they differ from the two southern varieties spoken in Buenos Aires and Punta Arenas.

After the concept of ‘Atlantic Spanish’ and its interpretation in this study have been thoroughly discussed in Section 2.1, Section 2.2 addresses the current state of research on the variation of Spanish consonant pronunciation in the aforementioned locations. Section 3 outlines the corpus data and methodological approach, that is, the principles of corpus phonology and the transcription procedure. Section 4 presents the analysis, including a detailed account of the data encoding parameters employed in Praat. Section 5 presents the results of the analysis. The findings relate to the variation in the pronunciation of the three consonants, examined in connection with both language-internal variables –speech style (read word list, read text, guided interview), the left and right phonological context as well as syllable stress– and language-external variables, including the speakers’ geographical origin, age, and gender. Section 6 discusses these results and relates them to findings from the existing literature, as outlined in Section 2. Finally, Section 7 draws conclusions and outlines outstanding research desiderata.

2. ATLANTIC SPANISH: LINGUISTIC CONCEPT AND PRONUNCIATION CHARACTERISTICS

2.1 Atlantic Spanish as a set of coastal varieties in Hispanic America

In addition to the concept of ‘*español atlántico*’ (Catalán, 1958, pp. 233–242; engl. *Atlantic Spanish*), the literature also references the terms *tierras marítimas* and *tierras de la flota* (Menéndez Pidal 1962, p. 142). These concepts highlight the significance of maritime trade routes in shaping the development of Spanish in the respective regions (Becker, 2021). Atlantic Spanish is frequently contrasted with Continental Spanish (Chela-Flores, 2013, p. 96; Becker, 2021, 2022). However, this distinction poses different challenges. First, dialectal classifications have consistently shown that there is no single, homogeneous variety of Spanish in Hispanic America (Henríquez Ureña, 1921; Canfield, 1962; Zamora Munné and Guitart, 1982; Rona, 1964; Resnick, 1976, among others; cf. Moreno Fernández and Ueda, 2018, p. 724, for an overview). This aligns with findings from diachronic studies, which have shown that *Atlantic Spanish* evolved differently across regions (Becker, 2021, 2022; Noll, 2005a, p. 96). A uniform development of the various linguistic features cannot be observed; instead, they developed under the influence of distinct linguistic, sociodemographic, and historical factors specific to each region: “la idea de un modelo evolutivo común para todo el conjunto del ‘español atlántico’ u otras entidades diatópicas suprarregionales debe ser abandonada en favor de escenarios individuales de región a región” (Becker, 2022, p. 8).

Second, the definition of *Atlantic Spanish* is not uniformly established. In cases where the concept is linked to the debate on the Andalusian influence on Hispanic American Spanish (e.g. Catalán 1958, Menéndez Pidal 1962; see Rosenblat 1969 or Noll, 2005a, 2021 as a summary), it comprises varieties from Andalusia, the Canary Islands and the Caribbean region (Chela-Flores, 2013, p. 96). Thus, the term refers to varieties in Hispanic America that are considered classic lowland varieties (sp. *tierras bajas*, Henríquez Ureña, 1921, p. 358; Rosenblat, 1973, pp. 39–40; Noll 2019, pp. 28–29).

Atlantic Spanish is characterized by certain linguistic features, primarily of a phonetic-phonological nature¹: aspiration of syllable- and word-final /s/, weakening of intervocalic /d/, pronunciation of /x/ as an aspirated variant [h], neutralization of final /t/ (grapheme <r>) and /l/, *seseo* and *yeísmo* (Rosenblat, 1973, pp. 39–40; Fontanella de Weinberg, 1984, p. 171; Salvador, 1987, p. 70). Both *seseo* (merger of /s/ and /θ/) and *yeísmo* (merger of /ʎ/ and /j/) are frequently regarded as features that distinguish Hispanic American Spanish from its European counterpart (Lipski, 1994, 36), although they are also present in Andalusian and Canarian varieties. A crucial point is that these two features are generally not considered part of the Peninsular standard, since in most Spanish varieties differentiation of /θ/ and /s/ (e.g. in *caza* vs. *casa*), as well as of /ʎ/ and /j/² (e.g. in *pollo* vs. *poyo*), is observed (Hualde, 2014, p. 42).

In this study, the concept of ‘Atlantic Spanish’ is scrutinized to determine whether it truly represents a cluster of varieties with shared phonetic and phonological features across the five cities under investigation. Rather than attributing its characteristics to the long-assumed transmission of Andalusian Spanish features via diffusion through the Canary Islands, ‘Atlantic Spanish’ is reconceptualized as a form of Spanish spoken along the coasts of Hispanic America, with particular focus on the Caribbean. This focus is motivated by the Caribbean’s central role in previous conceptualizations of ‘Atlantic Spanish’ (Catalán, 1958, pp. 233–242; Lapesa, 1966, p. 304; Becker, 2022, p. 8). The investigation aims to identify both similarities and differences between Caribbean varieties and those spoken along the eastern and southern coasts of Hispanic America.

2.2 Consonant pronunciation as a key characteristic of Atlantic Spanish varieties

This section discusses the pronunciation of syllable- and word-final /s/ (2.2.1), intervocalic /d/ (2.2.2) and /x/ in various phonological contexts (graphemes <j> and <g> before front vowels, 2.2.3), taking into account diatopic, sociodemographic and communicative variables from a theoretical standpoint. The focus of this section is on the current state of research, while the analysis is presented in Section 4.

¹ In contrast, D’Introno, *et al.*, (1979) found fricative realizations in nearly 70% of cases in Caracas. Consequently, Moreno Fernández (2004, p. 999) categorizes Caracas in the same group as Madrid and Mexico City.

² Since the corpus-phonological study presented in Quijada, Bäumlér and Weiland (2023) indicates that a significant portion of this phoneme’s realizations are approximants, the IPA symbol /j/ is selected to represent the central palatal sound.

2.2.1 Variation in the pronunciation of syllable- and word-final /s/

Aspiration and elision of syllable- and word-final /s/ are considered weakening processes and are frequently cited in the literature as characteristic features of consonant pronunciation in lowland areas, especially in the Caribbean (Henríquez Ureña, 1921, p. 358): “hay debilitamiento de /s/ en mayor o menor grado, siendo el proceso especialmente prevalente en el Caribe y en zonas de la costa del Pacífico de América del Sur” (Hualde, 2014, p. 157). These weakening processes exhibit strong variation depending on factors such as speech register (formal vs. informal, Lafford 1986), the speaker’s age, gender and educational background, as well as the phonological context and syllable stress (Alba, 1982; Fontanella de Weinberg, 1973; Medina-Rivera, 2011, p. 37; Hualde, 2014, p. 157). Word length (Terrell, 1979; Carrasquero, 2010, p. 93) and lexical frequency (Brown, 2008, pp. 197–198) also influence this phenomenon. Weakening occurs most frequently before consonants, both within words and at word boundaries when the subsequent expression begins with a consonant, while it is less common before pauses and vowels (Hualde, 2014, pp. 157–158).

According to the *Nueva gramática de la lengua española* (NGLE, 2011, p. 200), aspiration is the standard variant of /s/ pronunciation in Cuba, particularly in word-internal position before consonants, whereas elision is most commonly found in word-final position. Klump (2021, p. 749) notes that in the Caribbean, elision primarily occurs in fast, colloquial speech, whereas aspiration is more characteristic of formal registers. Alba (2004) finds that male speakers in the Dominican Republic exhibit greater tendencies toward weakening than female speakers.

Bybee (2000), drawing on earlier data from Terrell (including 1979), demonstrates that /s/-weakening is significantly more prevalent in Cuba than in Buenos Aires (Hualde, 2014, pp. 158–159). Nevertheless, /s/-weakening remains the predominant variant in Buenos Aires, with aspiration being the more frequent realization, while elision is regarded as a sociolinguistic stigma (Lipski, 1994, p. 169). Cepeda (1990) also describes elision in syllable-final, word-internal position in Chile as socially stigmatized. However, Rogers (2020) challenges this notion based on data from Concepción, where elision emerged as the predominant variant across all analyzed social groups. In fact, the rates of elision observed in the study surpass those reported by Alba (1990) for the Spanish spoken in the Dominican Republic (Rogers 2020, p. 150). With regard to the phonological context, a distinctive feature of Chilean Spanish is the notably high rate of /s/-weakening even in word-final prevocalic position and before a stressed vowel, as in *los otros* (Lipski 1994, p. 199).

Venezuela is one of the rare regions where /s/-weakening carries more prestige than its retention, with the prestigious standard variety being that of Caracas (Lipski, 1994, p. 351). Recent data from Caracas in the PRESEEA corpus (2004–2010) state that aspiration ([h]) is the preferred variant (74%), while [s] is realized in 16% of cases, and elision occurs in 10% (Carrasquero, 2010, p. 103). These findings align with those of Villamizar (1998) and Romero (2005), who further observes that word-internal /-s/ tends to retain its sibilance when followed by nasal consonants, particularly in the speech of individuals from higher socioeconomic backgrounds. The only significant extralinguistic variable influencing /s/-weakening is socioeconomic status, with speakers from lower socioeconomic backgrounds favoring elision.

2.2.2 Variation in the pronunciation of intervocalic /d/

In intervocalic position, the standard realization of /d/ in Spanish is not the plosive [d], but rather a pronunciation without full occlusion (Hualde, 2014, pp. 132–135). From a dialectological perspective, Moreno Fernández (2004, pp. 999–1002) classifies the pronunciation of intervocalic /d/ into three groups: (A) dialects in which the full dental fricative predominates, (B) dialects with a predominance of the relaxed dental variant, and (C) dialects where elision is most common.

Caribbean varieties are known for their high rates of elision, particularly in participle endings (-ado, -edo, -ido) and high-frequency words, which can lead to contracted forms (e.g., *lado* [lao], *todo* [to]) (Klump, 2021, p. 749). In the case of Caracas, analysis based on the PRESEEA corpus (2004–2010) examines the linguistic and sociolinguistic factors influencing the weakening and elision of intervocalic /d/. The results indicate a 54% elision rate within the Caracas community, with 28% approximant realizations and 18% fricatives³. Among the linguistic variables, the vocalic environment and lexical diffusion play a crucial role, whereas sociolinguistic variables have little impact (Malaver & Perdomo, 2016). By contrast, according to Moreno Fernández (2004, p. 1001), the sociolinguistic profile of speakers with the highest elision rates across much of Europe and Hispanic America tends to correspond with older men of rural origin and low sociocultural

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status. Conversely, fricative realizations are primarily associated with highly educated women. Empirically, however, these statements do not seem to be substantiated and appear to contradict Noll (2019, p. 37), who assumes a social marking primarily for Argentina but less so for the Caribbean.

Alba (2000, p. 58) reports that elision occurs in 23% of cases of intervocalic /d/ in free interviews from the Dominican Republic; however, the remaining 77% are not further categorized and are simply labeled as “*retención*” (engl. *retention*). He also notes a similarity between Lima and Santiago, where the elision rate is nearly 25%, while Caracas – unlike what the data from the PRESEEA corpus (Malaver & Perdomo, 2016) indicate – shows a significantly lower rate of approximately 12% (Alba, 2000, p. 59). In the Spanish of the Dominican Republic, especially in the Villa Mella region, intervocalic /d/ may sometimes be pronounced as tap [ɾ] (Núñez Cedeño, 1987).

In Chilean Spanish, the intervocalic /d/ in the suffix *-ado* is frequently subject to deletion, even in informal speech among educated speakers (*amado* > [a'mao]). According to Oroz (1966, p. 100), this phonological reduction extends to other intervocalic contexts, particularly among speakers from lower socioeconomic backgrounds, affecting words with the suffixes *-edo* and *-ido* in informal speech. However, Oroz (1966, p. 100) characterizes the complete deletion of /d/ outside the *-ado* ending as being linked to vulgar speech. By contrast, a recent study by Sadowsky (2015, p. 80) states that in upper-class Chilean Spanish, intervocalic /d/ is predominantly elided or realized as the approximant [ɰ], and that both pronunciations are socially unmarked. Speakers from lower and lower-middle class frequently employ the fricative [ð] in emotionally charged contexts (e.g., [naða] instead of [naða] or [na]).

2.2.3 Variation in the pronunciation of /x/ in different phonological contexts

The realization of the fricative /x/ (graphemes <j> and <g>, before front vowel, as well as <x> in *México*) exhibits significant regional variation. Aspiration ([h]) is considered predominant in Caribbean, Central American, and Colombian varieties, reflecting a process of debuccalization ([x] > [h], (as in *mujer* [mu'her] or *jefe* ['hefe]; Hualde, 2014, p. 149; Klump, 2021, p. 749). The same phenomenon is observed throughout Venezuela, whereas the Rioplatense region (Argentina, Uruguay, and Paraguay) maintains a velar realization (Rosenblat, 1990, p. 130). In Cuba, the process of debuccalization extends further, as elision may occur independently of phonological context (Lipski, 1994, p. 231).

In Chile, /x/ frequently undergoes palatalization, whereby articulation before front vowels (/i/ and /e/) is realized as a palatal fricative [ç], i.e. in *gente*. Consequently, Chilean Spanish exhibits two allophones of /x/ in complementary distribution: a palatal fricative before front vowels and a velar fricative in other contexts, such as in *ajo* (['axo]; Oroz, 1966, pp. 53-54, 124; Aleza Izquierdo, 2010, p. 84; Hualde, 2014, p. 149).

3. DATA AND METHODOLOGY

3.1 Corpus phonology

Corpus phonology combines corpus linguistics with phonology. While phonology has traditionally focused on theoretical discussions despite the long-standing exploration of empirical data in linguistic atlases and sociolinguistic surveys, corpus phonology now leverages the new possibilities of digital humanities. The notion of *corpus phonology* emerged at the beginning of the 21st century and has gained increasing recognition, especially in recent years (Durand, *et al.*, 2014; Durand, 2017; Pustka, 2021; Eychenne, 2022). It provides us with good possibilities to study pronunciation as a function of language-internal as well as language-external variables, such as geography, sociodemographic characteristics (i.e. gender, age, education) or situation of communication.

In corpus phonology, the primary object of study is datasets of spoken language, particularly speech recordings. A corresponding corpus comprises not only the recordings but also orthographically and/or phonetically annotated transcriptions, phonological annotations, and metadata. The alignment of the data is conducted using specialized software, such as Praat (Boersma & Weenink, 2021) or Phonometrica (Eychenne & Courdés-Murphy, 2019). Phonological corpora can be accessed and, if necessary, updated at any time through databases. Ideally, the data are archived and published in open-access repositories, ensuring their availability to the research community (Voormann & Gut, 2008; Eychenne, 2022).

For the TiAlBa corpus, metadata is derived from two main sources: the recording protocol (word list, text, and interview), and a sociolinguistic questionnaire completed by each participant. This questionnaire gathers information on regional origin, age, gender, educational background, spoken languages, and the languages spoken by the participant's family members.

3.2 Corpus data

The data used in this study originate from the *Tierras Altas y Bajas de Hispanoamérica* (TiAlBa) corpus. Currently, this corpus comprises speech recordings from over 20 data collection points across 11 Hispanic American countries. The recordings were collected in 2023 and 2024, following the *Fonología del Español Contemporáneo* (FEC) protocol, which ensures a standardized methodology for data collection for linguistic purposes (Pustka, *et al.*, 2016; Pustka, *et al.*, 2018). It is based on two pre-existing projects dedicated to French and English: *Phonologie du Français Contemporain* (PFC) and *Phonology of Contemporary English* (*Phonologie de l'Anglais Contemporain* PAC, Durand & Przewozny, 2012). The aim of the FEC protocol is to comprehensively capture the phonetic-phonological inventory of the Spanish language. The protocol employs a three-part methodology: it starts with a list of 125 words, mostly arranged in random order. However, some of these words are organized to form potential (pseudo-)minimal pairs, enabling a detailed analysis of phonemic contrasts. The author includes another word, number 126, *gente*, to investigate possible palatalization processes of /x/ in word onsets preceding a front vowel. The second component is a text that incorporates some of the words from the word list, designed to observe the phonemic features within a continuous speech context. These two components provide the protocol with a distinctive feature, as corpora such as PRESEEA (*Project for the Sociolinguistic Study of Spanish from Spain and America*), Val.Es.Co (*Valencia, Español Coloquial*) or CORLEC (*Corpus Oral de Referencia del Español Contemporáneo*), for instance, primarily consist of spontaneous speech. The wordlist and text also consider the pluricentric nature of the Spanish language by including, for example, minimal pairs designed to analyze the pronunciation of <s> and <z> (*casa, caza*) or expressions with the graphemes <ll> and <y> (i.e., *allí, llave, lleno, pollos, oye*). The final part of the FEC protocol consists of a semi-structured interview of about 20 minutes. It includes questions about participants' daily lives and cultural backgrounds. A sociolinguistic interview blends spontaneity and formality by guiding speakers toward specific topics to elicit natural speech while allowing them to take the lead as “experts”, which ultimately fosters a conversational dynamic that closely resembles spontaneous interaction (Labov 1972, pp. 36-37; Brown 2008, pp. 38-39). Thus, while the word list and text are read aloud to ensure maximum comparability of the linguistic data across different speakers, the guided interview aims to capture the natural variability of unscripted speech.

In each location, twelve speakers are recorded, all of whom have resided in the respective location throughout their lives (see table 1 for distribution). Speakers are evenly distributed across gender (male/female), age categories (young adults: 18-30 years, middle-aged adults: 31-65 years, older adults: over 65 years) and educational level (non-academic/academic). Each speaker is required to complete the sociodemographic questionnaire and provide a consent form for the scientific and educational use of the speech recordings and associated metadata.

Table 1: Speaker distribution

LOCATION	TOTAL BY LOCATION (MALE/FEMALE)	Young (18–30)	Middle (31–65)	Old (65+)
Buenos Aires (Argentina)	12 (6/6)	4	4	4
Camagüey (Cuba)	12 (6/6)	4	4	4
Caracas (Venezuela)	12 (6/6)	4	4	4
Consuelo (Dominican Rep.)	12 (6/6)	4	4	4
Punta Arenas (Chile)	12 (6/6)	4	4	4
TOTAL	60 (30/30)	20	20	20

3.3 Orthographic and phonetic transcription

The speech recordings in the TiAlBa corpus were fully transcribed orthographically and aligned in *Praat* (Boersma and Weenink, 2021). Phonetic transcription was also conducted using *Praat*, while statistical analysis was performed based on coded data stored in an Excel file and processed in *R Statistics* (R Core Team, 2018). A separate numeral coding system was developed for each consonant under investigation, established based on annotations from three linguists. For each coding system, an “agreement index” (Bäumler, 2022, p. 122) was created to assess the consistency of the codings among the three linguists. To this end, Fleiss’ kappa (Fleiss, *et al.*, 2003) was calculated, as it is suitable for three or more coders. The calculation of the kappa value was performed using the R package *DescTools* (Signorell, *et al.*, 2025). Each coding system (Section 4) demonstrates an inter-coder reliability within the range of “almost perfect agreement” (Kappa value: 0.81–1.00), according to the classification by Landis and Koch (1977).

4. ANALYSIS

The following section provides a detailed explanation of the individual coding systems. For each consonant under investigation, only those pronunciation variants that are actually coded in the TiAlBa corpus data have been considered. Consequently, the variants listed in the tables, along with their numerical codes, offer an overview of the observed realizations. The categorization was designed to ensure the stability of each coding system. For instance, in the analysis of /s/ in syllable- and word-final position, no distinction is made between the voiceless and voiced alveolar fricative, as pilot studies showed that such a differentiation led to instability within the coding system.

Even though the recordings were not made in a phonetics laboratory, the quality of the sonograms is very high. They provide essential criteria such as the structure of formants, evidence of friction and sonority. The encoding is therefore based on a combination of acoustic and visual cues (s. sections 4.1-4.3).

4.1 Analysis of syllable- and word-final /s/

For the coding of /s/, there are nine different categories, of which six are fricatives. These are distinguished based on the place of articulation. The alveolar fricative [s] receives code 1; a representative sonogram is shown in Figure 1. Aspiration is coded as [h] (coded category: 2, with the sonogram in Figure 2). Elision (coded category: 8, Figure 3) is only coded if no traces of aspiration are visible in the spectrogram (visual inspection of the sonogram in Praat, Boersma and Weenink, 2021). The Kappa value of this coding system is 0.91, indicating “almost perfect agreement.”

Category 9 in the coding system is applied when the utterances in the corpus are mispronounced or insufficiently clear, making definitive coding impossible. Categories 8 (elision) and 9 (unknown) are assigned the same code in the coding of the remaining two consonants.

Table 2: Numeral coding system for the realization of the Spanish consonant /s/

1	Alveolar fricative [s] or [z]
2	Glottal fricative [h] (aspiration)
3	Dental fricative [θ] or [ð]
4	Retroflex fricative [ʂ] or [ʐ]
5	Palatal fricative [ç] or [j]
6	Velar fricative [x] or [χ]
8	Elision [ə]
9	Unknown

Figure 1: Realization of /s/ in *toros* as alveolar fricative [s] (wordlist, TiAlBa), ar_ba_01 (Buenos Aires)

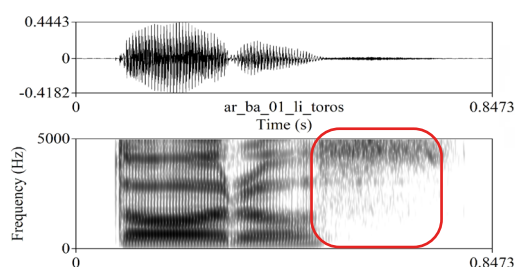


Figure 2: Realization of /s/ in *mismo* as glottal fricative [h] (wordlist, TiAlBa), ar_ba_10 (Buenos Aires)

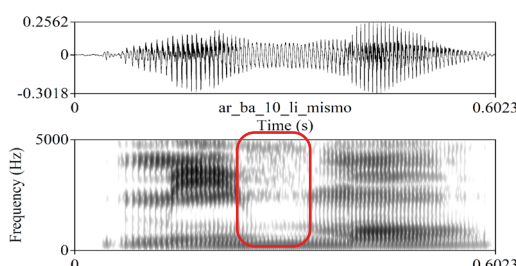
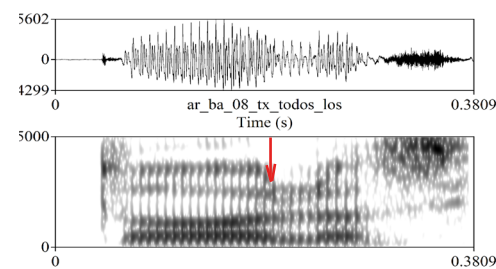


Figure 3: Elision of /s/ in *Todos* (followed by *los*) (text, TiAlBa), ar_ba_08 (Buenos Aires); the arrow marks the transition from [o] to [l], thereby indicating the elision of /s/



4.2 Analysis of intervocalic /d/

The coding system for intervocalic /d/ comprises five categories (Table 3) and achieved a Fleiss’ Kappa value of 0.945. Moreno Fernández (2004, p. 999) classifies the realization of intervocalic /d/ into three categories: *fricativa*, *relajada*, and *elidida*, while Malaver and Samper Padilla (2016, p. 330) distinguish between *plena*, *debilitada*, and *elidida*. Since the speech recordings in the TiAlBa corpus are of sufficient quality for phonetic analysis, the project’s coding system differentiates between the alveolar plosive (Category 1), the dental fricative (Category 2), the dental approximant (Category 3), and elision (Category 8).

Table 3: Numeral coding system for the realization of the Spanish consonant /d/

1	Alveolar plosive [d]
2	Dental fricative [θ] or [ð]
3	Dental approximant [ɻ]
8	Elision [ø]
9	Unknown

Plosives were coded only when a burst release was visible in both the spectrogram and oscillogram (Praat, Figure 4). Code 3, approximant, was assigned when the formant structure was clear, continuous, and uninterrupted (Figure 6, cf. Martínez Celdrán, 1991). Category 2 includes fricatives, that is, cases in which the formant structure of the preceding and following vowel is disrupted by friction (Figure 5). Elisions were assigned when no acoustic signal was present, meaning that even higher formants (F_3 and F_4) exhibited no movement.

Figure 4: Realization of /d/ in caudal as plosive [d] (wordlist, TiAlBa), cl_pa_10 (Punta Arenas)

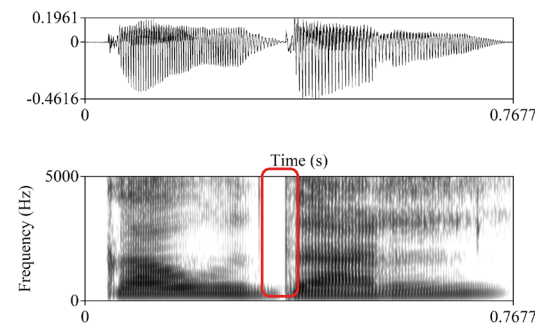
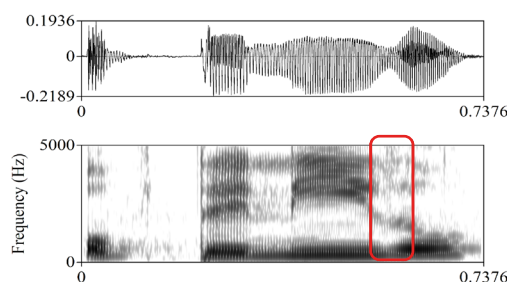
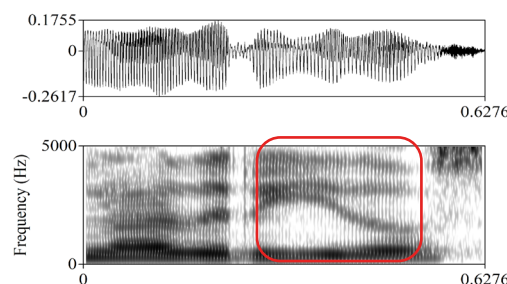


Figure 5: Realization of /d/ in *obtenido* as dental fricative [ð] (text, TiAlBa), ve_ca_06 (Caracas)**Figure 6:** Realization of /d/ in *ladridos* as approximant [ð̞] (text, TiAlBa), ve_ca_06 (Caracas); the red outline highlights the pronunciation of *ido* with the uninterrupted formant structure

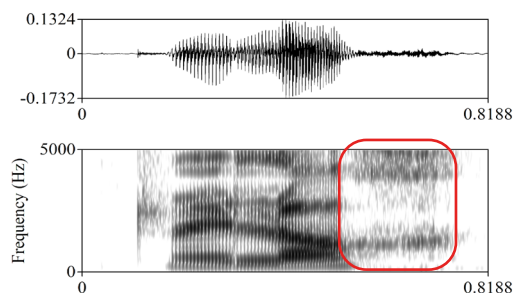
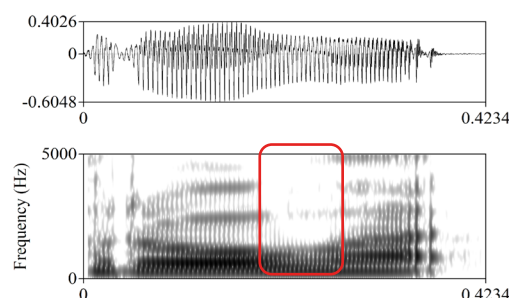
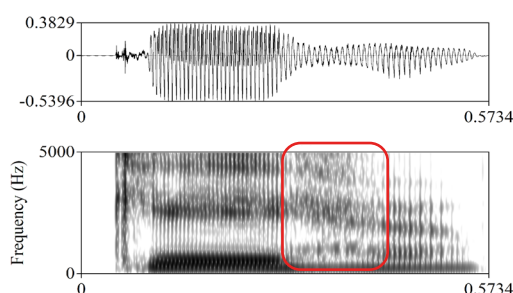
4.3 Analysis of /x/

The fricative /x/ in Spanish corresponds to three different graphematic representations: <j> (e.g., *reloj*), <g> before the front vowels <e> and <i> (e.g., *gente*), and <x> in the lexeme *México*. A dedicated coding system was developed for the fricative /x/, accounting for seven different realizations and achieving a kappa value of 0.84.

Table 4: Numeral coding system for the realization of the Spanish consonant /x/

1	Velar fricative [x]
2	Glottal fricative [h]
3	Palatal fricative [ç]
4	Alveolar or velar plosive [t] or [k]
5	Intermediate category, [x] ~ [h]
8	Elision [ø]
9	Unknown

The velar fricative [x] (Figure 7) is distinctly identifiable in the sonogram, contrasting sharply with its aspirated realization as [h] (Figure 8). A distinctive feature of this coding system is Category 5, the intermediate category, which includes realizations that combine a velar fricative with a glottal articulation (e.g., [xh]) or exhibit both aspiration and additional friction. In this case, the sonogram shows voice bar and formant structure typical of approximants, although in a partially dissolved form where friction is present (Figure 9). To distinguish between the three mentioned pronunciation variants, the oscillogram is particularly informative (compare Figures 7-9).

Figure 7: Realization of /x/ in *reloj* as velar fricative [x] (wordlist, TiAlBa), ar_ba_01 (Buenos Aires)**Figure 8:** Realization of /x/ in *rojas* as glottal fricative [h] (text, TiAlBa), rd_co_01 (Consuelo); final /s/ is elided**Figure 9:** Realization of /x/ in *queja* coded as intermediate category (wordlist, TiAlBa), rd_co_06 (Consuelo)

5. RESULTS

This chapter presents the results of the analysis, beginning with a descriptive examination of the data, followed by a statistical investigation of the relationships between pronunciation variation and the independent variables.

5.1 Overall quantification

Tables 5 to 7 illustrate the distribution of the respective pronunciation variants for the three consonants under investigation. All values presented are rounded to two decimal places to ensure consistency and clarity in the quantitative analysis. The tables only present the variants that have actually been coded. For example, Category 9 (unknown), which is accounted for all consonants in Tables 2-4 of the coding system, does not apply.

For the pronunciation of syllable- and word-final /s/ (Table 5), 750 cases were analyzed. The most frequent realization across all data is the alveolar fricative ([s] or [z], 54.47%), with the highest proportion found in Consuelo (68.75%) and the lowest in Camagüey (39.29%). The glottal fricative [h] is particularly prevalent in Caracas (29.41%) but less common in Consuelo (6.25%). Notably, elision ([ø]) occurs frequently, especially in Camagüey (25.71%) and Consuelo (22.66%), while other variants, such as the retroflex fricative [ʂ] or the palatal fricative [ç], appear only marginally.

Regarding intervocalic /d/ (Table 6), a total of 516 realizations were analyzed. The approximant [ð] is the dominant realization (66.28%), particularly in Buenos Aires (90.53%) and Punta Arenas (77.08%). Fricatives ([θ] or [ð]) occur in 18.99% of cases, with their highest frequency in Consuelo (45.65%). The plosive variant [d] is relatively rare overall (7.95%), though it is notably more frequent in Consuelo (22.83%). Elision of /d/ is least common (6.78%), with a slightly higher prevalence in Camagüey (10.20%).

Table 5: Distribution of pronunciation variants for syllable- and word-final /s/

Code	Pronunciation variant	Total	Camagüey	Caracas	Consuelo	Buenos Aires	Punta Arenas
1	Alveolar fricative [s], [z]	54,47%	39,29%	52,45%	68,75%	55,32%	58,82%
2	Glottal fricative [h]	20,43%	25,71%	29,41%	6,25%	18,44%	16,91%
3	Dental fricative [θ], [ð]	7,08%	9,29%	4,41%	2,34%	11,35%	8,82%
4	Retroflex fricative [ʂ], [ʐ]	0,13%	-	-	-	0,71%	-
5	Palatal fricative [ç], [j]	0,13%	-	-	-	-	0,74%
6	Velar fricative [x], [χ]	1,07%	-	0,49%	-	3,55%	1,47%
8	Elision [ø]	16,69%	25,71%	13,24%	22,66%	10,63%	13,24%

Table 6: Distribution of pronunciation variants for intervocalic /d/

Code	Pronunciation variant	Total	Camagüey	Caracas	Consuelo	Buenos Aires	Punta Arenas
1	Alveolar plosive [d]	7,95%	7,14%	4,44%	22,83%	1,05%	6,25%
2	Dental fricative [θ], [ð]	18,99%	14,29%	20,00%	45,65%	5,26%	10,42%
3	Dental approximant [ð]	66,28%	68,37%	66,67%	27,17%	90,53%	77,08%
8	Elision [ø]	6,78%	10,20%	8,89%	4,35%	3,16%	6,25%

Table 7: Distribution of pronunciation variants for /x/

Code	Pronunciation variant	Total	Camagüey	Caracas	Consuelo	Buenos Aires	Punta Arenas
1	Velar fricative [x]	42,38%	5,83%	19,42%	22,45%	94,06%	80,41%
2	Glottal fricative [h]	42,01%	65,05%	69,06%	52,04%	4,95%	7,22%
3	Palatal fricative [ç]	3,16%	1,94%	1,44%	1,02%	-	12,37%
4	Alveolar/velar plosive [t], [k]	0,93%	0,97%	0,72%	3,06%	-	-
5	Intermediate [x]~[h]	8,55%	21,36%	4,32%	17,35%	0,99%	-
8	Elision [ø]	2,97%	4,85%	5,04%	4,08%	-	-

For /x/ (Table 7), a total of 537 realizations were coded. A strong dialectal contrast is observed between Buenos Aires and Punta Arenas – where the velar fricative [x] predominates (94.06% and 80.41%, respectively) – and Camagüey and Caracas, where the glottal fricative [h] is predominant (65.05% and 69.06%, respectively). The intermediate variant [x]~[h] is more common in Camagüey (21.36%) and Consuelo (17.35%), while the palatal fricative [ç] is only marginally represented, occurring particularly in Punta Arenas (12.37%).

5.2 Results for the pronunciation of syllable- and word-final /s/

Statistical analysis was performed in R using generalized linear mixed effects models (glmer) implemented in the library *lme4* (Bates, *et al.*, 2015). In light of concerns that a p-value threshold of 0.05 allows for a high rate of false positives (Colquhoun, 2017), a more stringent significance threshold of 0.001 is adopted. The type of consonant realization (s. Table 2-4 for the codes) was the dependent variable and the PROTOCOL (*wordlist*, *text*, *interview*), LEFT, and RIGHT PHONOLOGICAL CONTEXT (*front*, *central*, *back vowel*), SYLLABLE STRESS (*stressed*, *unstressed syllable*), CITY OF ORIGIN of the speakers (*Camagüey*, *Caracas*, *Consuelo*, *Buenos Aires*, *Punta Arenas*), GENDER (*male*, *female*) and AGE (*young*, *middle*, *old*) were the predictors. SPEAKER was treated as a random effect to prevent extremes in individual behavior from biasing the results (Winter 2020, pp. 232-233; Bäumlér, 2022, p. 144).

The analysis examined the factors conditioning the aspiration of Spanish /s/ as [h]. Figures 10a and 10b show forest plots of a generalized linear mixed-effects logistic regression model (aspiration vs. no aspiration). Figure 10.a summarizes the sociolinguistic predictors: the speakers' CITY OF ORIGIN, AGE GROUP, and GENDER

(variable values as specified above). Figure 10.b displays the linguistic predictors, including SPEECH PROTOCOL, PHONOLOGICAL CONTEXT immediately to the LEFT and RIGHT of the target sound, and SYLLABLE STRESS.

The plotted values represent the model's log-odds estimates for each factor level, calculated relative to a reference category (*Consuelo* for CITY, *middle-aged speakers* for AGE, *male* for GENDER in Figure 10.a; and *wordlist* for PROTOCOL, *central vowel* for LEFT PHONOLOGICAL CONTEXT, *pause* for RIGHT PHONOLOGICAL CONTEXT, *unstressed syllable* for STRESS in Figure 10.b). Positive estimates indicate an increased likelihood of aspiration ([h]), whereas negative estimates indicate a decreased likelihood. The horizontal error bars correspond to 95% confidence intervals, calculated as estimate $\pm 1.96 \times$ standard error. The plots were created using the *ggplot2* package (Wickham, 2016) in R, with a vertical dashed line at zero indicating no effect relative to the reference category.

Regarding sociolinguistic factors, the model reveals significantly higher aspiration rates in all examined cities compared to *Consuelo*. The Caribbean cities Camagüey and Caracas show the strongest effects, followed by Buenos Aires and Punta Arenas further south. None of the confidence intervals cross zero, confirming the significance of these differences and indicating a clear geographic gradient in /s/ aspiration. Both younger and older age groups show a non-significant trend toward less aspiration than middle-aged speakers, the reference group in the model, as reflected by their negative estimates in the forest plot. Although gender did not have a significant effect on aspiration, women showed a tendency to aspirate /s/ more often than men.

Among linguistic predictors, aspiration was significantly less frequent in the wordlist condition, compared to text reading and spontaneous speech. Phonological context showed that consonantal and vocalic contexts immediately following /s/ significantly increase the frequency of aspiration compared to a following pause. This effect is primarily linked to the wordlist condition, where word-final /s/ is most often followed by a pause (e.g., *toros*). Aspiration of /s/ tended to be lower in stressed syllables than in unstressed ones, though this effect was not significant.

For the elision of /s/ ([ø]), the statistical analysis, again performed using *glmer*, revealed significant influences of linguistic and sociolinguistic variables (results not shown in plots). Protocol type has a strong effect, with elision occurring significantly less frequently in text reading and wordlist conditions compared to spontaneous speech. Elision of /s/ is significantly more frequent before consonants than before a pause, with no significant difference between vowels and pause or between consonants and vowels. The results indicate that stress has a significant influence on the elision rate, with unstressed syllables showing a higher likelihood of elision. In the investigation of the variables of origin, gender, and age, no significant effects were observed. However, it is noteworthy that male speakers exhibited a higher likelihood of aspiration compared to female speakers, although this difference did not reach statistical significance.

Figure 10a: Results of the generalized linear mixed effects model for the pronunciation of /s/ as aspirated variant [h], showing the effects of sociolinguistic variables (log-odds estimate 95% CI)

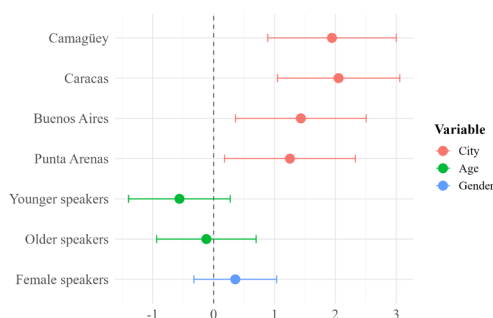
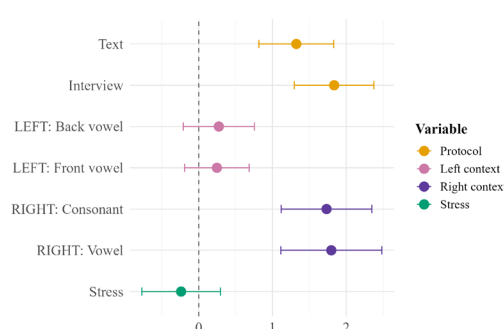


Figure 10b: Results of the generalized linear mixed effects model for the pronunciation of /s/ as aspirated variant [h], showing the effects of linguistic variables (log-odds estimate 95% CI)



5.3 Results for the pronunciation of intervocalic /d/

The results of the generalized linear mixed-effects models for the pronunciation of intervocalic /d/ are presented in Figures 11a and 11b. Figure 11a shows the effects of sociolinguistic variables on the realization of /d/ as an approximant, while Figure 11b illustrates the effects of linguistic variables. City significantly influences the realization of /d/: The approximant is produced significantly more often in Buenos Aires, Caracas, Camagüey, and Punta Arenas compared to Consuelo. Regarding socio-demographic variables, women tend to aspirate slightly less than men, but this difference is not statistically significant. Men, however, realize significantly more elisions than women. Additionally, although elision is not depicted in the forest plots, it was analyzed as part of the study. Age shows no significant effect on pronunciation variation.

Regarding linguistic factors, protocol type significantly affects the realization of the approximant: it occurs considerably more frequently in interviews than in wordlists (log-odds estimates around 2 in the forest plot), indicating greater articulatory reduction in less controlled speech. A significant difference is also found between the wordlist and text reading conditions, but not between text reading and interviews. This suggests that articulatory reduction primarily increases from the more controlled wordlist to the less controlled text conditions, with the wordlist being the most regulated part of the protocol. The generalized linear mixed-effects model also shows that the realization of /d/ as fricative occur predominantly in the wordlist condition, indicating an increased likelihood of fricative realization in more controlled speech.

The left phonological context is crucial, with the central vowel /a/ (e.g., *jubilado*, *pasada*) serving as the model intercept and strongly favoring the realization of both fricatives and approximants. Regarding the right context, Figure 11b shows that both back and front vowels increase the likelihood of aspiration compared to the intercept (central vowel). A following back or front vowel reduces the likelihood of fricative realization compared to a central vowel. However, the variance of the speaker random effect indicates considerable individual variability in fricative production.

Regarding stress, it has a significant effect on approximant pronunciation, with approximants occurring more frequently in unstressed than in stressed syllables.

Figure 11a: Results of the generalized linear mixed effects model for the pronunciation of /d/ as approximant, showing the effects of sociolinguistic variables (log-odds estimate 95% CI)

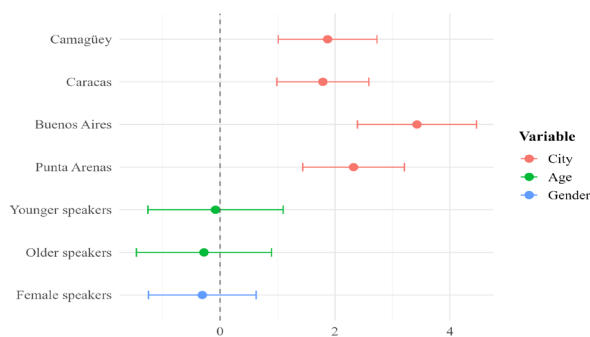
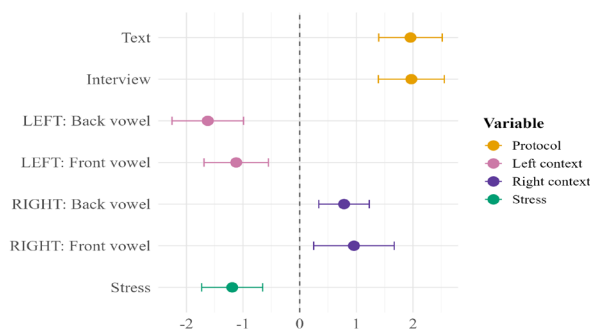


Figure 11b: Results of the generalized linear mixed effects model for the pronunciation of /d/ as approximant, showing the effects of linguistic variables (log-odds estimate 95% CI)



5.4 Results for the pronunciation of /x/

Notable dialectal differences emerge in the realization of /x/: speakers from Buenos Aires exhibit the highest frequency of the velar fricative [x], occurring in 94.06% of relevant tokens (see Table 7). In contrast, speakers from Caracas, Camagüey, and Consuelo show significantly lower probabilities of realizing [x] compared to Buenos Aires, as confirmed by the statistical model.

Regarding aspiration, the results for sociolinguistic variables are presented in Figure 12a, while linguistic variables are shown in Figure 12b. For the variable CITY, as in the analysis of /s/ and /d/ realization, Consuelo serves as the intercept (reference category). The analysis reveals no significant difference in the realization of /x/ between Consuelo and the other Caribbean cities, Camagüey and Caracas, indicating clear similarities within the Caribbean region as opposed to Buenos Aires and Punta Arenas. Neither age nor gender significantly affects the realization of /x/, suggesting that variation is primarily driven by regional and phonological factors.

Concerning linguistic factors, the statistical analysis finds no significant effect of speech protocol or syllable stress on the realization of [h]. However, the left phonological context significantly influences the realization of /x/: a preceding vowel reduces the likelihood of /x/ being realized as [h] compared to a pause (e.g., *reloj* vs. *jinete* or *juzgar* from the wordlist). For the right phonological context, only tokens followed by a pause (e.g., *reloj*) or by a vowel (e.g., *jinete*, *juzgar*) were available in the data. In this case, a vowel in the right context significantly increases the likelihood of [h] realization compared to a pause.

Figure 12a: Results of the generalized linear mixed effects model for the pronunciation of /x/ as aspirated variant [h], showing the effects of sociolinguistic variables (log-odds estimate 95% CI)

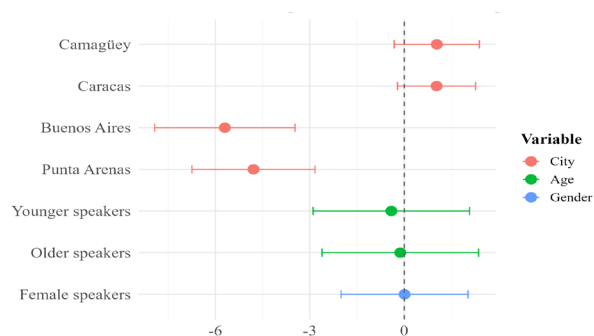
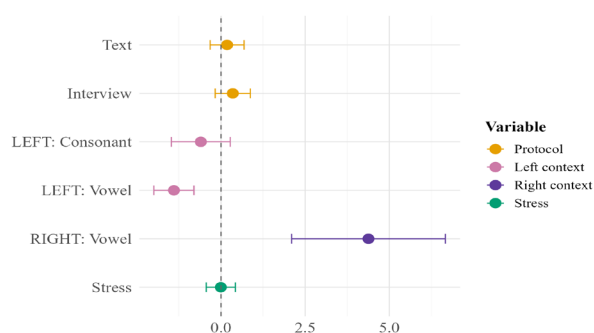


Figure 12b: Results of the generalized linear mixed effects model for the pronunciation of /x/ as aspirated variant [h], showing the effects of linguistic variables (log-odds estimate 95% CI)



The hypothesis regarding the palatal fricative [ç] suggests that this variant occurs predominantly in Chile (section 2.2.3; Oroz, 1966, pp. 53-54, 124; Aleza Izquierdo, 2010, p. 84; Hualde, 2014, p. 149). This is confirmed by the empirical analysis, which reveals significant differences in frequency when compared to the three locations in the Caribbean. Surprisingly, the phonological context does not exhibit clear effects, as no significant predictors emerge, even when only considering data from Punta Arenas. Additionally, the protocol does not have a significant influence on the realization of this variant, although there is a tendency for [ç] to occur more frequently in the wordlist than in the text and interview. Age and gender also do not significantly affect the realization of this variant.

6. DISCUSSION

In Section 2.2 we noted, based on previous research, that the consequent weakening of syllable- and word-final /s/ reaches its strongest manifestation in the Caribbean region. The present results, however, suggest that this region cannot be treated as a uniform domain for /s/-weakening. As shown in Table 5 and Figure 10a, with Consuelo serving as the intercept (that is, the reference level) for the variable CITY, the probability of producing the aspirated variant [h] is significantly higher in both Caracas and Camagüey than in Consuelo. This pattern indicates that the three Caribbean locations under study do not exhibit a consistent behavior for /s/. For /d/-weakening to the approximant ([d] > [ð]), as for /s/-weakening to the aspirated variant ([x] > [h]), CITY is the only significant sociolinguistic variable, with Consuelo differing significantly from the other locations.

The results regarding the realization of /x/ as [h] show that the three Caribbean locations form a relatively homogeneous group that, as such, clearly sets itself apart from Buenos Aires and Punta Arenas. As shown in Figure 12a, neither Caracas nor Camagüey differs significantly from Consuelo, indicating that diatopic variation within the region does not affect this variable. While [h] constitutes the standard variant in the Caribbean cities under study – even though Consuelo, with only 52.04%, falls behind Camagüey and Caracas, both of which exceed 65% – the standard variant in Buenos Aires and Punta Arenas is clearly the velar fricative [x]. Accordingly, significant differences emerge when comparing the three Caribbean locations to the other two sites, Buenos Aires and Punta Arenas.

Taken together, these results point to a strong role of CITY as a predictor of pronunciation patterns, while AGE and GENDER remain non-significant across all cases analyzed. This highlights the relevance of geographic variation for the phenomena under study, while also indicating that social factors such as age and gender exert comparatively little influence in this dataset.

The linguistic variables, including the protocol, the phonological context to the left and right, and syllable stress, play a more heterogeneous role across the three consonants. While all of these variables are significant for intervocalic /d/, only the right phonological context is significant for /x/, with a vowel in this position (e.g., *jinete*) rather than a pause (e.g., *reloj*) leading to a higher rate of aspiration. For /s/, both the right phonological context (e.g., a consonant, as in *mismo*; a vowel, as in *Buenos Aires*; or a pause, as in *toros*) and the protocol are relevant factors. It is important to note, however, that the left and right phonological contexts differ across consonant analyses: for intervocalic /d/, different types of vowels were considered (Figure 11b shows the central vowel as the intercept, with back and front vowels plotted). For syllable-final /s/, there are naturally no pauses in the left phonological context and no consonant examples in the dataset, so the three vowel categories were compared (central vowel versus front and back vowels); in the right context, a pause was used as the intercept and vowels and consonants were compared. For /x/, the left context compared pause, consonant, and vowel, while in the right context a pause was compared only with vowels, as no consonant examples were available in the dataset.

We can contrast our findings with additional results from the research literature: the results confirm that /s/-weakening occurs more frequently in Cuba than in Buenos Aires (Hualde 2014, pp. 158-159, see Table 5). They further support Klump's (2021, p. 749) findings that elision primarily characterizes spontaneous informal speech in Cuba (NGLE, 2011): In Camagüey (Cuba), elision occurs in 25.71% of the speech data (Table 5), but when considering only interviews, elision rises to 53.13%. In Consuelo (Dominican Republic), aspiration occurs in 1.5% of male speech and elision in 16.67%. In interviews, aspiration increases to 6.67% and elision to 40%. In contrast, female speakers show 11.29% aspiration and 29.03% elision across all recordings, with 13.33% aspiration and 60% elision in interviews. Thus, contrary to Alba's (2004) hypothesis, women weaken /s/ more frequently than men, even though the differences are not statistically significant.

Previous studies suggest that intervocalic /d/ elision is most prevalent in the Caribbean region. However, our findings reveal considerable variation within this area itself (see the differences between Camagüey and Consuelo, Table 6). Malaver and Perdomo (2016) report 54% elision, 28% approximants, and 18% fricatives for Caracas. Yet, in our overall data, elision occurs in only 8.89%, approximants in 66.67%, and fricatives in 20%. When considering only the interview data, the elision rate rises to 20%, approximants increase to 75.56%, and fricatives decrease to 4.4%.

The results of the study largely align with previous findings on regional variation in the realization of /x/. In Buenos Aires and Punta Arenas, the velar fricative [x] is overwhelmingly the standard variant (94.06% and 80.41%, respectively), consistent with the Rioplatense and Chilean patterns described in the literature (Rosenblat, 1990; Oroz, 1966; Aleza Izquierdo, 2010; Hualde, 2014). By contrast, in the three Caribbean locations, aspiration [h] emerges as the most frequent variant, with rates of 65.05% in Camagüey, 69.06% in Caracas, and 52.04% in Consuelo (see Table 7). When considering only spontaneous speech, the prevalence of [h] increases, particularly in Caracas, where 79.07% of /x/ realizations are aspirated, compared to 67.74%

in Camagüey and 53.33% in Consuelo. This pattern confirms the general tendency toward debuccalization in Caribbean varieties, as reported for Cuba, Central America, and Colombia (Hualde, 2014; Klump, 2021). However, the extreme elision described for Cuban Spanish (Lipski, 1994) cannot be confirmed in this dataset, as deletion occurs in only 4–5% of cases in the three Caribbean locations and is absent entirely in Buenos Aires and Punta Arenas.

7. CONCLUSION AND FUTURE DIRECTIONS

In this study, Atlantic Spanish was empirically examined in relation to the coastal regions of Hispanic America, drawing on data from the *Tierras Altas y Bajas de Hispanoamérica* (TiAlBa) corpus. The analysis focused on the pronunciation of /s/ in syllable- and word-final position, intervocalic /d/, and /x/ (graphemes <j> and <g> before front vowels). Speech data from 60 participants were included, balanced across gender (30 male, 30 female) and evenly distributed across three age groups (young, middle, old; 20 speakers each; see Table 1).

Some similarities were observed across the three consonants under investigation, most notably that age and gender had no significant effect on their pronunciation. In contrast, diatopy proved highly informative, generally producing significant differences between locations. The only exception was /x/ realized as [h], where Camagüey, Caracas, and Consuelo could not be significantly distinguished, indicating that the speakers from these locations show relatively homogeneous pronunciation in this context. Sociolinguistic and speech-style factors – including protocol, left and right phonological context, and syllable stress – emerged as significant to varying degrees depending on the consonant.

Focusing on the Caribbean varieties, Consuelo diverges noticeably from the other two Caribbean sites in certain features, such as the aspiration of /s/ and the realization of intervocalic /d/ as a plosive [d]. At the same time, the Caribbean sites show commonalities in other respects, for example the realization of /x/ as [h], as a palatal fricative [ç], or its elision. Notably, /x/ also serves to distinguish the Caribbean region from the southern sites Buenos Aires and Punta Arenas, which exhibit a more homogeneous pattern. Overall, each consonant must be considered individually, as distinct characteristics emerge for each.

The analysis presents certain challenges. It is very difficult to measure the exact influence of sociolinguistic factors on pronunciation. First, speech recordings only capture a limited number of speakers, preventing generalizations from the findings. In particular, the sample size ($n = 12$ per city, 60 speakers in total) constrains the breadth of the analysis. Second, it is important to acknowledge that numerous other factors influencing a person's pronunciation may not be verifiable or comparable (e.g., social circle, personal traits, socio-economic status, etc.).

Future research could include investigation points from the Canary Islands and Andalusia to further examine these relationships. Additionally, it would be beneficial to contrast the data from the five studied locations along the Atlantic coast with corresponding sites on the Pacific coast and/or with varieties spoken inland (*tierras altas/bajas*). This comparative analysis would help determine the extent to which a relative homogeneity exists across these contrasting regions.

ACKNOWLEDGMENTS

I would like to thank Isabel Hernández Montalbán (University of Salamanca) and Michelle Müller (University of Bochum) for their contributions to the development of the coding systems.

DECLARATION OF COMPETING INTEREST

The author of this article declares that he has no financial, professional or personal conflicts of interest that could have inappropriately influenced this work.

FUNDING SOURCES

The funding for conducting the speech recordings and transcriptions was provided through an Argelander Starter Grant from the University of Bonn.

AUTHORSHIP CONTRIBUTION STATEMENT

Verena Weiland: Conceptualization, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing.

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