

CLICK VARIATION AND REACQUISITION IN TWO SOUTH AFRICAN NDEBELE VARIETIES

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This article deals with click consonants in two Nguni varieties of South Africa, namely isiNdebele, or Southern Ndebele, as it is better known outside of South Africa; and Sindebele, or Northern Transvaal Ndebele. We review previous research on the topic, in which isiNdebele been described as having a somewhat reduced click inventory compared to better described Nguni languages, and Sindebele has been claimed to have lost clicks completely. We also review previous research on click loss, variation, and acquisition. We then describe the current situation of both language varieties regarding clicks. For Sindebele, we observe that while clicks indeed seem to have been almost completely replaced by other consonants, some speakers still do produce clicks in isolated words, possibly as a result of recent contact with isiZulu. In isiNdebele, we find that the lateral click has been lost almost completely, while the distinction between dental and postalveolar has been lost for some speakers (with most of them preferring the dental click), whereas some speakers still maintain the distinction. We propose a tentative correlation between increasing formal education in the isiNdebele language and the tendency to maintain the two clicks as distinct, but generally find the functional load of the distinction to be very low, at least on a lexical level.

1. INTRODUCTION

The language varieties known as Ndebele belong to the Nguni branch of the Southern Bantu languages. All Nguni languages are spoken in South Africa, with the exception of Northern Ndebele (or Zimbabwean Ndebele), which is spoken in Zimbabwe. Southern Ndebele (sometimes known as Transvaal Ndebele, or isiNdebele, used below) is spoken to the east of Pretoria in the former apartheid-era homeland of KwaNdebele. However, the Northern Ndebele of Zimbabwe is, despite its name, more closely related to isiZulu than to isiNdebele.

A third Ndebele language is Sumayela Ndebele (sometimes called Northern Transvaal Ndebele) or Sindebele (used below), spoken in Limpopo, in and around the town of Mokopane. While sometimes considered a dialect of isiNdebele, Sindebele is quite distinct from it and is under considerable influence from neighboring Sotho-Tswana languages. In fact, even the position of Sindebele within the Nguni branch is an open question.

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This study looks at the two Ndebele varieties spoken in South Africa, to the exclusion of Northern Ndebele in Zimbabwe. While isiNdebele has approximately 1.1 million speakers and is one of the official languages of South Africa, Sindebele lacks any official recognition and is only spoken by some thousands of people.

Click consonants are a prevalent feature of the Nguni languages, but both South African Ndebeles have been described as having reduced click inventories – isiNdebele with only two phonemic series clicks and Sindebele with none. This study seeks to investigate the variation in click use (or non-use) in these languages as well as the sociolinguistic factors affecting it.

The main research topic for isiNdebele is the variation in the place of articulation of click consonants, and the research questions investigated are as follows:

1. How does production of click consonants vary in isiNdebele?
2. How many phonemic clicks are in the consonantal inventory of isiNdebele?
3. Does varying familiarity with other Nguni languages with larger click inventories correlate with varying realizations of clicks?
4. Does the age of speakers correlate with variations in click realization?
5. Does the level of education of speakers correlate with variation?

For Sindebele, the relevant inquiries can be stated as follows:

1. Are there cognate lexemes in Sindebele with clicks in their isiNdebele equivalents?
2. Which speech sounds in Sindebele correspond to the clicks of isiNdebele?
3. Can earlier descriptions of the above be confirmed?

2. PRELIMINARIES

In the following sections we will present an outline of some common features of the phonological systems of the Nguni languages with a focus on their click consonant inventories, along with an overview of what has been previously reported regarding click consonants in Sindebele and isiNdebele. We also include discussion of previous research on click loss and variation, and review some of the relevant sociolinguistic literature.

2.1 Click consonants in the phonological systems of the Nguni languages

Unusually among Bantu languages, Southern African languages, and the Nguni languages in particular, are known to have relatively large consonant inventories. Some of the less typical features – at least for Bantu languages – include, in addition to the click consonants, lateral fricatives and affricates, numerous places of articulation (up to six in isiNdebele and isiXhosa) and a three-way contrast in manner of articulation for plosives and affricates. All of the Nguni languages are tonal. They are known for a relatively well studied interaction between the segmental and

prosodic levels of the phonological system known as tonal depression, in which a set of mainly obstruent consonants known as depressor consonants causing the pitch of the following mora to lower (along with other language dependent changes).

With the sole exception of Sindebele, all the Nguni languages have clicks. Three series of clicks – dental, postalveolar, and lateral – are found in Siphûthî (Donnelly 2007: 63–65), isiXhosa (Doke 1967: 93; Gowlett 2003: 615–616), Zimbabwean Ndebele (Sibanda 2004: 4–7), and isiZulu (Khumalo 1987: 102–106). Manners of articulation range from four in Siphûthî to six in isiXhosa. The isiXhosa set includes plain, aspirated, slack or breathy voiced, and nasalized, as well as slack voiced nasal and glottalized nasal clicks, while isiZulu and Zimbabwean Ndebele lack the glottalized nasal series.¹ The click inventory in siSwati is reduced to one place of articulation (dental, but with idiolectal variation) with four accompaniments: plain, aspirated, voiced, and nasalized (Lanham 1960: 57–60).² The situation in isiNdebele, which is similar to that of siSwati, will be discussed in detail in subsequent sections.

It should be pointed out that descriptions of Southern Bantu languages variously refer to the postalveolar click series as alveolar (e.g. Khumalo 1987: 102–106 for isiZulu), palatal (e.g. Poulos & Msimang 1998: 481, again, for isiZulu, and Donnelly 2007: 64–65 for Siphûthî), or as being located somewhere between these two places – for example as postalveolar (e.g. for Zimbabwean Ndebele by Sibanda 2004: 5–7) or palato-alveolar (e.g. Skhosana 2009: 73 for isiNdebele, and Doke 1967: 35 for all the Southern Bantu languages that have clicks). While there may well be variation between languages regarding the place of articulation of this series of clicks, the seeming confusion in terminology is not very surprising, given that no Nguni or other Southern Bantu language makes a four-way distinction in place of articulation of click consonants. There is thus no great functional pressure to clearly distinguish between alveolar and palatal places of articulation – the speakers would have no need to be exact in their pronunciation regarding the place of articulation of this click series. This would, in turn, allow for more free variation between and within idiolects, as well as conditioned variation due, for example, to the influence of the tongue positions required by surrounding vowels. Thus, it would be quite plausible for clicks of this series to average out as being produced somewhat between the alveolar and palatal places of articulation commonly found in the non-Bantu click languages of southern

1 Doke (1967: 93) claims the glottalized nasal series occurs (though rarely) in isiZulu, and that isiXhosa even has a seventh series, with a voiced glottal fricative following click release. Neither claim can be substantiated by later descriptions of those languages.

2 *Accompaniment* is how the specialist literature commonly refers to the various manners of articulation and co-articulations that click consonants display.

Africa. We have chosen to refer to this series of clicks as postalveolar, as this fits our observations of isiNdebele best.

2.2 *No (more) clicks in Sindebele*

The phonological system of Sindebele has been described by Ziervogel (1959) and later Msimang (1989) and Skhosana (2009) as not having clicks. Ziervogel, however, states that there was a time when clicks were present in the language, as recalled by his older informants. He also mentions a handful of plant names, still in use at the time of his writing, that contain clicks (Ziervogel 1959: 33). According to Skhosana (2009: 71), these click words are no longer in use, and words similar to ones in Northern Sotho are used instead.

Ziervogel (1959: 33) notes similarities between Sindebele words and equivalent words in other Nguni languages with clicks in them. In his examples, the ejective velar affricate /kx'/ corresponds to non-nasal clicks, while nasal clicks are represented by the velar nasal /ŋ/ in Sindebele.

Sindebele has a set of fricative and affricate consonants which are not typically found in Nguni languages. In addition to the ejective velar affricate mentioned above, an aspirated velar affricate /kx^h/ as well as an aspirated labio-palatal affricate /pf^h/ are attested, along with the fricatives /x/ and /χ/. All these sounds are more widely found in the Sotho-Tswana languages, with which Sindebele has been in intensive contact since at least the seventeenth century (the region is mainly Sepedi-speaking; see, e.g. Doke (1967) for more on Sotho-Tswana consonants).³

2.3 *Clicks in isiNdebele*

In earlier literature, the click inventory of isiNdebele is described as more or less similar to that of isiZulu, with the same three places of articulation – that is, dental, postalveolar, and lateral – and five accompaniment types, although they are not always presented as being distributed evenly (see, e.g. Potgieter 1950; Skhosana 2009: 53–54, 73–74). However, the lateral series is seen as very marginal by Skhosana (2009: 54, 74), only occurring with the nasal accompaniment on some ideophones and verbs derived from them.

3 See Loubser (1994) for a treatment of the archaeological evidence of Mandebela presence in the Transvaal, as well as an overview of relevant ethnographic information. Especially relevant for the claim made here of centuries of contact with Sotho-Tswana speaking populations is the discussion of ceramic traditions in archaeological sites associated with Mandebela groups, showing a strong presence of ceramics of the Moloko tradition, associated commonly with Sotho-Tswana speakers, throughout the assumed Mandebela occupation, alongside ceramics of the Letaba tradition, associated especially with Venda sites elsewhere (Loubser 1994: 138–141).

The same situation can be seen in the bidirectional isiNdebele–English dictionary (Iziko lesiHlathululi-mezwi sesiNdebele 2006), in which only two words with a lateral click occur, both nasalized. The dental and postalveolar series are, however, both represented in the dictionary, each with all five accompaniments.

However, in the other dictionary available for isiNdebele, an English–isiNdebele unidirectional dictionary (Shabangu & Swanepoel 1989), instances of the lateral click are more numerous, with 40 entries attested, representing approximately 20–30 different roots with four accompaniment types.⁴

When comparing the dictionaries, we found that the entries containing lateral clicks in the English–isiNdebele dictionary either corresponded to roots containing a dental click in the isiNdebele–English dictionary or had no corresponding lexemes in the isiNdebele–English dictionary. Out of 22 roots we compared with <x>, we found no corresponding entry in the isiNdebele–English dictionary for eleven of them; for six, the corresponding click was represented with <c>; for two, it was represented as <q>; and for one root, <-xol->, which has numerous derivations in both dictionaries, we found reflexes with both <c> and <q>, for example <icolo>, <iqolo> ‘forgiveness’ and <-colela>, <-qolela> ‘forgive’. Reflexes of derivations of <-xol-> with (only) <c> were more common, for example <-colisa> ‘ask for forgiveness’ and <ukucolelwa> ‘amnesty’.

Finally, there were two forms for which no direct correspondence was found, but for which possible cognates nonetheless suggested themselves. The first, <-xabana> ‘quarrel’ seems to be a reciprocal derivation from the root <-qaba> ‘block across, cross’ – this is corroborated by the isiZulu cognate <-xabana>, derived from <-xaba> which as one of its meanings has ‘block the way, stand crosswise’ (Doke & Vilakazi 1953: 858). The second, <ixhaphozi> ‘vlei’ (a small, shallow, marshy lake or wetland) might be conceived as derived from <-chapha> ‘splash, stain’. Although that root is represented in the English–isiNdebele dictionary by two lexemes with <c>, <-chaphazela> ‘blot’ and <ichaphazana> ‘dot’, the isiZulu comparison might again point in the direction of a connection. In isiZulu both the roots <xapha> and <capha> exist, and both have one of their meanings relate to liquids or wetness (Doke & Vilakazi 1953: 109, 862). However, the connection here is less certain, both between the roots with different clicks, as well as between <ixhaphozi> and the underived root <xapha>. The full comparison can be found in Appendix I.

4 No examples of words with the non-nasalized depressor lateral click <gx> were found in any of our sources, but the other possibilities, i.e. plain <x>, aspirated <xh>, nasalized <nx>, and prenasalized depressor <ngx>, could all be found in Shabangu & Swanepoel (1989).

It thus seems that the common reflex of <x> in the English–isiNdebele dictionary and also of the historical lateral click /l/ is <c>, representing the dental click /l/. The historical connection can be supposed on the basis of isiZulu and isiXhosa reflexes of the <x> containing roots, as these also commonly represent the clicks in question with an <x> (when a cognate could be determined easily), which is indeed a lateral click in those languages.

Examples of each type of click found in the dictionaries are given in Table 1.⁵

Table 1 Examples of click containing words in isiNdebele dictionaries

	Dental	Postalveolar	Lateral
Plain	<ukucacisa> /ukulalisa/ 'to make clear'	<ukuqaqada> /uku!a!aḡa/ 'to climb up steep'	<ukuxabana> /ukullabana/ 'to quarrel'
Aspirated	<ukuchoba> /uku ^h oḡa/ 'to crush'	<ukuqhuba> /uku! ^h uḡa/ 'to prolong'	<ixhaphozi> /i!l ^h ap ^h ozi/ 'a vlei'
Depressor	<isigcino> /isi ^ḡ lino/ 'an end'	<isigqila> /isi ^ḡ !ilo/ 'a slave'	
Nasal	<ukuncancabeza> /uku ^ḡ !a ^ḡ !abeza/ 'to apologize'	<umnqopho> /um ^ḡ ! ^ḡ op ^h o/ 'an aim'	<ubunxemu> /ubu ^ḡ llemu/ 'a squint'
Nasal depr.	<ingcenyē> /iŋ ^ḡ !eŋe/ 'a part'	<ingqondo> /iŋ ^ḡ ! ^ḡ ondo/ 'a mind'	<ingxoxo> /iŋ ^ḡ !lollo/ 'a chat'

5 Click accompaniments are transcribed in the examples as follows: *plain* clicks only have the symbol for their respective click (dental l, postalveolar !, lateral ll; in the standard Nguni orthographies, such as that of isiNdebele, this is represented by any of the letters for the click consonants, <c>, <q>, or <x> by themselves), *aspirated* click are followed by the standard superscript *b* (dental l^h, postalveolar !^h, lateral ll^h; in the orthography, this is represented by the letter of the click consonant followed by an <h>: <ch>, <qh>, <xh>), *depressor* clicks are preceded by a superscript voiceless *g* (dental ḡ, postalveolar ḡ!; in the orthography this is indicated by a <g> preceding the click letter: <gc>, <gq>), *nasal* clicks are preceded by a superscript velar nasal (dental ḡ, postalveolar ḡ!, lateral ḡll; orthographically indicated by a preceding <n>: <nc>, <nq>). (Pre-)nasalized depressor clicks are phonetically realized in two significantly different ways, which are, accordingly, represented differently: either as preceded by a velar nasal and a superscript voiceless *g* (dental ḡ^ḡ!, postalveolar ḡ^ḡ!, lateral ḡ^ḡll) or in the same way as the (non-depressor) nasal clicks; in the orthography the (pre-)nasalized depressor clicks are represented by the digraph <ng> preceding the click letter itself: <ngc>, <ngq>, <ngx>.

It was noted as early as Potgieter (1950: 44) that not only was the inventory of click containing words in isiNdebele apparently significantly smaller than in isiZulu, but also that the realizations of some clicks had gotten, in his words, “confused” (Afrikaans *deurmekaar*). Potgieter does not elaborate much on what he means by this, but he does present some examples of isiNdebele words containing clicks for which the cognate isiZulu word has the click produced at a different place of articulation.

Of Potgieter’s eleven examples of isiNdebele words with clicks, six contain one or more dental clicks, three contain palatal clicks, and two have lateral clicks. Of his dental click words, Potgieter compares *-cina* ‘become strong’, *-ceda* ‘finish’, and *-chacha* ‘rip’ (<-qina>, <-qeda>, and <-chacha> in the modern orthography) to their palatal containing isiZulu equivalents *-qina*, *-qeda*, and *-qhaqha*; similarly, *-qimeza* (<-cimeza> in the modern orthography), with its palatal click, is compared to the (underived) isiZulu form *-cima*. The differences between some of the clicks as appraised by Potgieter compared to their presentation in the modern isiNdebele orthography show that the issue is not as simple as the clicks in some words having changed from their original Nguni forms (and as, presumably, still kept intact in isiZulu). Some of the lexemes have, in the dictionaries and in the modern orthography, clicks that differ from those given for them by Potgieter, and instead are similar to the isiZulu forms. Changes in place of articulation first in one direction (prior to Potgieter’s work) and then back within less than a century since seem improbable. Furthermore, there is a definite lack of regularity in the sound correspondences between the isiNdebele and isiZulu forms as compared by Potgieter. Considering this, a completed change of place of articulation does not present itself as a viable explanation for the variable pronunciations given for the isiNdebele forms in different sources, nor their varying differences from the isiZulu forms.

Our previous observations of click production among isiNdebele speakers point in a similar direction to that seen in Potgieter’s description. The speakers often do not consistently produce the same click during repetitions of the same lexical item, and there are differences between speakers in their frequency of use of the dental versus the palatal clicks, with different speakers producing one or the other more frequently and consistently. This variation is investigated in Section 4.2.

2.4 Previous research on click loss and variation

That some southern African languages were losing click phonemes has been noted by researchers since the nineteenth century (see Traill & Vossen 1997: 25–28 for an overview of the observations and their proper interpretation). The languages in question were mainly moribund Khoe languages which have since disappeared

due either to language shift to Afrikaans or to the death of all remaining speakers, and Traill & Vossen (1997: 28) claim that these cases of “sound system instability” and resultant click loss can be attributed to well-known processes of language attrition preceding language death.

More detailed research into the phenomenon of click loss or reduction itself has, however, only been conducted starting in the last few decades of the twentieth century. The first two studies of this kind were Traill (1986), who studied click loss in the Khoe languages, and Vossen (1991), whose study focused on the implications of click loss for the reconstruction of the Kalahari branch of the Khoe languages. Vossen also investigated the sociolinguistic settings of the languages in question.⁶ More detailed work on the sociolinguistics of click loss of the Kalahari languages can also be found in Wilmsen & Vossen (1990).

The main findings of Traill’s (1986) article are summarized by Traill & Vossen (1997: 28) as follows:

click loss systematically affected the alveolar and palatal influxes and [...] loss of the latter implied loss of the former [...]. In most cases they were replaced with “cognate” velar and palatal non-click stops (oral or nasal) respectively [...] The accompaniments were preserved in almost every case.⁷

Of the results in Vossen’s (1991) and Wilmsen & Vossen’s (1990) studies, the ones of most interest regarding our current work are those pertaining to the sociolinguistics of click loss. According to Traill & Vossen (1997), Vossen (1991) found that the Kalahari varieties in which click replacement had taken place were those spoken in areas in which archeological evidence points to a long-time interaction between foragers (as the Kalahari speakers at least initially would have been) and agropastoralists (likely Bantu-speaking).

After presenting the results of these earlier works, Traill & Vossen move on to discuss some cases of click loss for which they present older data supplemented by their own newer data. These come from the Kx’a language Northern Ju (called Angolan !Xū by Traill & Vossen 1997: 35–40) and the Tuu language !Xegwi (Traill & Vossen 1997: 41–42). An in-depth discussion of these cases is not possible here, but, in short, different types of clicks in these languages

6 The Kalahari branch of the Khoe languages is also known by the names Tshu-Khwe languages or Non-Khoekhoe languages, the latter used also by Traill & Vossen (1997), but the term “Kalahari languages” is chosen here simply due to its being less unwieldy than the other two nomenclatures.

7 Clicks with glottal stop accompaniments were an exception to this tendency, but as that accompaniment type does not occur in the languages examined in this study, we need not go into the details of Traill & Vossen’s analysis of this exception.

have ultimately been replaced by palatal or velar obstruents via various steps of weakening. Importantly, both languages were already in advanced stages of language shift or loss due to the influence of neighboring Bantu languages when the observations on click replacement and loss were made.

Based on their analysis, Traill & Vossen categorize clicks into two wider articulatory categories: dental or lateral clicks form a natural class of *affricated clicks*, whereas alveolar and palatal clicks constitute the natural class of *abrupt clicks*. Traill & Vossen propose that the abrupt clicks are articulatorily particularly demanding speech sounds, and to counteract this, the clicks may be “weakened” by reducing area of tongue contact with the palate, resulting in more noisy, affricated versions at similar places of articulation. These weakened clicks, however, are now perceptually less distinct from the already present affricated clicks, resulting in reduced perceptual salience of the system. A further change of the weakened clicks to non-click sounds increases distinctiveness again, and the perceptual salience of the system is restored.

Finally, Traill & Vossen (1997: 51–51) discuss some sociolinguistic considerations regarding the affected languages. That discussion mainly strengthens the sociolinguistic considerations already provided in the shorter descriptions by Vossen (1991) and Wilmsen & Vossen (1990), emphasizing the roles of intense long-term language contact and bilingualism of the speakers of the language undergoing click reduction or loss. One further point of discussion is added in Traill & Vossen (1997): if (as argued by Wilmsen & Vossen 1990) avoidance of being seen as “peculiar” by neighboring Bantu speakers was indeed the reason for click loss, why did the click loss almost exclusively affect just two out of the four to five click series (by place of articulation)? No definite answer to the question is provided,⁸ but it is proposed instead that the initiation of the process of click reduction or loss may well be due to sociolinguistic pressures, but that the way the process unfolds is the result of phonetic factors such as those described above.

All of the research discussed above has dealt with non-Bantu languages of southern Africa in various stages of language attrition, shift, or death. These examples may nevertheless help shed some light on the situation of the Bantu language Sindebele, which has also long been experiencing intense language contact with Sotho-Tswana languages, as well as with Afrikaans for the last couple of hundred years. Speakers of Sindebele are typically (at least) bilingual in Sindebele and a

8 In Wilmsen & Vossen (1990), the idea that dominant Nguni speakers in the area contributed to the retention of clicks found in their languages is dismissed due to the facts that the presence of Nguni speakers in the area at the relevant times cannot be reliably attested, and that the click inventories of Nguni languages (mostly) also contain the alveolar click, which has been lost in most of the languages in question (Traill & Vossen 1997: 51–52).

Sotho-Tswana language. It may turn out that the click loss observed in Sindebele follows similar patterns to click loss in the languages described above, due to the similar sociolinguistic context. Less attention has been paid to variation in click production in languages that are not experiencing such significant language shift, attrition, or death; isiNdebele is such a language.

Herbert (1990) discusses the possible markedness differences between the different places of articulation of clicks. Herbert bases his analysis of differences in markedness on the comparison of the different click inventories of Southern Bantu languages, on the one hand, and on the earlier research on click loss in Khoe languages by Traill (1986), on the other. Herbert's analysis also considers earlier work by Köhler (1963), also on Khoe languages. Herbert concludes that the two groups of click languages differ notably in terms of which clicks seem to be the most and least marked in them. The Khoe languages seem to lose their palatal and alveolar clicks much more easily than the lateral and dental ones (the abrupt and affricated clicks, respectively, to use Traill's terminology). It thus seems that for the Khoe languages, the palatal and alveolar clicks are marked in contrast with the lateral and dental ones. The Bantu data, in contrast, indicates to Herbert that among the Southern Bantu languages, the click which they seem most likely to retain in their inventories is the palatal click,⁹ followed by the dental click, with the lateral click as the least common type to occur. This indicates that the palatal (postalveolar) clicks are the least marked, with the lateral clicks as the most marked ones. While his article does not really deal with variation in click production within any single language, nor the actual processes of click loss as such, Herbert's ideas of the relative markedness of different clicks in the different language groups may be useful when dealing with click loss and variation. The same is true for his observation that click loss or reduction of click inventories does not seem to proceed in the same manner in all languages.

More recently, cases of click borrowing and loss – but also cases of click insertion into non-borrowed lexemes as well as variation in place of articulation of clicks – have been discussed in an article by Gunnink et al. (2015) about Bantu-Khoisan language contact and its effects on the Bantu languages of the Kavango-Zambezi transfrontier area in southwestern Africa, and in sections of Gunnink's PhD dissertation about the Botatwe language Fwe (Gunnink 2018: 27–32, 448–449). Regarding the variation in click pronunciation in Fwe, Gunnink (2018: 28) states the following:

9 The varying nomenclature of the non-dental, non-lateral series of clicks in descriptions of Southern Bantu languages is dealt with in Section 2.1.

Fwe uses different click types, the dental, lateral, and post-alveolar, but click type is not contrastive; the same word may be realized with a dental, lateral or post-alveolar click without change in meaning.

- (71) kùlápùrà ~ kù#àpùrà ~ kùllápùrà
 ku-lapur-a
 INF-tear-FV
 ‘to tear’

Which click type is used depends mainly on the speaker, with the dental click being the most common. Of the thirteen speakers interviewed for a contrastive study, the majority only used the dental click, and those who used a click type other than the dental, would also use the dental click.

Gunnink’s observation is relevant to our work for several reasons. First, it seems to parallel the situation in siSwati (a Nguni language spoken in Eswatini – before known as Swaziland – as well as northeastern South Africa), as described by Lanham (1960: 57–60). Second, it holds for some speakers of isiNdebele, according to our research, regarding the number of phonemic distinctions made in place of articulation of clicks. Finally, it challenges Herbert’s ideas about the markedness of clicks. Gunnink’s (2018) and Lanham’s (1960) descriptions of clicks in Fwe and siSwati run counter to Herbert’s examples of Bantu languages typically resorting to the palatal (postalveolar) place of articulation, if only one series of clicks is distinguishable, and so do our observations on isiNdebele, as will be related further below.

2.5 Click acquisition

In addition to click loss and variation, the ways in which languages acquire click consonants are of relevance to the research at hand. Specifically, we are concerned with how Bantu languages with clicks – excluding those languages in which they are *marginal phonemes*, defined by Pakendorf et al. (2017: 5) as “occurring in a handful of lexical items at most, often ideophones” – acquire clicks. We are less concerned with the origin of clicks in language in general, or with how click phonemes might have arisen in formerly non-click languages that were not spoken in contact with click languages. It appears fairly certain that all of the southern African Bantu languages with clicks originally acquired them as borrowings from other click languages, either Khoisan or Bantu. After their initial borrowing into the system, clicks may then have innovatively spread to native lexemes (Pakendorf et al. 2017: 7–8), as in the case of click insertion in Fwe described by Gunnink et al. (2015: 205–206). Unfortunately, research on the origins of the various click-containing lexemes in the Nguni languages

is quite sparse. Pakendorf et al. (2017: 8) summarize the general state of this research as follows:

The [Southern Bantu] languages have adopted significant numbers of lexical items with clicks from now-extinct varieties of the Khoekhoe branch of the Khoe family, which were spoken by pastoralists (see, e.g. Anders 1937; Bourquin 1951; Louw 1977a,b). Evidence for loans into [Southern Bantu] from Tuu languages spoken by foragers is far more limited – possibly due to the lack of documentation of these forager languages. Languages belonging to the !Ui branch of Tuu are historically known to have been spoken in the Eastern Cape, and possible !Ui sources for certain Nguni words are attested (du Plessis 2016). There are often unexplained phonological mismatches between the !Ui and [Southern Bantu] items, however, so that it is unclear if these are really loanwords.

The etymologies of click-containing words in isiNdebele or the cognates of click-containing words in Sindebele have so far not been systematically investigated. The number of words with clicks is lower in isiNdebele than for example in its close relative isiZulu – Pakendorf et al. (2017: 10) give the proportions of click containing words as 6.6% and 22% for isiNdebele and isiZulu respectively. At least according to our superficial impressions, a majority of the isiNdebele click lexemes have cognates in isiZulu and often isiXhosa, although idiosyncratic differences between the cognate lexemes and sets of lexemes are also often present. This state of affairs means that it will be difficult to determine whether any given lexeme is shared with other Nguni languages due to common origin (either as borrowed from a Khoisan language or as a shared innovation) or due to later borrowing.

The issue of *hlonipha* – taboo-avoiding language – and its role in introducing or spreading click consonants in the Nguni languages, as proposed for example by Herbert (2002), is also of no concern for this paper. The discussion mainly relates to developments presumably quite far in the past of the languages in question. No noticeable role of such avoidance practices in click use has been observed in our work on either of the Ndebele varieties as currently spoken.

2.6 Sociolinguistic preliminaries

Variationist sociolinguistics, as established especially by William Labov beginning in the 1960s (Labov 1963; 1966; 1972a; 1972b), is a sociolinguistic approach aiming to understand language change, not only through categorical, but also through variable processes. The key insight is that synchronic variation in languages is not random, and that correlations can be established between

linguistic features and social variables, the latter meaning social attributes of the speakers, such as age, gender, or social status (Bayley 2013).

In this study, we are mainly concerned with the effects of education on the production of the click consonants. Al-Wer (2002) cites numerous studies of Arabic varieties in which education was used as a social variable and where correlations were found between the speakers' level of education and their language use. Al-Wer points out, however, that education is often what she calls a "proxy variable", reflecting changes involved in acquiring an education (and especially higher levels of education), such as leaving one's home area and interacting with a wider circle of people speaking different language varieties. However, we are presently interested in how a standard language taught in schools affects the speakers' adherence to its prescriptive rules. The assumption that more literate or more highly educated speakers of a language tend to follow its standardized rules more closely, at least in certain settings, seems to be taken for granted in mainstream sociolinguistics. We are, at least, not aware of any explicit studies of this kind. We have noted this phenomenon in earlier fieldwork elsewhere,¹⁰ and the situation in isiNdebele is discussed further in Sections 4 and 5.

3. DATA AND METHODS

The analysis presented in this article is based on data collected by the authors on a field trip to the Limpopo and Mpumalanga provinces of South Africa in May 2016, supplemented by data collected by the primary author on three fieldtrips to the provinces of Gauteng and Mpumalanga in the previous year. The data for Sindebele was collected entirely on the 2016 trip, in several locations around Mokopane, Limpopo. The data for isiNdebele comes from all four trips and was recorded in Pretoria, Gauteng and in several locations in Mpumalanga. All of the data was recorded in interviews with self-identified L1 speakers of the language varieties in question.¹¹

Most of the consultants were interviewed individually, but in some cases, pair or group interviews were conducted due to time constraints. The main data collection method was elicitation of selected lexical items in a number of frames. The main wordlist used in elicitation was compiled by gathering lexical items containing

¹⁰ While conducting fieldwork on Erzya (one of the two languages in the Mordvinic branch of Uralic), we noticed a tendency for more educated (and usually young) speakers to use forms more in line with the norms of the standard variety, whereas older, less educated speakers used both more dialectal forms and displayed more Russian influence, both in morphosyntax and lexicon.

¹¹ A few L2 speakers were also interviewed during the course of the fieldwork, but their data is not used in this study.

clicks from two different isiNdebele dictionaries. Attention was paid mostly to the structure of the words, so that as many different types of clicks as possible could be elicited in as many different positions within the words as possible. Another wordlist was used for collecting data on nominal tone in isiNdebele (see Aunio et al. in this volume). This list also contained many words with clicks, and data gathered with it is therefore extensively used in this study as well. Finally, the data are also supplemented by earlier elicitations of isiNdebele data, some of which were also explicitly aimed at collecting data with click consonants.

The elicitations were mainly carried out as speaker translations from English into the target varieties, but if this approach led to too few of the expected items, the interviewees were also queried directly for the isiNdebele words (including Sindebele informants, who were occasionally prompted to provide Sindebele words that were similar to the given isiNdebele forms).

3.1 Sindebele data

Our Sindebele data presented here was collected in May 2016 in the town of Mokopane, and the village of Kalkspruit (also known as Ga-Maraba) in the Capricorn District of Limpopo. The data is limited to informants who were available during a restricted time period, and, due to the small sample size, should be considered highly preliminary. The data used is from a group of five men and one woman, aged between 18 and 64 years. Everyone interviewed in Kalkspruit was a native of that town, though one of them was born in Polokwane. Informants from Mokopane were born in various villages in western Limpopo. Two of the informants had bachelor's degrees, and only one did not have any college experience. Occupational activities included entrepreneurship and on-going college studies, in addition to unemployment at the time. One informant was retired.

All informants reported Sindebele as their mother tongue, or the first language they learned, except for one, who reported a mother tongue of Sepedi (that speaker had also acquired Sindebele as a child through the father's language use). All informants also spoke Sepedi and at least a little bit of English. Tswana was spoken by three informants, and Afrikaans, by two. Some of the informants reported at least a limited knowledge of siSwati, Xitsonga, Tshivenda, isiXhosa, or isiZulu.

Sindebele was used as the main language of the home by all speakers, though one informant's partner was still reported to be learning the language. For more information on the sociolinguistic situation in Sindebele-speaking areas, see Grünthal, Honkasalo & Juutinen in this volume.

3.2 *isiNdebele data*

The main isiNdebele data in this paper was also collected during May 2016, in the village of Emthambothini/Weltevrede, a suburb of Siyabuswa in northwestern Mpumalanga. The area around Siyabuswa is one of the centers of amaNdebele culture and the isiNdebele language, as it has a relatively large and dense population, the majority of whom are isiNdebele speakers – 71.24% for Siyabuswa itself and 88.14% for neighbouring Mapoch, where Emthambothini is located, according to the 2011 Census (Statistics South Africa 2012).¹² The village of Emthambothini also houses one of the two amaNdebele kingly residences, that of the king of the Ndzundza Ndebele. The area in general is still far from monolingually isiNdebele speaking, as can be seen from research presented in this volume (Grünthal, Honkasalo & Juutinen in this volume). Even in Emthambothini, where the population overwhelmingly speaks isiNdebele as their first language, fluency in multiple languages is the norm rather than the exception.

Some earlier data recorded at Moloto was also used in the analysis presented here. Moloto is located on the border of Mpumalanga and Gauteng, close to the second major amaNdebele cultural hub of Kwamhlanga and the other amaNdebele kingly residence, that of the amaManala king. We additionally made use of data recorded in Helsinki with a visiting isiNdebele speaker. The speaker recorded in Helsinki lived in Pretoria at the time of recording.

The data used in the analysis was collected from twelve persons speaking isiNdebele as their first language, five of them female and seven, male. The ages of consultants at interview time range from 23 to 60, while educational levels range from six years of primary school to university education. The number of languages that the consultants speak varied between four and seven. A summary of the main social variables used in this study can be found in Table 2. When coding the social variables for quantitative analysis, for the multilingualism variable each language spoken counted for one point unless specified as spoken “a little”, “not very well” or similar, in which case half a point was counted.

12 Siyabuswa, population 36,882 according to the 2011 Census (Statistics South Africa 2012), and Mapoch, population 9,169, are both Main Places of the Dr JS Moroka Local Municipality in the Nkangala District Municipality of the Mpumalanga Province of South Africa.

Table 2 IsiNdebele speaker metadata

No. of consultants	Gender		No. of languages spoken					
	f	m	3.5	4.5	5	6	6.5	7
	5	7	2	3	2	3	1	1
No. of consultants	Age			Education level				
	20–29	40–49	50+	Pri.	Sec.	Voc.	Some univ.	Postgrad
	6	3	3	2	2	4	3	1

The values given for different levels of education can be found in Table 3. The different categories we used are as follows: at least six years of primary education; completed secondary education; some higher vocational or professional education; completed higher vocational or professional education; some higher academic education; and postgraduate education. The divisions of no formal education, fewer than six years of primary education, and some secondary education have not been coded because they did not come up in the sample. The division between vocational, professional, and academic higher education was not always very clear, and some arbitrary decisions in grouping consultants into either of these groups may have taken place during the survey or while interpreting the survey results for coding. Unfortunately, we did not collect precise data on how much time each consultant had spent in which type of education, thus precluding a more precise coding. During initial statistical tests, a weighted coding of different levels of education was used, as seen in Table 3. Academic education was coded higher than vocational education based on the assumptions that it is often more difficult to get access to and more demanding during studies, and that language use typically plays a more important role in academic education than vocational education.

Table 3 Values for the education variable

Pri.	Sec.	Some h. voc.	Compl. h. voc.	Some univ.	Postgrad
1	2	2.5	3	3.5	4

As we found this coding to be somewhat arbitrary, and as it furthermore does not take into account whether formal isiNdebele language instruction was part of a speaker's education, a different coding system was used for further tests. In this system, each speaker was assigned binary values in regard to a range of education variables. For level of education, these variables are as follows: secondary education, tertiary education (irrespective of type), vocational tertiary education, and university education, as shown in Table 4.

Table 4 Metadata for general level of education

	Highest level of education attained				
	Primary	Secondary	Any tertiary	Tertiary, voc.	Tertiary, univ.
No. of consultants	2	11	8	4	4

For formal isiNdebele instruction, we coded the following values: isiNdebele subject education during primary or secondary education (unfortunately, the collected metadata does not account for the difference between primary and secondary education) and having studied isiNdebele as a subject at university. These variables are cumulative, so that someone educated in isiNdebele in primary and secondary school, and then continuing on to study the language at university would have a value of 1 (TRUE) for both.¹³ This information is provided in Table 5.

Table 5 Metadata for formal education in isiNdebele¹⁴

	Formal isiNdebele education		
	None	Subject in pri./sec. ed.	University
No. of consultants	3	9	1

The language data itself was coded so that for each lexical item of each speaker, the place of articulation and accompaniment type are indicated as either 1) always the same; 2) one type preferred with other(s) also occurring; 3) equal occurrence (of dental and palatal clicks, and/or various combinations of accompaniment types). For the place of articulation there is also 4) a variable place of articulation averaging on alveolar. The tables containing this data can be found in Appendix II.

The obtained data on place of articulation preference was further processed during the statistical analysis in such a way that each speaker–lexical item pair has a numerical value indicating occurrence of each place of articulation. A value of 1.0 indicates 100% occurrence, a value of 0.75 indicates preferred occurrence (i.e. more than half of cases), 0.5 indicates equal occurrence between two clicks or, for some items of one speaker, a place of articulation between dental and

¹³ Except for the combined tertiary education variable and the differentiated vocational and university variables for general level of education – the first was not used in the same calculations as the latter two.

¹⁴ Due to the cumulative nature of the variables, the totals here add up to 13, not 12 – the speaker with formal university education in isiNdebele also has been counted in the column for isiNdebele subject education in primary/secondary school.

postalveolar, 0.25 indicates dispreferred occurrence (i.e. less than 50%), and 0.0 indicates no occurrence. Thus, in this study, no exact frequencies of occurrence were counted, only relative preferences. As this was an exploratory study, and we did not know beforehand which words work well in elicitation and which do not, the lists of obtained lexical items are not normalized and there is wide variation in which items could be elicited from each person.

4. ANALYSIS

In the following sections, we will analyze the data, starting in brief with Sindebele in Section 4.1. The more substantive isiNdebele analysis follows in 4.2, including more detailed quantitative and qualitative analyses in 4.2.1 and 4.2.2, respectively. These subsections focus on the sociolinguistic aspects of the observed variation.

4.1 Sindebele

The analysis of the Sindebele data began with the identification of possible cognate forms with isiNdebele words which have clicks in them. The segments in Sindebele corresponding to the clicks were then analyzed and compared to their isiNdebele counterparts.

The non-nasal clicks in isiNdebele correspond in many of the clearer cognates to the ejective velars (either the stops or the affricates) in Sindebele. The nasal clicks, on the other hand, typically correspond to the velar nasal, except for the word /gaxape/ ‘aside’, in which a voiced velar fricative occurs instead. These instances are listed in Table 6.

Table 6 Sindebele words with their corresponding click words in isiNdebele

Sindebele	isiNdebele	Translation
/ekx'a/	/e!a/ <-eqa>	jump (v)
/lekx'anda/	/i!anda/ <iqanda>	egg
/βok'op ^h o/	/ubul ^h op ^h o/ <ubuchopho> or <ubuqhopho>	brain
/k'enesa/	/!inisa/ <-qinisa>	stiffen (v)
/sejele/	/bu ^h llele/ <bunxele> ¹⁵	left
/ɲani/	/ ^h lani/ <-ncani>	small
/muɲaza/	/umlasa/ <umcasa>	rabbit
/gaxape/	/nga ^h lape/ <-ngancanye>	aside

15 The current isiNdebele word is *isincele* with a dental click, though.

It should be noted that the in isiNdebele *umcasa* ‘rabbit’, the click itself is not nasalized despite the adjacent nasal consonant. However, the Sindebele translation still has a velar nasal corresponding to the click.

In some isolated instances, further peculiarities can be found. With three lexemes, Sindebele informants actually produced clicks. For ‘crowbar’, isiNdebele *umgqala* is attested in Sindebele [mu!^wa:la]. This word is a likely borrowing and is also found in isiZulu, as *umgxala*. Another word is the interjection ‘sorry’, or *ncancabe* in isiNdebele (*ncancabeza* ‘to apologize’). In Sindebele, [ʔa:be] is found, with a dental click as in isiNdebele. Again, a similar interjection is also present in isiZulu: *ncephe* or *ngxephe*.

The third case is the verb ‘to finish, to complete’. It is found in isiZulu as *-pheza*, in isiNdebele as *-feza* and in Sepedi, a Sotho-Tswana language, as *-fetša*. In Sindebele, two variants of this word were found: [p^hε:ṭs^ha] and, rather surprisingly, [ʔε:ṭs^ha] with a nasalized dental click.

4.2 IsiNdebele

The observed variation in the production of click consonants was analyzed in two stages. The first stage consisted of mapping the individual click inventories of the speakers. The number and types of distinct click phonemes for each speaker was determined, along with any variation within a specific phoneme. This included measuring the consistency of each speaker and determining the contexts in which any observed inconsistencies are most likely to occur. The results of this analysis were checked for internal correlations and presented statistically. The second stage of analysis was to see how the results of the first stage correlate with known social and sociolinguistic variables, such as age, gender, level of education, and active multilingualism.

When determining the types of clicks used by speakers and how they are grouped into phonemes, we paid more attention to place of articulation than to accompaniment types. This decision followed from our observation that while variation is observable for both parameters, the variation observed in place of articulation is much more transparent and definable, whereas the variation in accompaniment type is much more difficult to classify and analyze and is mostly idiolect-centered; that is, generalizations to the wider speaker sample are difficult to make. Also, significant variation in accompaniment types is mostly restricted to possible observable differences between clicks classified as depressors and those that are not. This relates to a much larger phenomenon in the isiNdebele language, namely, the phonologization of the depressor effect, which is outside the scope of this article. For the sake of completeness, a description of the preva-

lence and parameters of variation observed in accompaniment types is provided in the following.

Four types of click accompaniment are found in our data that can be said to be clearly distinct for most speakers, while a fifth is not as evidently distinct. The four indisputable types of click accompaniment are shown below in Table 7.

Table 7 The distinct click accompaniment types of isiNdebele

	Dental	Postalveolar
Plain/tenuis	<c> [k]	<q> [kʰ] ¹⁶
Aspirated	<ch> [kʰ]	<qh> [kʰ]
Nasal	<nc> [ŋ]	<nq> [ŋʰ] (rare)
Prenasalized depressor	<ngc> [ŋk]~[ŋǰ]	<ngq> [ŋkʰ]~[ŋǰʰ]

For the plain clicks, see examples (1) and (2); for the aspirated clicks, see (3) and (4) below. The nasal clicks have audible nasal airflow before, during, and after the click burst, with the following vowel being initially nasalized, as in (5) and (6).¹⁷ The prenasalized depressor clicks have nasal flow usually only until the beginning of the click burst, with an oral stop secondary release, such as non-nasal clicks have after the click burst, and no nasalization of the following vowel. This can be seen in examples (7) and (8) The last type is depressor consonants, so a high tone may not be realized on the mora immediately following the click. The realization of the prenasalized depressor clicks is not consistent for all speakers, as some speakers may sometimes, or even frequently, produce them as segmentally indistinguishable from nasal clicks, differing only in tonal depression; see example (9) for the same word produced with a prenasalized depressor and a nasal depressor click.

- (1) Plain dental click <c> (2) Plain postalveolar click <q>
- a. <icici> (S₁)¹⁸ a. <isiqu> (S₃)
- [ili:li] [isi:u]
- ‘an earring’ ‘a stem’

16 In the examples 1–9 below exemplifying the different accompaniment types, we have used data in which <q> was actually pronounced as postalveolar, except in a few cases where all instances were pronounced as dental, in which case the transcription reflects this.

17 Of the nasalized clicks, <nq> [ŋʰ] occurs only rarely.

18 The consultants whose speech this study is based on are here labeled S₁–S₁₂.

- b. <ukubhaca> (S8)
[uyupa:la]
'to hide (something)'
- b. <ukukhiqiza> (S3)
[uyuk^hili:za]
'to produce'
- (3) Aspirated dental click <ch> (4) Aspirated postalveolar click <qh>
- a. <isichaka> (S1)
[isi^ha:ka]
'a poor person'
- a. <iqhegu> (S9)
[i^he:ku]
'an old man'
- b. <ukuchichima> (S5)
[uyu^hi^hi:ma]
'to overflow'
- b. <ukuqhaqhazela> (S3)
[uyu^ha^haze:la]
'to shiver'
- (5) Nasal dental click <nc> (6) Nasal postalveolar click <nq>
- a. <inceba> (S6)
[in^ɰē:βa]
'a wound'
- a. <inqaba> (S2)
[in^ɰla:βa]
'a castle'
- b. <ukuncinza> (S7)
[uyu^ɰi^hn·za]
'to pinch (something)'
- b. <ukunqopha> (S5)
[uyu^ɰo:p^ha]
'to intend'
- (7) Nasal depr. dental click <ngc> (8) Nasal depr. postalveolar click <ngq>
- a. <ungci> (S4)
[uŋ^ɰi]
'full stop'
- a. <ingqondo> (S4)
[iŋ^ɰ!o·n·dro]
'a mind'
- b. <ukungcwaba> (S1)
[uyuŋ^ɰ!w:a:βa]
'to bury'
- b. <ungqongqotjhe> (S9)
[uŋ^ɰ!oŋ^ɰ!o:ɿ^he]
'cabinet minister'
- (9) Nasal depr. dental click <ngcw>
- a. <bayangcwaba> (S5)
[baja^ɰ!w:a:βa]~[bajan^ɰ!w:a:βa]
'they are burying [someone]'

The fifth type of click, non-nasalized depressor clicks <gc> [l]~[ɛ̃l] and <gq> [k!]~[ɛ̃!], incur the same restriction on the following mora. They also tend to have a somewhat shorter voice onset time on average than the plain clicks, although this varies a lot between speakers, with some making no noticeable distinction in that respect.

In other Nguni languages, the depressor clicks are sometimes described as breathy or slack voiced,¹⁹ and, indeed, for some speakers of isiNdebele, the vowels following these clicks may be somewhat breathy. An interpretation of the clicks themselves as being underlyingly breathy voiced synchronically is not tenable, however, since the same speakers often have breathy voice in any context where there is no high tone, regardless of whether a depressor is present. Furthermore, when the breathiness starts after the depressor, it usually happens only in contexts in which the pitch-lowering effect of the depressor is realized. In these cases, there is usually a delay between the click and both the pitch drop and the concurrent breathiness. Conversely, when there is no high tone before the click and no pitch drop is necessary after the click, there is generally no breathiness. Exceptions to this generalization are speakers for whom low pitch and breathiness co-occur regularly, independent of depressors. For a majority of the speakers on whose data this research is based, breathiness does not occur, or only occurs very occasionally and weakly, in any conjunction with depressor clicks.²⁰

In example (10) below, two very different realizations of the same click can be seen, pronounced by the same speaker. In (10a) the click duration is overall quite short – depending on the instance, 20–25 ms from the start of the click burst until voicing starts and a further 5–10 ms until the vowel begins. There is no clear secondary release, but rather a gradual opening of the uvular closure. After this, the vowel starts as creaky voiced and with a somewhat higher pitch, turning to breathy voice after some 40–70 ms, with the pitch dropping at the same time.

In (10b), the plural form of the same word, there is a clear secondary release soon after the click burst, the voice onset time is somewhat longer (36 ms), and there is neither creaky nor breathy voicing on the vowel, even though the pitch contour of the vowel remains similarly falling, albeit with a somewhat higher starting point.

19 But see Traill, Khumalo & Fridjhon (1987) for isiZulu and Jessen & Roux (2002) for isiXhosa, for sceptical analyses of the breathy voice interpretation of depressors.

20 The prenasalized depressor seems to associate with breathiness even more rarely, if at all.

- (10) (S4)
- | | |
|--------------|---------------|
| a. <umgqala> | b. <imigqala> |
| [um̩ᵑ!a̩la̩] | [imi!a:la] |
| ‘a crowbar’ | ‘crowbars’ |

Other weak effects are sometimes observable with the depressor clicks that do not occur as frequently with the non-depressors. For example, we observed gradual or fricative secondary release with depressor clicks, and unexpected weak to moderate labialization of orthographically non-labialized depressor clicks.²¹ These effects may also sometimes be observed with the prenasalized depressor clicks. These features are, however, produced only by some speakers and even then, often not consistently, and sometimes gradual or fricative release, especially, also occurs with non-depressors, for some speakers.

One speaker (S12) who did have noticeable breathiness on the vowels following some depressor clicks also produced an unusual effect that did not occur with any other interviewed speakers. S12’s depressor clicks that were realized with following breathiness sometimes also had a more or less noticeable aspiration before the breathiness (example 11), in which case the breathiness might be analyzable phonetically as being caused by the clicks themselves. Although there was no noticeable voicing during the aspiration, the aspiration after the click seems to differ in quality from aspiration observed on the actual aspirated clicks of the same speaker. This fact lends itself to an analysis of S12’s depressor clicks actually being breathy voiced clicks like the depressor clicks of other Nguni languages, as they are sometimes described.

- (11) (S12)
- | | |
|---------------------|--------------|
| a. <umgqomu> | b. <umgqala> |
| [um!ᵑ̩:mu] | [um!ᵑ̩:la] |
| ‘a water container’ | ‘crowbar’ |

S12’s uncommon realization of the depressor clicks in isiNdebele is also evidenced in the fact that the speaker’s aspirated depressor clicks have a noticeably longer voice onset time than do the plain clicks. This speaker’s longer onset times for aspirated depressor clicks stands in contrast to the tendency measured in many other speakers for depressor clicks to have a slightly shorter voice onset time than

²¹ Labialization is a secondary articulation that can affect most non-labial consonants of isiNdebele, but which is then reflected in the orthography of the word in question as a <w> and is usually more clearly audible than the kind of labialization that occurs with these clicks.

plain clicks. S12's aspirated versions of depressor clicks were also more common in the first instances of elicited words, which were isolated dictionary forms. Later instances, embedded into phrases or sentences, mostly did not display aspiration, longer voice onset times, or much breathiness on the vowels, as can be seen in example (12).

- (12) (S12)
- a. <anginamgqomu olungileko>
 [aŋgina-m!omu luŋgile:ɣo]
 NEG.1SG.have-CL5.water.container CL5.straight
 'I don't have a suitable water container.'
- b. <ngibona umgqala kuhle>
 [ʰgiβona um!ala ɣu:ɬe]
 1SG.see CL5.crowbar CL15.good
 'I see the crowbar well.'

This all means that the plain clicks and non-nasalized depressor clicks are not consistently and reliably distinguishable from each other by their phonetic features, at least not for all speakers. Even when they are, the distinguishing features vary between speakers and within the speech of one speaker, so that no definite feature or set of features of the clicks themselves can be indicated to distinguish them. The only reliable, consistent way of distinguishing between these two click types is by their effect on tone, and even that is not possible in all contexts, for example, on utterance final syllables, since these are usually not distinctive for tone.

The lateral series of clicks, <x> [l], is left out of most of our analysis, as we were only able to elicit examples of these clicks in very few instances, confirming the observation by Skhosana (2009: 54, 74) of the lateral series being a marginal one. From our observations, it seems to be so marginal as to be absent from most speakers' inventories completely. Mostly, speakers did not even recognize the lexical items that should have contained a lateral click, and even for those speakers who knew words written with an <x>, it was hardly ever pronounced with a lateral place of articulation. One speaker even stated outright that <q> and <x> are pronounced the same, both as postalveolar clicks.²²

22 This statement did hold true for that speaker's pronunciation of the clicks, but not consistently for the other speakers from whom we were able to elicit words with <x>. The same speaker did produce one instance of <x> with a seemingly lateral pronunciation, as well.

Two broad categories of speaker click inventories are observable in the data: those speakers who distinguish clicks phonemically by place of articulation, and those who do not. The first category includes all those speakers who appear to distinguish the two places of articulation, dental and postalveolar. This type is not easily divisible into discrete groups, as the main variable here is consistency of production at the expected place of articulation, which forms a continuum from more to less consistent. In most cases in which a distinction is observed, the speakers produce the clicks consistent with their spelling, that is, as dental when written with a <c>, and as postalveolar when written with a <q>. There were also some cases of speakers clearly making a distinction, but sometimes producing clicks consistently against what would be expected from the orthographic forms. Some examples of these unexpected pronunciations are discussed in more detail below.

The main criterion used for determining whether a speaker distinguishes places of articulation phonemically is consistency.²³ That is, if a speaker produces clicks at clearly different places of articulation, we ask whether each click is pronounced consistently using the same place of articulation throughout occurrences of the same lexeme or root. Then, if it can be ascertained that the clicks are consistent, it is further necessary to see whether the choice of place of articulation depends on the surrounding phonetic context. The difference between clicks can be safely argued to be phonemic only if the place of articulation is both consistent and independent of context. Examples (13) and (14) present one speaker's inconsistent pronunciations of the supposed dental click <c> and the supposed postalveolar click <q>, respectively.

(13) (S4)

- | | |
|---|---|
| <p>a. <nginegcwetha elihle>
 [ʰgine-k!ʷet^ha eli:ɬe]
 1SG.have.CL9-CL9.advocate CL9.good
 'I have a good advocate.'</p> | <p>b. <ngibona igcwetha kuhle>
 [ʰgiβona ikl^we:t^ha χu:ɬe]
 1SG.see CL9.advocate CL15.good
 'I see the advocate well.'</p> |
|---|---|

23 Of course, to make definitively sure that a distinction is phonemic, allophony with complementary distributions, also producing consistent patterns, has to be ruled out. This process is, however, omitted in this paper, as the phonemicity of these clicks has been unproblematically assumed for other Nguni languages and described similarly (even if with some variation) for isiNdebele in the previous literature. Our data matches well with those descriptions – or rather, when there is variance (with what can be expected from the earlier and other Nguni sources) in the place of articulation of clicks, it is inconsistent and thus indicative of free variation – and so we see no need to delve into detailed phonemic analysis in this paper.

(14) (S4)

- | | |
|--|--|
| <p>a. <nginamaqanda amahle>
 [ʰgina-mak!anda ama:ɬe]
 1SG.have.CL6-CL6.egg CL6.good
 ‘I have good eggs.’</p> | <p>b. <anginamaqanda amahle>
 [aŋgina-mak!anda ama:ɬe]
 NEG.1SG.have-CL6.egg CL6.good
 ‘I don’t have good eggs.’</p> |
|--|--|

Expected, consistent pronunciations of both clicks by another speaker can be seen in examples (15) and (16) below.

(15) (S12)

- | | |
|--|---|
| <p>a. <le yingcenyelungileko>
 [le jɪŋ^ɰlɛ̃ne eluŋgile:yo]
 that.CL9 COP.CL9.part CL9.straight
 ‘That is a good part.’</p> | <p>b. <anginayoyingcenyelungileko>
 [aŋginajo iŋ^ɰlɛ̃ne eluŋgile:yo]
 NEG.1SG.have.CL9 CL9.part CL9.straight
 ‘I don’t have a good part.’</p> |
|--|---|

(16) (S12)

- | | |
|---|--|
| <p>a. <leli liqephe elilungileko>
 [leli lik!ep^he elilungile:yo]
 that.CL5 COP.CL5.shell CL5.straight
 ‘That is a good shell.’</p> | <p>b. <ngibona iqephe kuhle>
 [ʰgiβona ik!ep^he yu:ɬe]
 1SG.see CL5.shell CL15.good
 ‘I see the shell well.’</p> |
|---|--|

Also of interest are cases in which the criteria for phonemic status are fulfilled, but the clicks produced by the speakers go against etymological or lexicographic expectations – that is, when the speaker’s clicks do not correspond to those of cognate forms in related languages or the forms found in the dictionaries. Below are a few examples of this kind. Example (17) comes from a speaker who was not completely consistent for all words, but who still seemed to have total consistency for many lexemes. Sometimes, this speaker’s consistently produced lexemes had places of articulation contrary to expectation, as can be seen below, where the expected dental <c> was consistently pronounced as postalveolar.

(17) (S4)

- | | |
|---|--|
| a. <le yincwadi ehle>
[le: ji ^ɓ ! ^w ati e:ɬe]
that.CL9 COP.CL9.book CL9.good
'That's a good book.' | b. <nginencwadi ehle>
[^ɓ gine- ^ɓ ! ^w ati e:ɬe]
1SG.have.CL9-CL9.book CL9.good
'I have a good book.' |
|---|--|

As for example (18), the speaker was all in all very consistent, with pronunciation that also matched the expected standard forms to a high degree. But there was one interesting case in which the standard form had an aspirated postalveolar click <qh>, but the speaker pronounced it as a dental. The speaker also later stated that in isiNdebele there is no <qh>, only <ch> or <xh>. Unfortunately, we did not at that time test the speaker's aspirated clicks further, which might have allowed us to check whether the aspirated postalveolar clicks had indeed been regularly replaced by aspirated dental clicks.²⁴

(18) (S12)

- | | |
|---|---|
| a. <anginalo iqhezu elilungileko>
[aŋgina:lo il ^h ezu elilungile:ɣo]
NEG.1SG.have.CL5 CL5.fraction CL5.straight
'I don't have a good half.' | b. <ngibona iqhezu kuhle>
[^ɓ giβona il ^h ezu yu:ɬe]
1SG.see CL5.fraction CL15.good
'I see the half well.' |
|---|---|

Studying the possible reasons why these mismatches between expectation and observation occur is beyond the scope of this article. Still, relating the occurrence of clicks that are produced against expectations, and how this varies between speakers, to the other kinds of variation described here does provide additional data for the analysis of how these phenomena cluster. This, in turn, allows for a more fine-grained basis for further work.

²⁴ This speaker was also one of the few who actually produced lateral clicks. A word, given in the dictionary as <icatjhaza>, but which the speaker claimed as being written with <xh>, was actually pronounced with a lateral click, without aspiration but with a very long voice onset time, noticeably longer than with any other non-aspirated clicks. The speaker, however, also claimed that words with <x> were pronounced the same as words with <q>. We tested some other lexemes written with an <x> with this consultant, and for these, the speaker's pronunciation was consistently dental in one case, consistently postalveolar for two others.

The second speaker category includes all those speakers who do not seem to distinguish click phonemes by place of articulation. This type is further divided into the following three subtypes:

1. speakers who more or less consistently produce clicks at only one place of articulation, which in our sample is always dental. These speakers have a very strong preference for dental clicks, usually producing above 90% of their clicks as dental;
2. speakers who don't have a clearly delineated place of articulation for their clicks;
3. speakers who produce clicks at two distinct places of articulation, without a phonemic distinction.

To count a speaker into the subcategory of those producing clicks at only one place of articulation consistently, the speaker must have done the following:

1. produced each click occurring in a particular lexical item at that place of articulation on a majority of repetitions of said lexical item;
2. produced only that click for a majority of lexical items...
3. ...especially including a significant number of cases where, according to the orthography and known cognates, another place of articulation would have been expected.

Three possibilities for the single consistent place of articulation present themselves concerning the speakers who fulfill these criteria: they might produce their clicks at one of the two expected places of articulation, or they might produce them at some third, unexpected place, such as laterally. Of these possibilities, only one is found in the data, however. All the speakers in this group consistently produced only dental clicks. An example of such a speaker's pronunciations can be found in example (19).

(19) (S1)

- | | |
|--|---|
| a. <cacisa!> ²⁵
[lali:sa]
'clarify!' | b. <bayagcugcuzela>
[baya luluze:la]
'they encourage [someone]' |
| c. <qopha!>
[lo:p ^h a]
'wash yourself!' | d. <ingqondo>
[ij ^h !o·n·dro]~[ij ^h o·n·dro]
'a mind' |

The two other subgroupings in the category of speakers with a single phonemic series of clicks share one quality that also makes them somewhat difficult to distinguish, in that they both produce clicks at varying places of articulation. But

25 This verb was part of the original dataset, and was used in the preliminary phonetic work, but was accidentally omitted during the collection of the database used for the quantitative analyses, and because of this, it does not appear in the data table in Appendix II.

by careful phonetic analysis of the clicks in question, we were able to determine that most speakers who produced clicks in variable places of articulation did so at two relatively distinct places; one speaker clearly differed from this pattern.

This individual's clicks were sometimes also identifiable as dental or postalveolar, but in addition to those, in many instances the clicks were not clearly either, but rather, on closer analysis, alveolar, that is, located between the two expected places of articulation. The speaker used each of the three places with approximately equal frequency, and there was overlapping variation between them, making the place of articulation often hard to determine. The clicks were not at all consistently produced in one place for any single lexical item. We thus came to the conclusion that this individual's clicks did not seem to have a narrowly delineated central locus, but that their place of articulation was anywhere on the area from the upper teeth to the back of the alveolar ridge. Some of the pronunciations are presented in example (20) below.

(20) (S10)

- | | |
|--|--|
| a. <kancani>
[ka ^ɰ !a:ni]
'small' | b. <iqiniso>
[ilini:so]
'the truth' |
| c. <ukubhinca>
[uyupi-n ^ɰ !a]~[uyupi-n ^ɰ !a]
'to sing' | d. <iqanda>
[ila-n·dra]~[i!a-n·dra]
'an egg' |
| e. <icici>
[i!i:i]~[ili:i]
'an earring' | f. <iqhegu>
[i! ^h e:ku]~[i! ^h e:ku]
'an old man' |
| g. <inciliba>
[iɲ ^ɰ ili:βa]
'an ostrich' | h. <ukuguqa>
[uɣuku:la]
'to kneel' |

As for those speakers who produce clicks at two different places of articulation but for whom these are not distinct phonemes, it is most important to define the criteria by which to distinguish them from those speakers who might have two phonemically distinct places of articulation in their clicks. As described above, the main criterion used in this paper is consistency of pronunciation – for speakers that distinguish between places of articulation, the clicks are produced consistently in one place of articulation for any given lexeme, whereas those

speakers, whose clicks are in free variation between the two places of articulation have their clicks varying in place between occurrences of the same lexeme. Some examples of such a speaker were provided in (13) and (14) above.

Something that would certainly have been interesting, but did not fit within the scope of the current study, would have been to also try to check whether the two places are completely in free variation, or if the speakers have a preferred place of articulation, and whether such a preference is contextually determined – from a purely phonological point of view the variation is certainly free, but we do not know whether there might be, for example, factors of discourse or higher level prosody affecting the choice of place of articulation.

4.2.1 Quantitative analysis of clicks

The main variables analyzed concerning the clicks of each speaker were preference of place of articulation, consistency, and correspondence to standard forms (i.e. the forms found in the dictionaries). Speaker preferences for the two main places of articulation attested a range from 30 to 100 percent for the dental click <c>, with a mean value of 74% and a median value of 89%, whereas for the postalveolar click <q>, the range is 0 to 66 percent, with a mean of 25% and a median of 11%. This indicates a strong preference for the dental clicks for about half the speakers, with the rest producing dental clicks between approximately one third and two thirds of the time. There is only one speaker clearly preferring postalveolar clicks over dentals, with 66% of words with a postalveolar preferred click, whereas dentals are preferred (significantly over 50% of words with a dental pronunciation preference) by eight speakers, that is, two thirds of the sample, ranging between 63–100% preference.

The correspondence of speakers' forms to dictionary forms varies from 35 to 100 percent, with a mean value of 58% and a median value of 53%. Most of the speakers match the expected forms between 35% and 65% of the time, with two matching much more frequently, at 86% and 100%, respectively.

Measures of speaker consistency of click production in the sample vary from 21% (only a fifth of click words are consistently produced) to 100% (each word is consistently produced with the same click), with a mean value of 84% and a median value of 95%. Most speakers produce clicks with significant consistency, with half of them being consistent 95% or more of the time, while all but one of the rest are consistent 60% or more of the time. The one very inconsistent speaker (S10), with only 21% consistency, is the speaker whose place of articulation does not seem to be fixed.

When these results are checked against each other, as shown in Figure 1, some observations can be made. First of all, there seems to be a correlation between strength of preference for dental clicks over postalveolars and consistency of click production. For the more extreme cases of preference, this is hardly surprising. When a speaker only produces dental clicks, they are necessarily consistently dental.

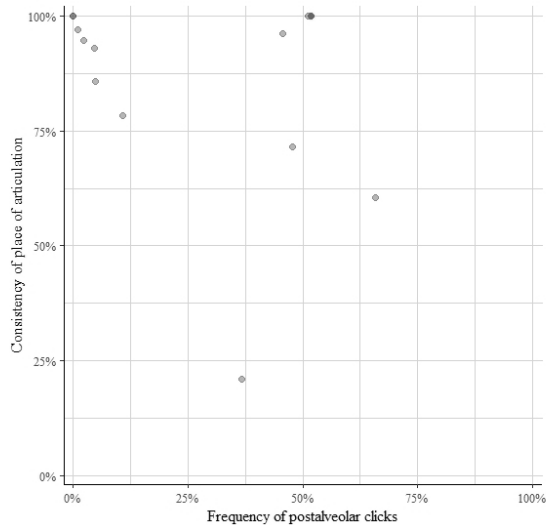


Figure 1 Consistency of place of articulation compared to frequency of production of postalveolar clicks

Consistency drops for those who prefer dentals but occasionally produce postalveolars. These speakers can be interpreted as having the postalveolar click as an inconsistently occurring, dispreferred allophone.

Another peak of consistency occurs for most of those speakers who produce approximately equal amounts of dental and postalveolar clicks. This is not that surprising either, as the vocabulary set that the recorded words were drawn from is also approximately balanced between words containing dental and postalveolar clicks, and on average, the set of words recorded with each speaker was also balanced.

There are two outliers that do not neatly fit into these patterns. One is the aforementioned speaker (S10) whose clicks are underspecified for exact place of articulation, and the other is a speaker who, contrary to the general trend, preferred postalveolar clicks irrespective of their expected place of articulation. The second observation that can be made is that the occurrence of words with

preferred postalveolar click pronunciation seems to correlate with correspondence of produced forms to expectations based on dictionary forms, as can be seen in Figure 2. This would not be the case if many speakers overpreferred postalveolar clicks, but as preference is rather skewed towards dental clicks, a correlation between high correspondence with standard forms and higher than average use of postalveolar clicks can almost be expected.

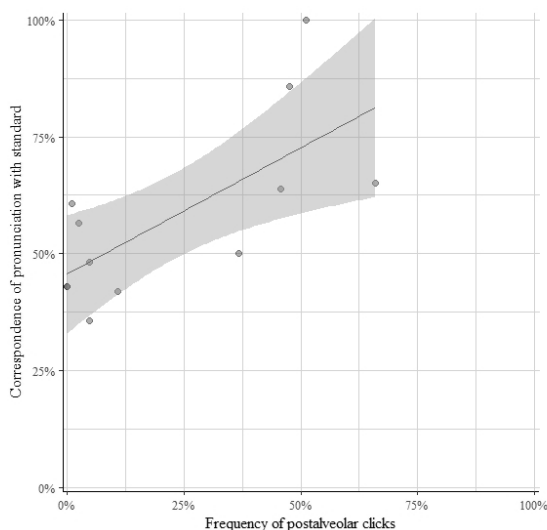


Figure 2 Correspondence of pronunciation with standard compared to frequency of production of postalveolar clicks

This result can be interpreted to mean that most forms not corresponding to dictionary forms are, for most speakers frequently employing such deviating forms, due to overpreference of dental clicks. The speakers who use postalveolar clicks more frequently can then be inferred to be using them mostly where expected. Even the one speaker clearly overpreferring postalveolars matches the standard forms 65% of the time, whereas the three other frequent, but more balanced, postalveolar click users (postalveolar occurrence at 47.6–51.1%, close to the percentage of dictionary forms with <q> occurring in the sample, 51.8%) match the dictionary forms 63.9%, 85.7%, and 100% of the time, respectively.

4.2.2 Quantitative sociolinguistic analysis

The numerical results on click realization acquired in the data analysis were further compared to some social and sociolinguistic variables. The variables discussed here are those which, as formulated in our relevant research questions,

are hypothesized to possibly correlate with and have some explanative power over the phenomena of click realization observed. These include age, number of languages spoken, and level of education. Because of the somewhat arbitrary way the values of the variable for the level of education were originally determined, we then did some further tests in which we used the different binary variables relating to a speaker's education. These included the four level of education variables (participation in) secondary, tertiary, vocational and university education, as well as the two formal isiNdebele instruction variables isiNdebele subject education at school and isiNdebele as a subject at university. As the number of variables is quite large and thus difficult to compare with the single level of education variable used in the earlier tests, we also did some tests using the composite variable *total level of education*.

Gender, social status, and issues of identity are not discussed here. Even though some slight differences along gender lines are possibly detectable even in the current, very limited, sample, and qualitative observations lend some support to a hypothesis of identity, gender, and/or social status playing some role in click production, the issue is complicated and deserves a more thorough treatment than would be possible to provide in this article. The issue is briefly taken up again in Section 5, however. Also, gender was still used as a variable in multiple regression analyses performed on the data.

Age was not found to correlate with any of the measures of click realization arrived at in the previous section. This result is not unexpected, due to the limits of the sample. Only five of the twelve speakers interviewed were above the age of 30, and there is great variation in the click production among those five – there are just too few data points for ages above 30 to arrive at any useful conclusions. Especially limiting is the fact that there are only two speakers above the age 50, the group that would certainly have not had any mother tongue subject education in isiNdebele. Those two, however – interestingly enough – are two of the three speakers who completely consistently produce only dental clicks, 100% of the time.

The number of languages spoken by a speaker is also not a good predictor of click realizations. Two very slight trends – decreasing preference for dentals (or rather increasing preference for closer to equal occurrences of dentals and postalveolars) and increasing correspondence to standard forms with increasing number of languages spoken – can be gleaned. However, the variation is too great, with outliers mostly in the middle of the scale, and the number of data points so small, that these trends cannot be viewed as very useful observations.

More interesting results can be observed when looking at the speakers' level of education. Even here, the small number of data points makes the results very preliminary, but the observed trends are nevertheless more noticeable than for

the number languages. The measures for which there seems to be a correlation with the level of education as well as the direction of the trends are exactly the same two as already mentioned for the number of languages spoken, that is, decreasing preference for dental click realizations and increasing correspondence to standard forms.

As can be seen from Figure 3, even though there is still significant variation, the downward trend of dental click production with increasing level of education is quite noticeable. In a 4-variable (age, number of languages spoken, level of education, and gender) *linear regression* test,²⁶ dental click preference was found to correlate with level of education with a value of -0.41 with a significance of $p = 0.022$ *.²⁷

The rising trend for correspondence to standard forms in Figure 4 is not quite as strong, but it is somewhat clearer, with not quite as much variation. In a similar 4-variable linear regression test, correspondence with pronunciation as expected from dictionary forms was found to correlate with level of education with a value of 0.303 with a significance of $p = 0.019$ *.

26 Linear regression was chosen as the method here, as in the initial stages of research we had only a vague idea as to which social factors might be of relevance regarding our data, and linear regression provided a simple way to test which if any of our proposed variables show a discernible effect. It was then used in the further tests to be consistent. Our small dataset and limited metadata restrict the statistical power of any test results.

27 *Regression analysis* is a statistical technique used to analyze the relationship between two or more variables, and *linear regression* is a variant of it, that tries to model the relationship of a dependent variable (in this case preference for dental clicks), to one or more independent variables (in this case age, number of languages spoken, level of education and gender) with a *linear model* – put simply, the model compares how well the values of the dependent variable related to the values of a given independent variable map onto a straight line. The closer the fit to a straight line, the better the independent variables are deemed to predict the behavior of the dependent variable.

Correlations are given as a value (the correlation coefficient r) ranging from -1 to 1, where -1 means a perfect negative correlation, 0 means no correlation at all, and 1 means a perfect positive correlation – these ideal values rarely occur. Instead, values above -0.3 but below 0.3 are usually interpreted as no correlation, values between -0.5 and -0.3 or between 0.3 and 0.5 are seen as weak correlation, values between -0.7 and -0.5 or between 0.5 and 0.7 as moderate correlation, and values at or below -0.7 or at or above 0.7 as strong correlation.

The statistical significance of results is given as a p -value, indicating the probability that the results obtained in the statistical test would be equal to or more extreme than the actual observed results, assuming that the null hypothesis (that is, the hypothesis that “nothing is happening”, that there is no relation between the variables observed and tested) is true. Put more simply, if the results obtained seem very improbable, should the null hypothesis be true, the null hypothesis may be rejected, and the results are statistically significant. As our research is rather prospective, we use no definitive cut-off point (or *significance level*) for the desired p -values, but rather indicate different levels of significance with asterisks after the p -value: $p \leq 0.05$ *, $p \leq 0.01$ **, $p \leq 0.001$ ***. These are all viewed as significant results, with more asterisks meaning more significant. Results of $p < 0.1 > 0.05$ are mentioned as interesting but not very significant. Results of $p \geq 0.1$ are rejected as insignificant.

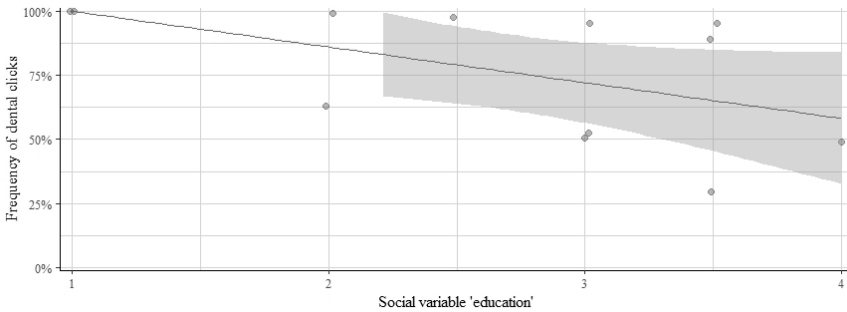


Figure 3 Social variable “level of education” and preference for dental clicks

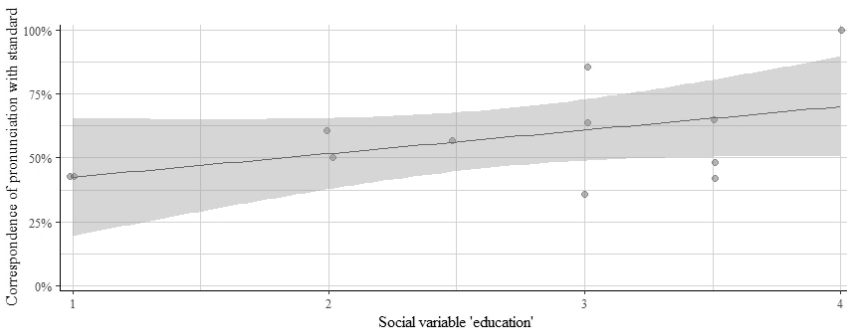


Figure 4 Social variable “level of education” and correspondence to standard

However, the further tests performed with the binary education variables gave somewhat different results. First of all, we found that the limits of the small size of the dataset were accentuated with the simple binary variables. When we tested using the separate binary variables, we found that higher levels of education (both general education and formal isiNdebele education) correlated, to some degree, with both decreasing overpreference for the dental click and production of clicks that more closely matched dictionary forms. These findings were, however, mostly statistically non-significant. Especially problematic was the fact that the cumulative nature of education could not be captured this way.

Thus, we employed two composite variables, one for the general level of education and one for formal isiNdebele education, calculated simply through addition of the values of the respective binary variables. Thus, the composite level of education variable can have values 0 (has not attended secondary or tertiary education), 1 (has attended secondary but not tertiary education), and 2 (has attended secondary and tertiary education). The composite isiNdebele education variable can have

values 0 (has not attended any formal isiNdebele education), 1 (has attended isiNdebele education in primary and/or secondary school), and 2 (has attended isiNdebele education both in primary/secondary school and at university).

Using these composite variables, we found that overpreference for dental clicks still might correlate negatively with general level of education. In a 5-variable linear regression test using the new composite variables in addition to the original variables for age, gender, and multilingualism, the occurrence of dental clicks was found to correlate with general level of education at an estimated value of -0.42 , although with $p = 0.096$ this finding cannot be considered very significant. However, looking at the plot in Figure 5, a better claim would be that the variability of click production increases with general level of education, with all education level groupings having a significant number of speakers with a high preference for dentals. The extent of divergence from the dental preference as well as the number of speakers diverging from it increase among the speakers with a higher level of education.

However, no correlation at all was found between general level of education and the tendency to produce clicks corresponding to dictionary forms. Instead, we found that a speaker's individual consistency of click production, along with their tendency to match dictionary forms, correlates with the formal isiNdebele education composite variable. In similar 5-variable linear regression tests, we found that the level of isiNdebele education correlates with the speaker's own

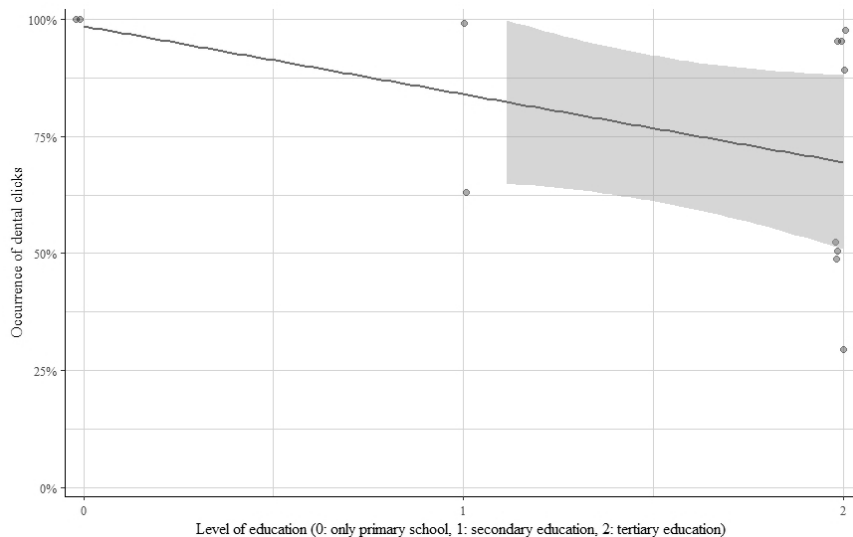


Figure 5 Level of education and preference for dental clicks

consistency in click production at an estimated value of 0.46, with a significance of $p = 0.0098^{**}$, and with the correspondence with dictionary forms at a value of 0.30 with a significance of $p = 0.008^{**}$.

This observation led us to formulate another composite variable, namely that of *consistent correspondence with standard forms* (or, shorter, *consistent correspondence*), calculated by multiplying the values for corresponding with standard/dictionary forms with the values for a speaker's consistency. In another 5-variable linear regression test, this new composite variable was found to correlate with formal isiNdebele education more strongly than either of its components, at an estimated value of 0.54 with a significance of 0.00105^{**}. As this is our most statistically significant finding, and yet the dataset is so restricted, we did a few additional tests to see how this finding would hold out against these tests. First, Figure 6 shows the trend visible in a plot of the consistent correspondence variable against the formal isiNdebele education variable.

Second, we calculated the *Pearson product-moment correlation coefficient* for the consistent correspondence variable and the formal isiNdebele education variable to measure their linear correlation. The correlation coefficient was found to be $r = 0.72$ with a p-value of 0.008^{**}, which seems to support the results of the linear regression test, even indicating a rather strong correlation. However, the small sample size means that r is not an unbiased estimate of the population, and thus has low statistical power. The low resolution of our education metadata also

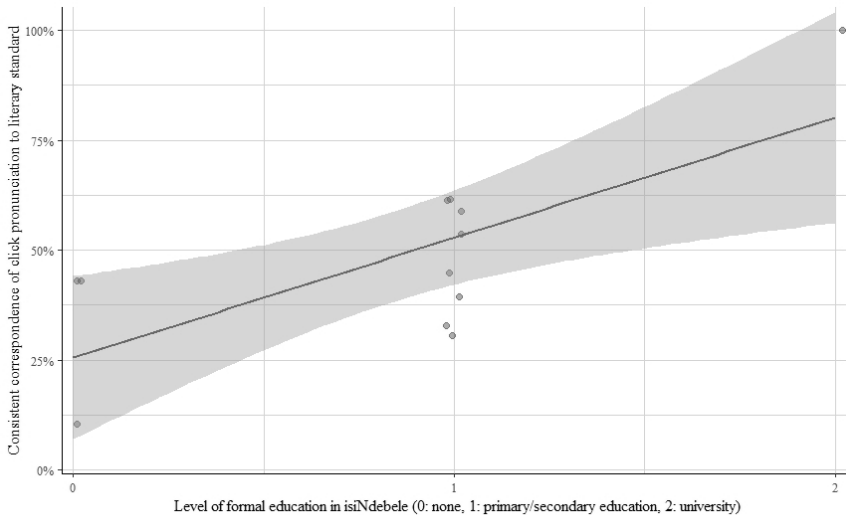


Figure 6 Level of formal education in isiNdebele and consistent correspondence to standard

means that although, for example, level of education is in reality a variable with a continuous probability distribution, in our sample it behaves as if it had a discrete distribution. This is also not the ideal case for relying on a Pearson correlation coefficient.

Therefore, we also calculated the *Spearman's rank correlation coefficient* for these variables, as it is more appropriate for discrete variables. Here, we found the correlation coefficient to be $r_s = 0.56$, but with a p-value of 0.06, that is, not as significant as the previous results. This high p-value might partially be explained by the fact that two thirds of the observations of the formal isiNdebele education variable come from speakers with the middle rank value of that variable.

In any case, although only two of three tests gave statistically significant results, the third was not far above $p = 0.05$, and all the tests indicated at least a moderate positive correlation of more than 0.5. Thus, the main caveat is the small sample size, which makes all of these results still very uncertain, due to the significant effect even one additional divergent observation could have on them.

In conclusion, it can be said that while the limited sample makes all these results initial and somewhat speculative, the data does seem to point towards a correlation between level of formal isiNdebele education and tendency to produce clicks (in elicitation, at least) according to how they are represented in the written standard. As for the other variables, we were unable to find discernible effects, except for the modest negative correlation between general level of education and preference for dental clicks. The number of languages spoken seems not to be a relevant variable for variation in click production for the language, whereas our sample's limitations preclude making any inferences about whether age or gender play a role in how speakers pronounce clicks.

4.2.3 *Qualitative observations*

In addition to our quantitative analysis, we gathered some qualitative information in the form of isiNdebele speaker attitudes and opinions on click consonants, as well as our own impressions of phenomena that we do not have enough data on to analyze qualitatively. First of all, a few speakers expressed their uncertainty about how to write some click-containing words and asked us to show them how they were written in the dictionaries. The problem was summarized by one of them as not always knowing whether a given word is written with a <c> or a <q>. These speakers belonged to the group who produced dental and postalveolar clicks inconsistently for the same words.

Furthermore, when interviewing speaker S9, who teaches isiNdebele at university level and is very knowledgeable about the ways the language is used

in different parts of the isiNdebele speaking region, in addition to elicitation, we discussed the articulation of click sounds. The speaker told us, that in everyday speech, some speakers pronounce some words typically with dentals while others produce them with postalveolars, and that which way one produces them does not matter in informal discussion. The speaker also told us that while for the elicitation they pronounced the clicks according to the orthography, in everyday speech they tend to quite freely mix the clicks. They added that speakers don't really care whether someone produces dental or postalveolar clicks in a given context, and that the choice of place of articulation does not affect understanding.

A final interesting observation is the seeming tendency for some speakers to use postalveolar clicks more frequently during initial pronunciation of lexemes during elicitation, and during some observed speech events where careful speech was used, like public speeches. Our first impression is that this tendency is especially typical of male speakers. However, no systematic analysis of the phenomenon has been performed yet. A proper treatment of this possible phenomenon would require a full study of its own.

5. DISCUSSION

The Sindebele data, while being highly preliminary, seems to largely agree with Ziervogel's (1959) observations about the consonant correspondences to the isiNdebele clicks, with the addition of the ejective stop /k'/ occasionally corresponding to the non-nasal clicks. No pattern regarding this alternation can be established based on the scarce data available, the main problem being the small number of cognates found. Further research should also be carried out in terms of mapping possible regional and individual variation. Another departure from Ziervogel's original analysis is our finding of a voiced velar fricative /ɣ/ corresponding to a nasal click, but this is an isolated incident and, again, merits more investigation in the future.

Comparing this to the findings on click loss by Traill & Vossen (1997) is complicated by the fact that very little is known of the clicks in Sindebele prior to their assumed loss. There are no palatal stops in our data, but the velars, as Traill & Vossen predict for the accompaniments, do seem to preserve nasality. As for Angolan !Xū and ||Xegwi, similar results (loss of "abrupt" series of clicks only, or earlier than the other series) are not attested in our data, but it should be noted that the sociolinguistic situation is quite different in comparison – Sindebele, while endangered, is not in a similar stage of language shift. There may also be a considerable difference in the time depth of the phenomena – we do not know

when the Sindebele clicks were lost, or indeed much at all about the historical developments within the language.

As for the clicks actually produced by Sindebele speakers, they are only found in loanwords. These seem to be mainly of isiZulu origin and were only attested for speakers with at least some knowledge of isiZulu. Further research is needed to establish the extent of such loans – it is possible that, at least in the form of loanwords, clicks might be in the process of being (re)introduced to Sindebele.

As for isiNdebele, although the small speaker sample makes it hard to draw any strong conclusions, some results seem to suggest themselves. First of all, the issue of the non-distinctiveness of the segmental qualities of the plain clicks as opposed to the non-nasalized depressor clicks raises the question of whether these two types of clicks are in fact distinct phonemes at all. This question ties into wider issues of apparent weakening of distinctive features of depressor consonants and of the phonologization of the depressor effect, as well as the possibly related issue of the simplification of lexical tone patterns in isiNdebele (see Aunio et al. in this volume), topics very much beyond the scope of this paper. Suffice to say, it does indeed seem as if the remaining segmental differences between the two click types discussed here are only marginally relevant, with the tonal distinction caused by the depressor effect taking on much of the functional load. Should the depressor effect become fully phonologized and reanalyzed as independent of the consonants preceding it, the two clicks might indeed proceed to fully merge.

The observation that dental clicks are highly preferred by about half of the speakers, and not dispreferred by any but one of the other speakers, is interesting in the light of Herbert's (1990) claim that the postalveolar (or palatal, in his terminology) click is the least marked in the Southern Bantu languages. As already indicated by Gunnink's (2018) Fwe data, this claim cannot be said to hold for all Bantu click languages, nor, based on our data, even for all Southern Bantu languages. The tendency for lateral clicks to be lost, also discussed by Herbert, does, however fit with our data as well.

Another interesting observation we have made relating to this issue is the phenomenon, mentioned in Subsection 4.2.3, of some speakers tending to use postalveolar clicks in contexts possibly assumed to be of higher importance, such as public speeches and initial moments of elicitation. This tendency might also point to some sort of identity-signaling role for the postalveolar click. Our preliminary hypothesis is that the very intense and loud character of the postalveolar click as compared with the dental one might make it more suitable for signaling emphasis or identity. As click consonants do not occur in most of the languages commonly spoken by the neighbors of the isiNdebele speaking communities, with isiZulu being the exception (and a latecomer to the area at that) clicks

might be viewed as something typical of isiNdebele as opposed to other languages of the area. Thus, it might be used to signal and enforce identity, for example, as an isiNdebele speaker valuing the language and amaNdebele culture. This might affect linguistic analysis for example if speakers tended to reinforce or accentuate the kinds of features that show group distinctions in elicitation situations. It might even be that similar phenomena occur in other Bantu languages with clicks as well, and that these might have influenced analyses of their click preferences. All of this should, however, still be viewed as highly hypothetical.

The correlation of correspondence of click realizations to standard forms with decreasing preference for dental clicks and respectively increasing preference for postalveolar clicks, and the correlation of each of those measures with the sociolinguistic variables of exposure to isiNdebele subject education and general level of education are especially noteworthy. Based on these findings, some preliminary confirmation may be found for the hypothesis that the click inventory of isiNdebele (or some varieties of it) seems at some earlier stage to have been at least partially reduced to a single – dental – place of articulation, but that the situation is again changing with speakers' increasing exposure to and education in the standard literary form of the language.

Our study does not give any good answers as to why the general level of education seems to correlate more strongly with a weaker preference for dental clicks than does the level of exposure to formal isiNdebele education. One hypothesis to investigate could be that any exposure to the literary standard language increases the probability of a speaker having the postalveolar realization in their active articulatory repertoire.²⁸ But higher exposure and, possibly as a result of this, higher adherence to the standard, would then limit this realization to only those forms where the postalveolar variant is found in the standard. This would result in a wider variance of occurrence of postalveolar clicks with those speakers who have had some level of formal isiNdebele education below university level compared either to those who have had no formal isiNdebele education or to those who have gone on to pursue further education in the language. However, a larger, more detailed study would be needed to investigate this hypothesis.

The spread of the written standard may be a key factor in explaining some of the variation found in the pronunciation of click consonants in isiNdebele. Exposure to the written standard (and, possibly, to forms based on the written standard, such as might be used in more official or highly public domains like the media or larger organizations or institutions) increases with increasing level of isiNdebele subject

²⁸ And possibly exposure to related languages, which have preserved the dental–postalveolar distinction more clearly.

education. Access to these normative spoken forms is also facilitated by education. Speakers more familiar with the standard language seem to be more likely to produce forms corresponding to the standard, whereas less educated speakers tend to prefer one place of articulation, usually dental, over the other.

This leads to a sort of diglossia of phonemic inventories: some speakers clearly only have one phonemic place of articulation, whereas others have two, at least in some speech registers. Intelligibility between speakers does not seem to be hampered by this situation, as can be observed from the description of click use and variation provided by one consultant (S9) above in Subsection 4.2.3; this situation is not surprising given the low number of minimal pairs existing for the two click series. The dictionary *Iziko lesiHlathululi-mwezi sesiNdebele* (2006) gives twelve apparent exact minimal pairs. However, eight of these have the same meaning (sometimes with a somewhat different choice of words for the English translation); one pair has basically the same meaning expressed somewhat differently; one has different specific meanings that are derived from the same root; and two have completely different meanings. These last two are also completely different parts of speech, with both dental examples being verbs and both of the postalveolar ones being nouns. These minimal pairs are illustrated in Table 8.

No convincing confirmation was found for the hypothesis that exposure to other Nguni languages with larger click inventories might be influencing the click realizations of isiNdebele speakers. The number of languages spoken did show slight correlation with increased occurrence of postalveolar clicks, but the variable can, in hindsight, be considered too general to be useful in measuring influence of other click containing languages on isiNdebele. This is because the number of languages spoken usually contained two to three languages without clicks (most commonly English, Northern Sotho, and Afrikaans) as well. Furthermore, it is not a completely independent variable, correlating noticeably with the level of education of a speaker, although speakers had frequently learned many of the languages outside of educational contexts.

Even measuring knowledge of other Nguni languages would, in all probability, not give confirmation for this idea, as in the study sample all but the oldest two speakers indicated that they speak isiZulu at least. In a larger sample this variable might still be tested successfully. One problem might still remain, however, namely, disentangling the not-quite-independent variables of age, multilingualism, and education. Older speakers of the language seem to be – on average – less well educated and less familiar with other languages. These factors might cumulatively cause a steep difference between those generations that grew up and settled down before the fall of apartheid – especially those who were schooled before the introduction of isiNdebele language teaching in the

1980s – and younger generations. For younger speakers, the factors of education and multilingualism might actually be more independent, and in future studies it might make sense to also analyze different age groups independently in relation to them.

Table 8 IsiNdebele minimal pairs with clicks

Word with <c>	Translation	Word with <q>	Translation	Notes
-bhaca	'to hide'	-bhaqa	'to hide'	
i-cabazi	'[yard] ²⁹	i-qabazi	'yard'	
-caca	'to be clear'	i-qaqa	'polecat, skunk'	different PoS
-catha	'to administer edema'	i-qatha	'hoof'	different PoS
-choba	'to crush between fingernails'	-qhoba	'to crush between fingernails'	
ubu-chopho	'brain'	ubu-qhopho	'brain'	Also found as <i>ubu-qopho</i>
-cima	'to put out fire'	-qima	'to extinguish'	
-cobela	'to fill a pipe/gun'	-qobela	'to cut up and mix (as stew)'	³⁰
-colela	'to forgive someone'	-qolela	'to forgive'	
um-condo	'scraggy legs'	um-qondo	'thin legs'	
i-condo	'position with bent knees'	i-qondo	'bended knee'	
um-sucwa	'kraal manure'	um-suqwa		

Possibly significant variables that were left out of this study completely were location (of birth, of residence) and mobility, as well as linguistic environments at home, in educational institutions, and at work (assuming that other environments are not as significant, as significantly less time is spent there). These variables could not be tested because the sample was too homogeneous regarding location and the linguistic environment at home, as all but three speakers lived in the same area in primarily isiNdebele speaking homes, and too little data was available for the rest.

²⁹ 'flat piece of ground in front of a house in an African homestead' i.e. 'yard'

³⁰ Probably both derived from *-qoba* 'to cut into small pieces', cf. *-cobelela* 'to cut into small pieces'.

It must also be noted that even for those variables for which there was more usable and variable data, the study sample is often not representative of the population of the area. According to the 2011 census of South Africa (Statistics South Africa 2012), people aged 40 or more only represent a little over 10% of the population of Mpumalanga, and only a little over 5% had any education of a higher level than secondary.

In conclusion, while the current situation regarding click consonants in both Sindebele and isiNdebele broadly corresponds to what has been described in earlier literature – complete replacement of clicks with pulmonic velar consonants in Sindebele and clicks with two main places of articulation in isiNdebele – variation within, and exceptions to, the general pattern occur in both languages. We further propose some tentative sociolinguistic factors that might help in explaining the variation observed. In the case of Sindebele, most of the sporadically occurring and probably recently reacquired clicks can plausibly be explained as borrowings from isiZulu. As for isiNdebele, the extent of isiNdebele subject education (and thus exposure to the written standard) appears as a likely candidate for explaining at least some of the variation found in whether speakers use dental clicks only or both dental and postalveolar ones. IsiNdebele subject education seems to correlate negatively with dental click preference and positively with the adherence of click production to the dictionary forms of words. These results are, however, tentative, and for both languages more research is needed, if more reliable conclusions are to be drawn about the effects of social dynamics on click variation and reacquisition. Further variables, such as geographic location, domains of language use, and identity signaling might also play a role, and accounting for these would also require additional research, designed specifically to account for these topics.

ABBREVIATIONS

CL	Noun class
COP	Copula
FV	Final vowel
NEG	Negation, negative
SG	Singular
INF	Infinitive

Numbers preceding an abbreviation refer to person (e.g. 1SG). Numbers following an abbreviation refer to noun class (e.g. CL5).

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APPENDIX I: COMPARISON OF CLICK WORDS CONTAINING A LATERAL CLICK IN SHABANGU & SWANEPOEL (1989) WITH IZIKO LESIHLATULULI-MEZWI SESINDEBELE (2006), WITH ISIZULU COMPARISONS FROM DOKE & VILAKAZI (1953) AND DOKE, MALCOLM & SIKAKANA (1958)

Dictionary: Eng-Nbl	Dictionary: Nbl-Eng	Translation	Note	isiZulu comparison
unoxhaka	unoxhaka	(mouse)trap	Nbl-Eng: isichaka is something completely different, 'a poor person'	unoxhaka
-ngxamile	-ncama	serious(ness)		-ngxamile
-xhwalileko	isiqhwala	sickly vs. cripple/ chronically sick person		-xhwalile
-nxele	incele	left, left-handed (person)		-nxele
inxeba	inceba	wound		i(l)inxeba
-xolo	-colo, -qolo	forgiveness, apology		-xola (and derived forms)
-xolisa	-colisa	apologise		'(be) peaceful, calm, at peace'
-xolelwa	-colelwa	amnesty		
-xolela, ixolelo	-colela, -qolela	forgive, excuse		
-xoxa	-coca	chat, narrate		-xoxa
ingxoxo	ingcoco	Eng-Nbl: chat, essay; Nbl-Eng: narration	Eng-Nbl: iqqoqo: summary, collection related?	

Dictionary: Eng-Nbl	Dictionary: Nbl-Eng	Translation	Note	isiZulu comparison
nganxanye	ngancanye	aside	Eng-Nbl: ngancanye: one-sided, sideways	nganxanye 'on/to one side'
inxenye	-ncenye, -ngcenye	part, side, aside etc.	Depressor difference between part and side/half?	inxenye
-nxande	-	rectangle, rectangular	Other similar geometrical words with a nxa-element also don't appear in the other dictionary, but the nxa-element is found as nca- for example in ngancanye above	
isixuku	-	cluster		isixuku
-nxephezela / isinxephezelo	-	compensation		-nxephezela 'sympathize etc.'
-xilonga	-	diagnose		xilonga ukwazi isifo 'diagnose a disease'
isithixo	-	god, idol		isithixo
-xhawulana	-	shake hands		-xhawula 'grip with / shake by the hand'
isigaxa	-	lump, nodule		isigaxa
-xabana	-	quarrel	Probably related to Nbl-Eng qaba 'block across, to cross', c.f. isiZulu comparison	-xabana from -xaba 'place in difficulties, block the way, stand crosswise etc.'

Dictionary: Eng-Nbl	Dictionary: Nbl-Eng	Translation	Note	isiZulu comparison
-bhoxobhoxo/ -mboxomboxo	-	slime/slimy	Descriptive/ideophonic, probably neither dictionary covers all of this type	bhoxo '(ideophone) of walking in the mud, mixing up'
umxhantela	-	sprout		umxhantela
ubunxemu/-nxwema	-	squint		-nxemu, -nxwemu, -nxwema
ixhaphozi	-	vlei	might be related to Nbl-Eng chapha 'splash, stain', although that is represented in Eng-Nbl as chaphazela 'blot'	ixhaphozi; possibly from xhapha '(ideophone) of boiling / bubbling up, squelching mud, etc.; might in turn be related to chapha '(ideophone) of dropping/splashing liquid'
-rhexisa	-	withdraw		hoxisa, from hoxa 'with-draw etc.'
xege-xege	-	(ideophone) of wobbling		umxexege 'loose/rickety/unsteady animal or thing', from xege '(ideophone) of looseness/unsteadiness/shakiness'

APPENDIX II: PLACE AND MANNER OF ARTICULATION ANALYSIS DATA

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S1	-ceba	dental	plain			100%
S1	-chaphaza	dental	aspirated			100%
S1	-chaza	dental	aspirated			100%
S1	-chichima	dental	aspirated	dental	aspirated	100%
S1	-chisa	dental	aspirated			100%
S1	-choba	dental	aspirated			100%
S1	-cimeza	dental	plain			100%
S1	-citha	dental	aspirated			100%
S1	-cobelela	dental	plain			100%
S1	-cwayisa	dental	plain, labialized			100%
S1	-cwebezela	dental	plain, labialized			100%
S1	-cwenga	dental	plain, labialized			100%
S1	-cwilisa	dental	plain, labialized			100%
S1	-gcina	dental	plain, depressor			100%
S1	-gcuguzela	dental	plain, depressor			100%
S1	-gcwala	dental	depressor, no voicing, labialized			100%
S1	-ncancabeza	dental	nasal	dental	nasal	100%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S1	-ncenga	dental	nasal			100%
S1	-ncinza	dental	nasal			100%
S1	-nciphisa	dental	nasal			100%
S1	-ngcwaba	dental	prenasalized, depressor, labialized			100%
S1	-nqophu	dental	nasal			0%
S1	-qala	>50% postalveolar	plain			75%
S1	-qaqada	dental	plain	dental	plain	0%
S1	-qeda	dental	plain			0%
S1	-qephula	dental	plain			0%
S1	-qhaqhazela	dental	aspirated	dental	aspirated	0%
S1	-qhuba	dental	aspirated			0%
S1	-qhuqhumba	dental	aspirated	dental	aspirated	0%
S1	-qima	dental	plain			0%
S1	-qintela	dental	plain			0%
S1	-qopha	dental	plain			0%
S1	-qothula	dental	plain			0%
S1	-qunga	dental	plain			0%
S1	-ququbala	dental	plain	dental	plain	0%
S1	amancina	dental	nasal			100%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S1	ichibi	dental	aspirated			100%
S1	icici	dental	plain	dental	plain	100%
S1	incwadi	dental	nasal, labialized			100%
S1	ingcenywe	dental	nasal, depressor			100%
S1	ingqondo	dental	sometimes prenasal, sometimes nasal, depressor			0%
S1	iqolo	>50% dental	plain			25%
S1	iqwatjhi	>50% dental	plain, labialized			25%
S1	isichaka	dental	aspirated			100%
S1	isigqila	dental	plain, depressor			0%
S1	isiqa	dental	plain			0%
S1	isiqhwala	dental	aspirated, labialized			0%
S1	isiqu	dental	plain			0%
S1	ubuchopho	dental	aspirated			100%
S1	ugcwetha	dental	depressor, no voicing, labialized			100%
S1	umgqala	dental	plain, depressor			0%
S1	umgqomu	dental	plain, depressor			0%
S1	umngcwabo	dental	prenasalized, depressor, labialized			100%

Speaker	Lexeme	First click in lexeme		Accompaniments and other manners		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners			
S1	ummqopho	dental	nasal					0%
S1	umqondo	dental	plain					0%
S1	umqwwebu	dental	plain, labialized					0%
S1	ungci	dental	nasal, depressor					100%
S2	-cola	dental	plain					100%
S2	-cupha	dental	plain					100%
S2	-eqa	dental	plain					0%
S2	-guqa	dental	plain					0%
S2	-qeda	dental	plain					0%
S2	ichibi	dental	aspirated					100%
S2	icici	dental	plain		dental		plain	100%
S2	incwadi	dental	nasal					100%
S2	ingqondo	dental	prenasalized, depressor					0%
S2	inguquko	dental	plain					0%
S2	inqaba	dental	nasal					0%
S2	iqanda	dental	plain					0%
S2	iqhawe	dental	aspirated					0%
S2	umngcwabo	dental	prenasalized, depressor					100%
S3	-bhaca	dental	plain					100%
S3	-cabanga	>50% postalveolar	plain					25%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S3	-caca	postalveolar	plain	postalveolar	plain	0%
S3	-casula	postalveolar	plain			0%
S3	-chaza	>50% postalveolar	aspirated			25%
S3	-cima	>50% dental	plain			75%
S3	-citha	dental	plain			100%
S3	-eqa	>50% postalveolar	plain			75%
S3	-gcina	dental	plain, depressor			100%
S3	-khiqiza	>50% dental	plain			25%
S3	-ncancani	>50% postalveolar	nasal	>50% postalveolar	nasal	25%
S3	-ncinza	postalveolar	nasal			0%
S3	-ngcola	postalveolar	nasal or prenasalized, depressor			0%
S3	-qala	postalveolar	plain			100%
S3	-qaleka	postalveolar	plain			100%
S3	-qaqada	postalveolar	plain	postalveolar	plain	100%
S3	-qatjha	postalveolar	plain			100%
S3	-qhaq hazela	postalveolar	aspirated	postalveolar	aspirated	100%
S3	-qhulana	postalveolar	aspirated			100%
S3	-qinisa	>50% postalveolar	plain			75%
S3	-qobezela	postalveolar	plain			100%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S3	-xabana	postalveolar, lateral	plain			25%
S3	-yingcosana	dental	prenasalized, depressor			100%
S3	amagqibu	postalveolar	plain, depressor			100%
S3	gqi	dental	plain			0%
S3	icebo	>50% dental	plain			75%
S3	igqatiha	postalveolar	plain			100%
S3	ingenye	50% dental, 50% postalveolar	nasal			50%
S3	inqwaba	>50% postalveolar	nasal, labialized			75%
S3	iqatha	postalveolar	plain			100%
S3	iqembu	>50% postalveolar	plain			75%
S3	isichaka	>50% postalveolar	aspirated			25%
S3	isinqumo	postalveolar	nasal			100%
S3	isiqa	postalveolar	plain			100%
S3	isiqongolo	>50% postalveolar	plain			75%
S3	isiqu	postalveolar	plain			100%
S3	isiquntu	>50% postalveolar	plain			75%
S3	isithixo	lateral, postalveolar	plain			75%
S3	ugcinazithathe	>50% postalveolar	plain			25%
S3	umaqobola	postalveolar	plain			100%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S3	umgcino	postalveolar	plain			0%
S3	umgqomu	postalveolar	plain			100%
S3	ungqongqotjhe	dental	prenasalized, depressor, slightly voiced release	dental	prenasalized, depressor	0%
S4	-coca	dental	plain	dental	plain	100%
S4	-cola	>50% postalveolar	plain			25%
S4	Gqibelo	>50% postalveolar	sometimes plain, sometimes no audible release, depressor, sometimes breathy			75%
S4	icici	dental	plain	dental	plain, sometimes no audible release	100%
S4	incayesincele	dental	nasal	dental	nasal	100%
S4	incayesokudla	dental	nasal			100%
S4	incitlba	dental	nasal			100%
S4	incwadi	postalveolar	nasal, labialized			0%
S4	ingqondo	>50% postalveolar	sometimes prenas. sometimes nasal, depressor			75%
S4	iqanda	>50% postalveolar	plain, sometimes unexpectedly depressor			75%
S4	iqimiso	>50% postalveolar	plain			75%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S4	isigqila	postalveolar	depressor, no voicing, labialized			100%
S4	ubuqopho	postalveolar	plain			100%
S4	ugqwetha	>50% postalveolar	plain, labialized			75%
S4	umcoco	dental	plain	dental	plain, sometimes no audible release	100%
S4	umgqala	postalveolar	plain			100%
S4	umgqekezi	postalveolar	plain			100%
S4	umngcele	dental	prenasalized, depressor			100%
S4	umqasa	postalveolar	plain			100%
S4	umucu	dental	plain			100%
S4	ungci	dental	prenasalized, depressor			100%
S5	-ceba	dental	plain			100%
S5	-chaphaza	dental	aspirated			100%
S5	-chaza	dental	aspirated			100%
S5	-chichima	dental	aspirated	dental	aspirated	100%
S5	-chisa	dental	aspirated			100%
S5	-choba	dental	aspirated			100%
S5	-cimeza	dental	plain			100%
S5	-citha	dental	plain			100%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S5	-cobelela	dental	plain			100%
S5	-cwayisa	dental	plain, labialized			100%
S5	-cwebezela	dental	plain, labialized			100%
S5	-cwenga	dental	plain, labialized			100%
S5	-cwilisa	dental	plain, labialized			100%
S5	-eqa	>50% dental	plain			25%
S5	-gcina	dental	plain, depressor			100%
S5	-gcugcuzela	dental	plain, depressor			100%
S5	-gcwala	dental	depressor, no voicing, labialized			100%
S5	-ncancabeza	dental	nasal	dental	nasal	100%
S5	-ncenga	dental	nasal			100%
S5	-ncinza	dental	nasal			100%
S5	-nciphisa	dental	nasal			100%
S5	-ngcwaba	dental	sometimes prenas. sometimes nasal, depressor			100%
S5	-nqophha	dental	nasal			0%
S5	-qala	dental	plain			0%
S5	-qaqada	dental	plain	dental	plain	0%
S5	-qeda	dental	plain			0%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S5	-qephula	dental	plain			0%
S5	-qhaqhazela	dental	aspirated	dental	aspirated	0%
S5	-qhuba	dental	aspirated			0%
S5	-qhuqhuba	dental	aspirated	dental	aspirated	0%
S5	-qima	dental	plain			0%
S5	-qintela	dental	plain			0%
S5	-qopha	dental	plain			0%
S5	-qunga	dental	plain			0%
S5	-ququbala	dental	plain	dental	plain	0%
S6	-cola	dental	plain			100%
S6	Gqibelo	dental	plain, depressor			0%
S6	icici	dental	plain	dental	plain	100%
S6	inceba	dental	nasal			100%
S6	inciliba	dental	nasal, one instance depressor and breathy			100%
S6	incwadi	dental	nasal, one instance depressor and breathy			100%
S6	ingqondo	dental	prenasalized, depressor, one instance breathy			0%
S6	iqanda	>50% postalveolar	plain			75%

Speaker	Lexeme	First click in lexeme		Accompaniments and other manners	Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners		Place of articulation	Accompaniments and other manners	
S6	iqhegu	dental	aspirated				0%
S6	iqiniso	dental	plain				0%
S6	isigqila	dental	plain, depressor				0%
S6	ubuqopho	dental	plain				0%
S6	umgqekezi	dental	plain, depressor, sometimes breathy				0%
S6	ungci	dental	prenasalized, depressor				100%
S7	-bhaca	dental	plain, sometimes no audible release				100%
S7	-cabanga	dental	plain				100%
S7	-caca	dental	plain		dental	plain	100%
S7	-casula	dental	plain				100%
S7	-chaza	dental	aspirated				100%
S7	-cima	dental	plain				100%
S7	-citha	dental	plain				100%
S7	-khiqiza	dental	plain				0%
S7	-ncinza	dental	nasal				100%
S7	-ngcola	>50% dental	prenasalized, depressor				75%
S7	-qala	dental	plain				0%
S7	-qaleka	dental	plain				0%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S7	-qangi	>50% dental	plain			25%
S7	-qaphela	dental	plain			0%
S7	-qaqada	dental	plain	dental	plain	0%
S7	-qaqamba	dental	plain			0%
S7	-qatjha	dental	plain			0%
S7	-qeda	dental	plain			0%
S7	-qhaq hazela	dental	aspirated	dental	aspirated	0%
S7	-qhulana	dental	aspirated			0%
S7	-qinisa	dental	plain			0%
S7	-qothula	dental	plain, one instance nasalized			0%
S7	-qotjha	>50% dental	plain			25%
S7	-quntula	>50% dental	plain			25%
S7	ekugcineni	dental	plain			100%
S7	icebo	dental	plain			100%
S7	igqatjha	dental	plain, depressor, somewhat breathy			0%
S7	inqwaba	>50% postalveolar	nasal, labialized			75%
S7	iqatha	dental	plain			0%
S7	iqephe	dental	plain			0%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S7	isichaka	dental	aspirated			100%
S7	isinqumo	>50% postalveolar	nasal			75%
S7	isiqa	dental	plain			0%
S7	isiquнту	dental	plain			0%
S7	umgqomu	dental	plain			0%
S7	umqhele	>50% postalveolar	aspirated			75%
S7	umqwayiba	>50% postalveolar	plain, unexpected depressor, labialized			75%
S8	-bhaca	dental	plain			100%
S8	-cabanga	dental	plain			100%
S8	-caca	dental	plain	dental	plain	100%
S8	-chaza	dental	aspirated			100%
S8	-cima	dental	plain			100%
S8	-cwebezela	dental	plain, labialized			100%
S8	-khiqiza	dental	plain			0%
S8	-ncinza	dental	nasal			100%
S8	-qala	>50% dental	plain			25%
S8	-qaleka	dental	plain			0%
S8	-qanda	dental	plain			0%
S8	-qatjha	dental	plain			0%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S8	-qeda	dental	plain			0%
S8	-qhulana	dental	aspirated			0%
S8	-qinisa	dental	plain			0%
S8	-qothula	dental	plain			0%
S8	-qotjha	>50% dental	plain			25%
S8	-quntula	dental	plain			0%
S8	icebo	dental	plain			100%
S8	iggatjha	dental	plain			0%
S8	iqatha	dental	plain			0%
S8	iqembu	dental	plain			0%
S8	isichaka	dental	aspirated			100%
S8	isiqongolo	dental	plain			0%
S8	isiquntu	dental	plain			0%
S8	umgqomu	dental	plain			0%
S8	umqhele	>50% dental	aspirated			25%
S8	umqwayiba	>50% dental	plain, labialized			25%
S9	-bhinca	dental	nasal			100%
S9	-chaza	dental	aspirated			100%
S9	-coca	dental	plain	dental	plain	100%
S9	-cola	dental	plain			100%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S9	-eqa	postalveolar	plain, labialized			100%
S9	-gcina	dental	plain, depressor			100%
S9	-gugcuzela	dental	plain, depressor	dental	plain, depressor	100%
S9	-gwala	dental	plain, depressor, labialized			100%
S9	-gqekeza	postalveolar	plain, depressor			100%
S9	-guqa	postalveolar	plain			100%
S9	-qaqada	postalveolar	plain	postalveolar	plain	100%
S9	-qhaqhazela	postalveolar	aspirated	postalveolar	aspirated	100%
S9	icebo	dental	plain			100%
S9	icici	dental	plain	dental	plain	100%
S9	inceba	dental	nasal			100%
S9	inciliba	dental	nasal			100%
S9	incwadi	dental	nasal, labialized			100%
S9	ingceny	dental	nasal, depressor			100%
S9	ingqondo	postalveolar	sometimes prenas. sometimes nasal, depressor			100%
S9	iqanda	postalveolar	plain			100%
S9	iqatha	postalveolar	plain			100%
S9	iqembu	postalveolar	plain			100%
S9	iqhegu	postalveolar	aspirated			100%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S9	iqiniso	postalveolar	plain			100%
S9	isichaka	dental	aspirated			100%
S9	isigqila	postalveolar	plain, depressor			100%
S9	isinqumo	postalveolar	nasal			100%
S9	isiqa	postalveolar	plain			100%
S9	isiqu	postalveolar	plain			100%
S9	ubuchopho	dental	aspirated			100%
S9	ubuqopho	postalveolar	plain			100%
S9	ugcwetha	dental	plain, labialized			100%
S9	ugqwetha	postalveolar	plain, labialized			100%
S9	umaqobola	postalveolar	plain			100%
S9	umcabango	dental	plain			100%
S9	umcasa	dental	plain			100%
S9	umcoco	dental	plain	dental	plain	100%
S9	umgqala	postalveolar	plain, depressor			100%
S9	umgqekezi	postalveolar	plain, depressor			100%
S9	umgqomu	postalveolar	plain, depressor			100%
S9	umngcele	dental	prenasalized, depressor			100%
S9	umqasa	postalveolar	plain			100%
S9	umucu	dental	plain			100%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S9	ungci	dental	prenasalized, depressor			100%
S9	ungqongqotjhe	postalveolar	nasal, depressor	postalveolar	prenasalized, depressor	100%
S10	-bhinca	>50% dental	nasal			75%
S10	-cola	>50% postalveolar	plain			25%
S10	-eqa	postalveolar	plain, depressor			100%
S10	-guguczela	“in-between”/alveolar	plain, depressor	>50% postalveolar	plain	50%
S10	-gcwala	>50% postalveolar	plain, labialized			25%
S10	-gqekeza	>50% dental	plain			25%
S10	-guqa	“in-between”/alveolar	plain			50%
S10	-ncani	dental	nasal			100%
S10	-ncibilika	>50% dental	nasal			75%
S10	-qeda	>50% postalveolar	plain, depressor-like			75%
S10	amancina	“in-between”/alveolar	nasal			50%
S10	icici	>50% postalveolar	plain			25%
S10	inceba	“in-between”/alveolar	nasal	>50% dental	plain	50%
S10	inciliba	“in-between”/alveolar	nasal			50%

Speaker	Lexeme	First click in lexeme		Accompaniments and other manners		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners			
S10	incwadi	postalveolar	nasal, labialized				0%	
S10	iqanda	>50% dental	plain, depressor				25%	
S10	iqhegu	>50% postalveolar	aspirated				75%	
S10	iqiniso	dental	plain				0%	
S10	umcabango	>50% dental	plain				75%	
S11	-cola	dental	plain				100%	
S11	-cupha	dental	plain				100%	
S11	-eqa	dental	plain				0%	
S11	-guqa	dental	plain				0%	
S11	-qeda	dental	plain				0%	
S11	ichibi	dental	aspirated				100%	
S11	icici	dental	plain	dental		plain	100%	
S11	incwadi	dental	nasal				100%	
S11	ingqondo	dental	prenasalized, depressor				0%	
S11	inguquko	dental	plain				0%	
S11	inqaba	dental	nasal				0%	
S11	iqanda	dental	plain				0%	
S11	iqhawe	dental	aspirated				0%	
S11	umngcwabo	dental	prenasalized, depressor				100%	
S12	-bhaca	dental	plain				100%	

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S12	-cabanga	dental	plain			100%
S12	-cabanga	dental	plain			100%
S12	-chaza	dental	aspirated			100%
S12	-cima	dental	plain			100%
S12	-eqa	postalveolar	plain			100%
S12	-ncinza	dental	nasal			100%
S12	-qala	dental	plain			0%
S12	-qaleka	dental	plain			0%
S12	-qaqamba	postalveolar	plain	postalveolar	plain	100%
S12	-qatjha	postalveolar	plain			100%
S12	-qotjha	dental	plain			0%
S12	-xabana	dental	plain			0%
S12	-xola	postalveolar	plain			0%
S12	-xoxa	postalveolar	plain	postalveolar	plain	0%
S12	icatjhaza	lateral	plain, very long VOT as if aspirated			0%
S12	ingcnye	dental	nasal			100%
S12	iqatha	postalveolar	plain			100%
S12	iqephe	postalveolar	plain			100%
S12	iqhezu	dental	plain			25%

Speaker	Lexeme	First click in lexeme		Second click in lexeme		Match dictionary
		Place of articulation	Accompaniments and other manners	Place of articulation	Accompaniments and other manners	
S12	iqhezu	>50% dental	plain			0%
S12	isinqumo	dental	plain			0%
S12	isiqandiso	postalveolar	plain			100%
S12	isiqongolo	postalveolar	plain			100%
S12	ugqwetha	postalveolar	plain, labialized			100%
S12	umggala	postalveolar	plain, depressor			100%
S12	umgqomu	postalveolar	aspirated/breathy, depressor			100%