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Sound change or community change? The speech community in sound change studies: a case study of Scottish Gaelic

Abstract: This paper considers the typical focus of analysis in a sound change study across generations: the speech community. I argue that changes in social practices across generations may mean that generational comparisons can be problematic, and these issues are particularly pertinent in small and endangered language communities. Using data from Scottish Gaelic (Celtic, ISO = gla), a minority endangered language of Scotland, I exemplify the challenges posed by the speech community construct via an examination of lateral production across generations of speakers. Gaelic traditionally contrasts three phonemic laterals, but analysis shows that this might be changing. There are two possible directions for sound change in the Gaelic lateral system: results show that younger speakers produce some palatalised laterals as palatal glides without laterality. Meanwhile, the remaining laterals are less acoustically distinct among younger generations, suggesting the possibility of future merger. The construct upon which any apparent- or real-time study of sound change relies is the speech community as a unit of analysis for change. While there are differences among the groups of speakers analysed here, I argue it is potentially problematic to consider this to be a form of sound change due to differences in social practices among generations surrounding Gaelic usage and socialisation. Ultimately, I advocate for a socially-informed approach to sound change study which sympathetically takes local social structure into account.

Keywords: laterals; phonetics; Scottish Gaelic; sound change; speech community

1 Introduction

1.1 Speech community and sound change

In studies of sound change, subsequent generations from a particular community are usually compared to infer change in the system, whether through the apparent-time model, or in a real-time design. For example, in Labov's seminal (1966) work, subsequent generations of Lower East Side New Yorkers are compared to infer change in apparent time. Similarly, more recent studies such as Hay et al. (2015) use this method for their comparison of archival and contemporary recordings of New Zealand English. In a real-time design, members of the same community are compared at different life stages (panel study e.g. Haddican et al. 2013). Or, similar members of the same community are studied at different time points (trend study e.g. Cukor-Avila 2002). For example, in Sankoff and Blondeau (2007), 32 speakers were recorded in both 1971 and in 1984 to compare /r/ production over time in Montreal in a real-time panel study. Also, the 32 speakers recorded in Montreal in 1971 were compared to 32 different speakers recorded in 1984 in a trend study. All of these studies assume that the community in which speakers participate is a stable enough social entity for meaningful comparison of speech to take place. The construct upon which any apparent- or real-time study of sound change relies is the speech community as a unit of analysis for change. This may be a very large speech community e.g. New

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Zealand, or a smaller one such as York. In comparing speakers within a community, we can determine whether and how the variety of that community has changed.

As the speech community is such a central construct, there has been much discussion about its nature and how membership might be defined (Coupland 2010; Patrick 2004; Rampton 2009). Patrick (2004) gives an extensive overview of the development and theoretical evolution of the concept of the speech community in linguistics. Broadly, in the Ethnography of Speaking approach to the field (Gumperz 1968; Hymes 1972), linguistic behaviour is seen as one of the many resources used in the creation of meaning. This approach prioritises long-term immersion with a small group of informants rather than generalising to larger populations and inferences about wider linguistic structure. The Ethnography of Speaking approach defines the speech community as a set of shared linguistic and social norms (Gumperz 1982). Labovian sociolinguistics developed along a slightly separate line of enquiry focussing on larger samples and with greater emphasis on wider generalisation. Classically, Labov sees a speech community as some set of shared linguistic values within social or geographical space (1972: 463). Coupland (2010: 100) notes that no lasting consensual definition of the speech community has been reached, but within these two broad approaches to language and variation outlined above it can be seen that a definition should encompass both shared social and linguistic norms.

Defining precisely what these shared linguistic and social norms might constitute is clearly problematic and dependent on the level of abstraction intended (Rampton 2009). For example, in a study of sound change it can be assumed that some aspect of linguistic behaviour is undergoing change and might not be shared between generations. In order to assess the possibility of change within a particular community, it must be demonstrated that the community is to some extent fundamentally the same across generations. At the same time, it can hardly be expected that older community members and younger members, or members across time, will share all social practices, but *enough* must be shared in order to make comparison of linguistic behaviour meaningful. Thomason and Kaufman (1988: 10) suggest that 'normal transmission' from generation to generation will occur when the sociolinguistic context is 'relatively stable' i.e. when all speakers considered form a socially consistent speech community.

This paper will explore where the boundary lies between *enough* shared social practice and *too little*. At what point is it appropriate to compare generations in a sound change study, and at what point is it no longer appropriate as speakers do not constitute the same speech community? This is a challenging question to resolve. In this study, I aim to explore these issues with data relating to possible sound changes in the lateral system of Scottish Gaelic, a minority endangered language of Scotland. The situation presented here is a small-scale analysis aiming to exemplify the issues raised above and provide some context to the discussion.

1.2 Gaelic

Scottish Gaelic is usually known simply as 'Gaelic' [galɪk] in English by its speakers and will be referred to as such henceforward. There were approximately 58,000 Gaelic speakers in Scotland according to the most recent UK Census (Scottish Government 2015a). Gaelic was widely spoken across Scotland in medieval times (MacKinnon 1974), but is now a minority language spoken by around 1% of the population. UNESCO classifies Gaelic as 'definitely endangered' (Moseley 2010). Census figures show numbers of Gaelic speakers is in decline, and a dialect of Gaelic was once the prototypical example of language obsolescence (Dorian 1981). The number of Gaelic speakers in Scotland according to national censuses is shown in Figure 1.

The densest concentration of Gaelic speakers is found in the chain of islands off Scotland's north-west coast, the Outer Hebrides/Western Isles, although significant populations also live in lowland cities due to historical emigration (Withers 1998) and recent language revitalisation policies (McLeod 2006). In the Outer Hebrides, approximately 60% of inhabitants speak Gaelic (Scottish Government 2015b). The location and density of Gaelic speakers across Scotland is shown in Figure 2.

In the Western Isles, the experience of Gaelic speakers differs across generations. Typically, the oldest generation of speakers aged 65 and upwards grew up in Gaelic-dominant environments and learned English on entering compulsory education. Gaelic is the code of choice in conversations with friends and neighbours.
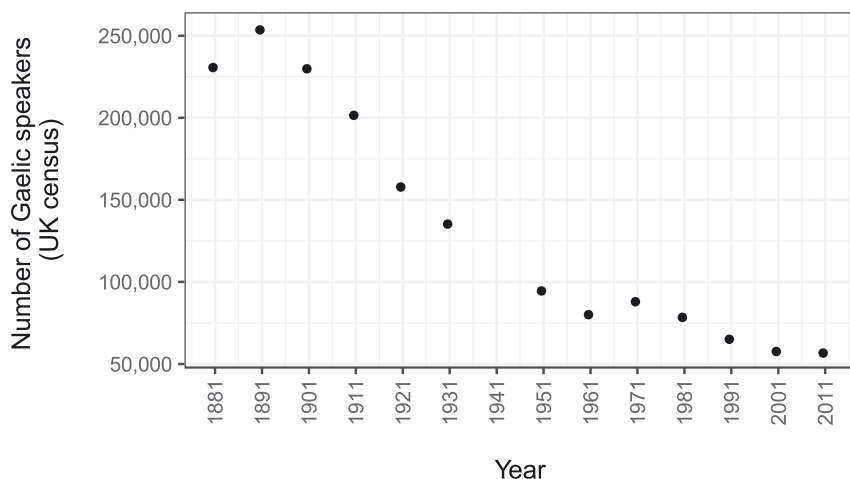
Figure 1: Number of Gaelic speakers in Scotland according to UK national censuses. Sources: MacAulay (1992: 141) and Scottish Government (2005, 2015a).
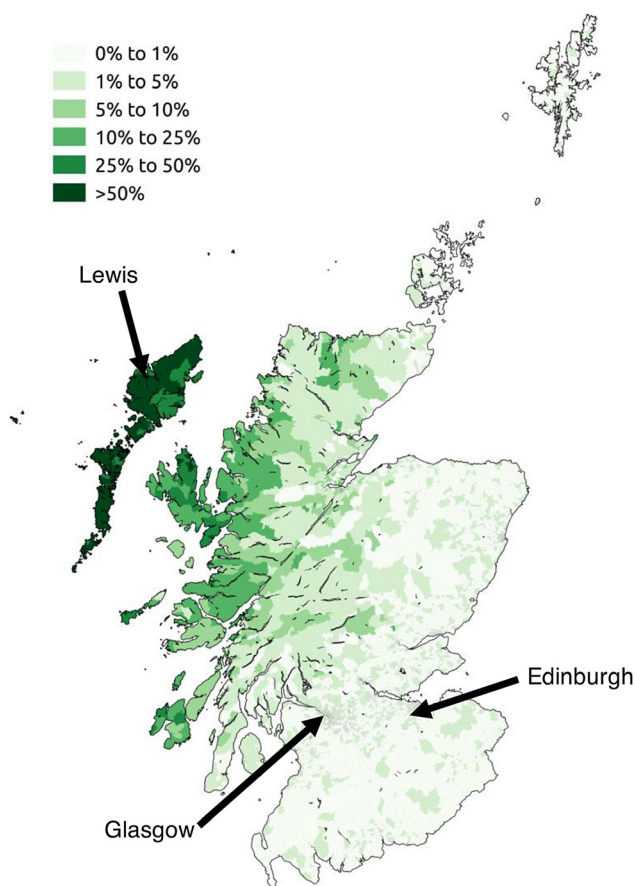

Figure 2: Location and density of Gaelic speakers in Scotland according to the 2011 UK Census. Attribution: SkateTier (https://commons.wikimedia.org/wiki/). Licensed under https://creativecommons.org/licenses/by-sa/3.0/legalcode. Location labels added by Claire Nance.

While these older speakers learned Gaelic as a first language in the home, family language transmission has become increasingly rare across generations. A community survey in 2011 described intergenerational transmission of Gaelic in the Outer Hebrides as 'broken' (Munro et al. 2011: 11). Instead, there is now greater reliance on immersion schooling as a method of Gaelic acquisition (Nance 2020; Will 2012). Gaelic Medium Education (GME), an adapted form of immersion schooling, has been available to parents in Scotland since 1985 and allows children from any home language background to receive their education in Gaelic. GME is now the default method of primary education in the Outer Hebrides, however parents can request that their child

attend English-only schooling. Children in GME classes typically use Gaelic in classroom settings but prefer English as a peer group language in the playground and outwith the school setting (Nance 2013, 2020).

1.3 Research questions

Here, I will exemplify the challenges posed by the speech community construct via an examination of possible sound changes in Gaelic's lateral system. Specifically, I consider whether different generations of Gaelic speakers produce the phonemic categories traditionally described for the language, and how acoustically distinct phonemic categories are from one another.

2 Methods

2.1 Laterals in Gaelic

Gaelic is described as having three phonemic laterals, a dental velarised lateral, a dental palatalised lateral and an alveolar lateral without secondary articulations: / l̪ˠ l̪ʲ l / (Borgstrøm 1940; Ladefoged et al. 1998; Nance 2014; Oftedal 1956). I refer to these laterals as velarised, palatalised and alveolar respectively. The contrast can be exemplified in near-minimal triplets such as *càl* /kʰaːl̪ˠ/ 'cabbage', *caill* /kʰail̪ʲ/ 'lose' and *càil* /kʰaːl/ 'something'. Gaelic has a wider system of contrastive palatalisation across the consonant system, and three-way contrasts between palatalised, velarised and plain phonemes in the sonorants (Nance and Kirkham 2020; Nance and Ó Maolalaigh 2019). The different lateral phonemes are common across Gaelic, although 'true' minimal pairs/triplets appear to be rare in the language (Ladefoged et al. 1998; Shuken 1980).

While contrasts in secondary palatalisation are relatively common across the world's languages (17% of languages in Bateman 2007), three-way palatalisation contrasts are much rarer and not found in English. Previous studies of sound change in minority, endangered language settings suggest that sounds which are typologically unusual and not shared in the societally-dominant language are most likely to undergo change (Jones 1998; Thomason 2001). These studies report a reduction in the number of phonemic contrasts in contexts of language endangerment as system-internal change but accelerated due to the sociolinguistic context. My analysis considers the possibility of change in the lateral system in two respects: firstly, whether palatalised laterals are being produced as palatal glides, an existing phoneme in Gaelic. Delateralisation in palatal articulations is widely reported in other contexts such as Romance e.g. Gómez and Molina Martos (2016), and was noticed previously in young speakers' palatalised Gaelic laterals but not systematically analysed (Nance 2014). Secondly, I consider whether laterals are becoming more acoustically similar as a possible pre-cursor to a reduction in the number of phonemic contrasts (Nance and Stuart-Smith 2013).

2.2 Speakers

This study focusses on an area with a high density of Gaelic speakers, the Isle of Lewis, which is the most northerly island in the Outer Hebrides. The study adopts an apparent-time design taking the geographical location of Lewis and the social practice of using Gaelic as the definition of the community under study. Data were collected from thirty-five speakers, with a focus in particular on younger age cohorts. The four age groups considered are detailed below:

(1) Children: 18 children aged 7–11 attending primary GME (10f, 8m). The children had lived in Lewis for their whole lives. For full details see Nance (2020).
(2) Adolescents: 11 adolescents aged 13–14 attending secondary GME (5f, 6m). The adolescents had lived in Lewis for their whole lives. For further details see Nance (2015).

(3) Middle-aged: 3 speakers aged 35–50 (3f). These speakers were born and raised in Lewis but were currently working in Glasgow. In Scottish island communities it is very common to work on the mainland and then return to one's home island later in life. For further details see Nance (2013).

(4) Older: 3 speakers aged 60–80 (3f). The older speakers were born and raised in Lewis, had worked on the mainland for varying periods of time and then returned to Lewis. For further details see Nance (2013).

Most of the children and adolescents came from homes where both parents spoke English to them, though some had Gaelic-speaking grandparents. A small number had one Gaelic-speaking parent (4/18 children, 3/11 adolescents), and a very small number had two Gaelic-speaking parents (2/18 children, 0/11 adolescents). All parents were very supportive of GME and even where English is spoken in the home parents often provide Gaelic resources or attend classes themselves. The home language background of these young people is therefore a mix of English and Gaelic. Previous studies found few differences between those with more Gaelic input at home and those with less Gaelic input at home, so this factor is not analysed further here due to the aim of considering aggregate patterns. For full details see Nance (2014, 2020).

2.3 Data and recordings

The data were collected via a word list reading task. The children were recorded in a quiet place in their school using a Beyerdynamic Opus 55 headset microphone and USB Pre mixer connected to a laptop and digitised at 44,100 Hz sampling rate. Words were presented on picture cards and were designed to be recognisable to children. The word list contained word-medial laterals and is shown in the Appendix. Each word was repeated twice in random order among distractor items. The adolescents and adults were also recorded with the headset microphone, a Rolls Live mixer and laptop computer. Stimuli were presented on the laptop screen with accompanying pictures and were repeated three times among distractors. The word list for these groups contained word-initial and word-medial laterals (see Appendix). The adolescents and middle-aged adults were recorded in their school or workplace respectively, and the older adults were recorded in their homes.

2.4 Analysis

The total token counts included in the analysis are as follows:
(1) Children: 216 (median = 11 per speaker, range = 8–12)
(2) Adolescents: 388 (median = 33 per speaker, range = 24–36).
(3) Middle-aged adults: 107 (median = 36 per speaker, range = 35–36)
(4) Older adults: 105 (median = 35 per speaker, range = 34–36)

Three analyses were carried out on the data. First, an auditory analysis was carried out to ascertain whether all tokens were produced as laterals. In the case of some phonemically palatalised laterals, a substantial number were produced as palatal glides (Section 3.1). The difference between a glide and lateral is illustrated in Figure 3 (though labelling for this analysis was done auditorily only). This figure shows the production of the same word *leabhar* 'book' /lʲɔ.əɾ/ by two male adolescent speakers. There is a very high F2 in the glide as compared to the lateral: approximately 2,800 Hz (glide) versus 2,200 Hz (lateral).

The results of this auditory analysis show that children and adolescents produce some glides, but adult speakers produced none at all. Due to the complete absence of palatal glides among the adult speaker groups I do not analyse this through inferential statistics further.

The second analysis considered the acoustic properties of tokens produced with laterality (i.e. the glides were excluded from the acoustic analyses). The data were low-pass filtered to 11,025 Hz and downsampled to 22,050 Hz prior to analysis in Praat (Boersma and Weenink 2019). Data were then labelled using Praat TextGrids for lateral steady state as defined by a phase of the lateral where F2 was stable (Carter and Local 2007). Linear
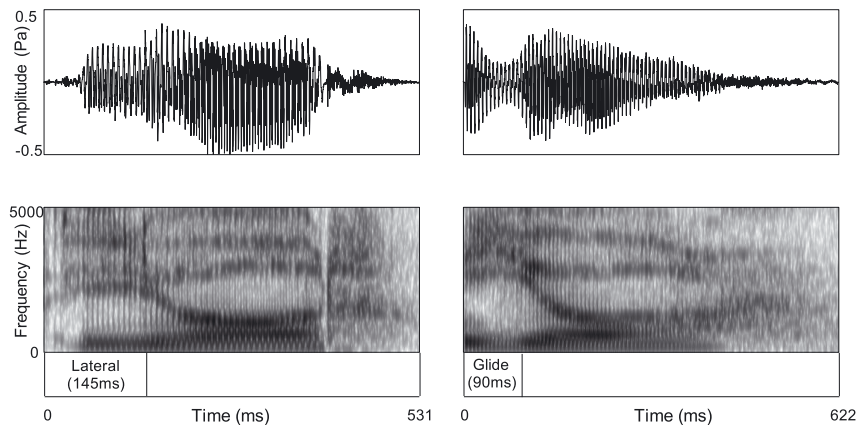
Figure 3: Spectrogram and waveform comparison of palatalised lateral versus palatal glide at the start of the word 'leabhar'.

Predictive Coding formant values were estimated using Emu (Winkelmann et al. 2017), manually checked for accuracy, and hand-corrected where necessary using the Emu functions.

Previous acoustic analysis has shown that the difference between the first two formants can capture differences between the lateral phonemes (Ladefoged et al. 1998; Nance 2014; Nance and Kirkham 2020; Shuken 1980). Specifically, the velarised lateral is characterised by low F2 and high F1; the palatalised lateral has high F2 and low F1; and the alveolar lateral has intermediate values. I therefore present values of F2-F1 which captures the palatalisation or velarisation gesture (Section 3.2; Kirkham et al. 2019; Nance 2014; Sproat and Fujimura 1993). Comparing the differences between formants will already include some degree of normalisation for vocal tract length so the data were not normalised further for sociolinguistic differences (Kirkham et al. 2019; Nance 2014; Simonet 2010). Data are reported in Bark (Traunmüller 1990) to approximate the perceptual response of the ear (see Morris 2017; Nance 2020 for others who have taken this approach).

The F2-F1 acoustic data from each group of speakers were modelled via Conditional Inference Trees (CTrees) (Breiman 2001; Levshina 2015; Tagliamonte and Baayen 2012). CTree analysis is a non-parametric technique which functions by first testing which independent variable is most closely associated with the dependent variable. If an association is made at a pre-defined significance level, the data are split, and the process repeated. For further explanation see Levshina (2015: 291). Each group of speakers was modelled separately to allow for the possibility of different significant splits in the data. The analysis of the child data considered lateral phoneme and gender, and the data from the other speaker groups also considered word position. The middle-aged and older adults are all female so their analysis does not include gender.

The final analysis considers the acoustic distinctiveness of the lateral phonemes. Acoustic data from the two predicted most extreme phonemes, the velarised and the palatalised laterals, were extracted for analysis. First the median F2-F1 for velarised laterals was calculated for each speaker. Then, the median F2-F1 for palatalised laterals was calculated for each speaker, and then the Euclidean distance between these two medians was calculated in order to quantify the acoustic space used (Section 3.3).

The Euclidean distances for each speaker group were regressed against speaker group in a standard linear model. The baseline speaker group was the older speakers and contrast coding was used. As there is only one value per speaker (Euclidean distance), mixed effects modelling with random intercepts was not used here.

3 Results

3.1 Auditory analysis

The first analysis auditorily coded laterals as to whether they were realised as laterals or palatal glides. The latter variant only occurs in the palatalised lateral category. The results of this labelling are shown in Figure 4. The middle-aged and older speakers did not produce any of their palatalised laterals as glides at all so this
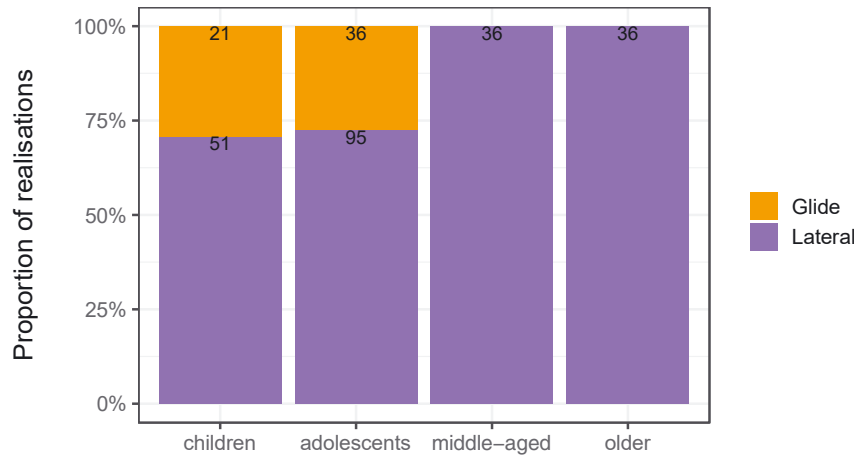
Figure 4: Proportions of phonemically palatalised laterals produced as glides or laterals (auditory coding) for each speaker group. Token counts are shown at the top of each bar.

finding is not analysed further statistically. The children produced 29% of their palatalised laterals as palatal glides and the adolescent speakers 27%.

3.2 Acoustic analysis

The first acoustic analysis considers whether all speaker groups maintain the phonemic categories described for Gaelic laterals (Figure 5). This was analysed via a CTree built for each group. The CTrees built for each group are shown in Figures 6–9. These figures show that overall, each group of speakers displays a distinction between velarised and alveolar/palatalised laterals, and then another significant split between alveolar and palatalised laterals as the first branches in the tree.[1] The adolescent female speakers produce slightly higher F2-F1 in alveolar laterals than the male speakers. There are no differences according to gender among the children. Word position differences include: initial palatalised laterals have higher F2-F1 than medial
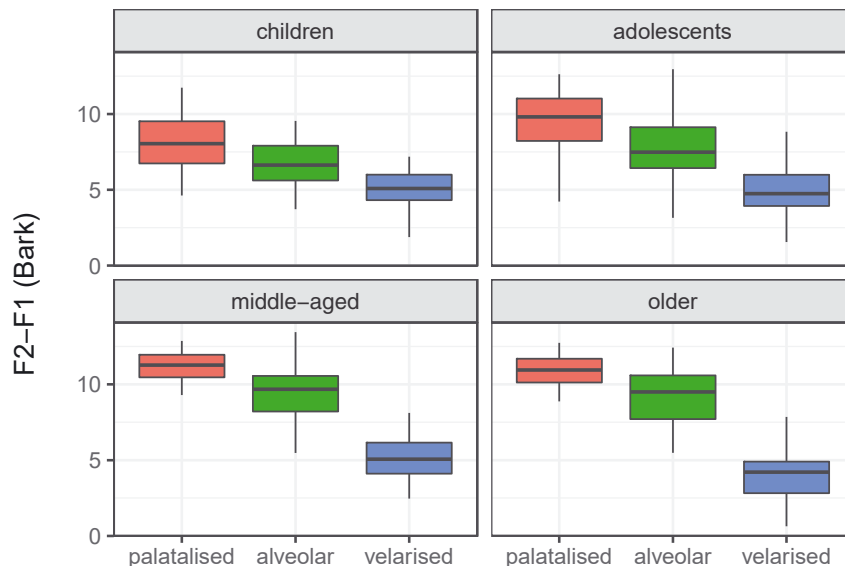

Figure 5: F2-F1 values from all speaker groups. Each facet shows boxplots of palatalised, alveolar, and velarised laterals.

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1 Note that Nance (2020) considered differences within the group of children and found the youngest (7 year olds) do not produce a difference between palatalised and alveolar laterals. However, here I have aggregated all of the children together to compare them to the other groups of speakers.
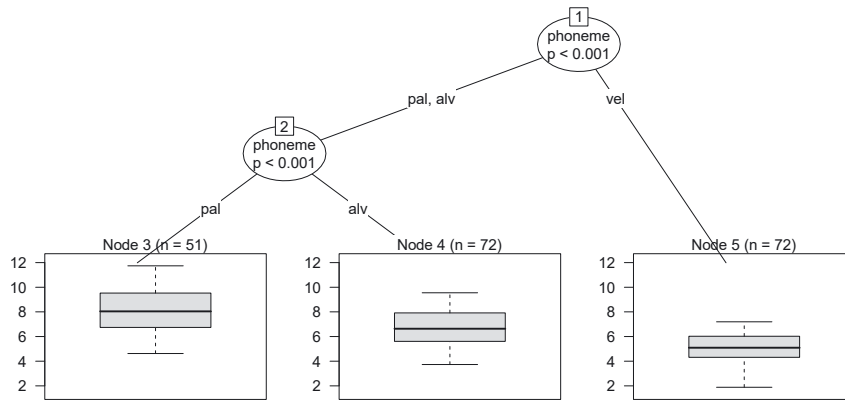
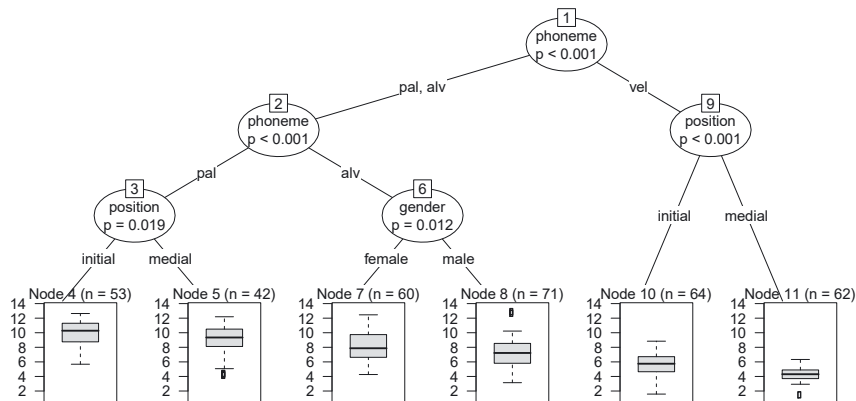**Figure 6:** CTree analysis of children's lateral data.

Figure 7: CTree analysis of adolescents' lateral data.
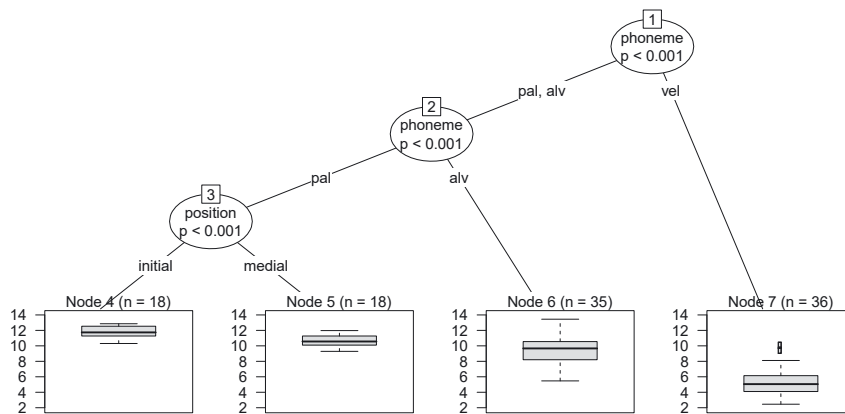

Figure 8: CTree analysis of middle-aged speakers' lateral data.
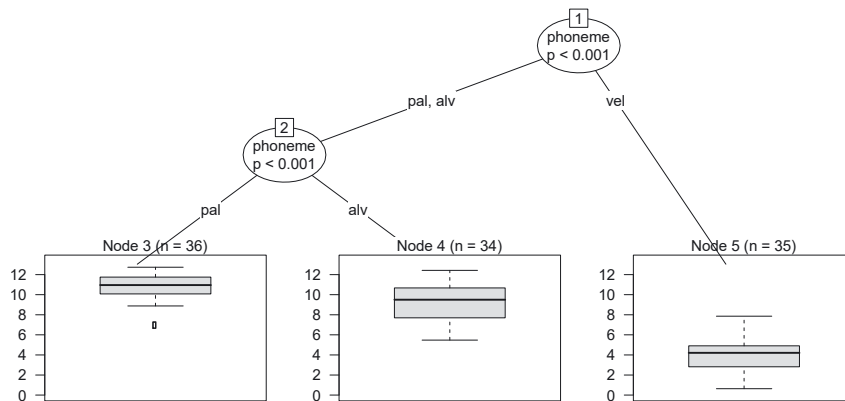

Figure 9: CTree analysis of older speakers' lateral data.

palatalised laterals in adolescent and middle-aged speakers, and initial velarised laterals have higher F2-F1 than medial laterals in adolescent speakers.

3.3 Euclidean distance analysis

The Euclidean distance analysis is shown in Figure 10. Middle-aged and older speakers have the largest Euclidean distance, adolescents are somewhere in the middle and children have the lowest.
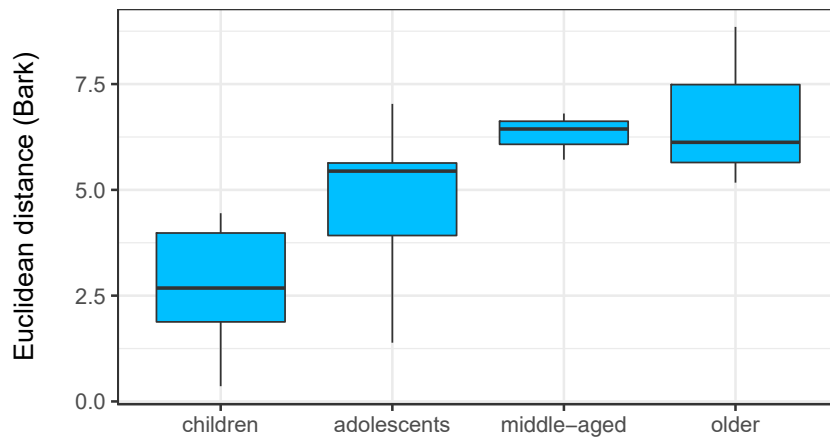

Figure 10: Euclidean distance between median velarised and palatalised F2-F1 laterals for each speaker.

The Euclidean distance was then regressed against speaker group and the results are given in Table 1. The model shows a significant effect of group ($F(3,28) = 10.91$, $p < 0.001$) by which children are significantly lower than older speakers. Adolescents have a lower value than the older speakers but this is not significant ($p = 0.06$). Middle-aged speakers have almost the same Euclidean distance values as the older speakers.

Table 1: Regression model conducted on Euclidean distance.

	Estimate	SE	t	p
Intercept	6.71	0.8587	7.818	<0.001
Children	−4.0389	0.9358	−4.316	<0.001
Adolescents	−1.9276	0.9791	−1.969	0.06
Middle-aged	−0.3955	1.2145	−0.326	0.75

3.4 Summary of results

The auditory analysis shows that children and adolescent speakers produce their phonemically palatalised laterals as palatal glides nearly a third of the time (Section 3.1). Middle-aged and older speakers do not do this. In terms of acoustics, all speaker groups make a distinction between phonemic categories (Section 3.2), but the acoustic difference (Euclidean distance) between categories is greater among older and middle-aged speakers and significantly lower among children (Section 3.3).

4 Discussion

The analysis presented here considers possible sound changes in progress in the Gaelic lateral system. The results show differences between generations and using the apparent-time model we might infer sound change here: potentially, the palatalised lateral is changing to be realised as a palatal glide some of the time, and categories of laterals are becoming more similar across generations. In this section I discuss the need for caution in using the apparent-time model in contexts of small or endangered languages where the context of generations differs significantly, such as the context of Gaelic.

The first important factor is that in minority language settings where the language is acquired to a large extent through the educational system, acquisition of complex structures not shared in the dominant language may occur later than can be expected in other language settings, or might not occur at all. For example, Thomas et al. (2014) found that young Welsh speakers with lower amounts of input in the home lag behind L1 Welsh-speaking children in morphology acquisition. They suggest that such children might 'catch up' when sufficient quantity of input is received, but this will take longer if they only receive input at school. Kennard (2013) considers mutation acquisition in Breton speaking children, young adults, and older speakers. She shows that although children in immersion education have not yet acquired the mutation system, young adults who have finished Breton immersion education have done so. It may be the case that the young Gaelic speakers recorded here will, in the future, acquire the lateral system in the traditional manner, but they have not done so yet. In light of these findings, there may not actually be a sound change in progress at all in Gaelic laterals.

A second important factor is that an apparent-time model assumes some kind of continuity in the speech community. As discussed in Section 1, there is no conclusive way of precisely defining the speech community, but it can be assumed that a definition would include some shared linguistic and social practices. The three groups of speakers analysed here differ in many linguistic and social practices surrounding Gaelic and Gaelic use: how they acquired the language (to a greater or lesser extent depending on family), their experience of Gaelic at school, the use of Gaelic in the wider community, their language code choice among friends, and their experience of Gaelic's political status in Scotland. As such, the community of Gaelic speakers on Lewis is socially and linguistically not consistent, leading to the question of whether it is meaningful to consider speakers part of the same speech community and comparable as generations. Thomason and Kaufman (1998: 10) specifically highlight contexts of extreme language shift as situations which might be too unstable to constitute the sociolinguistic context where change via transmission can occur. Yet the context of Lewis described here is not one of extreme shift; younger speakers are of course still Gaelic speakers, but their experience of Gaelic is different.

A final factor in endangered/revitalising language settings is that the youngest group of speakers will not be socially or numerically the same as the older groups. For example, in the context of contemporary Gaelic, in 2018–2019 there were 3,467 pupils enrolled in primary GME classes, but only 1,423 in secondary (Bòrd na Gàidhlig 2020). GME is increasing in popularity and availability so it is probable that the secondary figures will rise in coming years, but even allowing for this there is considerable drop-off between primary and secondary-age speakers. Dunmore (2019) shows that few former GME pupils who are now young/middle-aged adults continue to use Gaelic. For younger generations then, it is likely that at each life stage only those speakers most motivated and most dedicated to Gaelic, with resources available, continue using the language. In this respect, the population of young adult Gaelic speakers is a small, and (typically) dedicated, proportion of the children who start GME and the groups may not be comparable.

5 Conclusion

This study considers the extent to which linguistic and social practice must be shared between generations in order to make them meaningfully comparable through the apparent-time model. A socially-informed knowledge of the community is crucial and must be included in any possible analysis of sound change in such

communities. Recognition of what is *enough* shared social practice must in some part stem from how the community perceives itself. While there are occasional suggestions of communication breakdowns between GME pupils and older speakers (e.g. Will 2012: 124), it is largely recognised that GME pupils are the future of the language and an important part of Gaelic society (e.g. Bòrd na Gàidhlig 2018).

Even when it is accepted that comparing generations is possible, I argue that it is important to consider the points raised in Section 4 when interpreting results. For example, in the case of the data presented here, I do not think it possible without further data to conclude that sound change is taking place. Certainly, there are differences between the speaker groups compared, but further conclusions are not possible. The context of Gaelic throws into sharp focus these questions of what can constitute a speech community and thus be meaningful in generational comparison. However, this issue is not limited to small and endangered languages. Older and younger speakers in different communities will always differ in some aspects of social and linguistic practice so these factors must be taken into account in studies of community language change.

Ethical statement: This project was granted ethical approval through the School of Social and Political Sciences and the College of Social Sciences Ethics Committee, University of Glasgow (adolescent, middle-aged speakers, older adults), and the Faculty of Arts and Social Sciences-Management School Ethics Committee, Lancaster University (children). Adult participants gave consent to anonymously participate in the research. Parents gave consent for the adolescent and child speakers to anonymously participate in the research and I underwent a background assessment by Disclose and Barring Service (Scotland) and Protection of Vulnerable Groups (Scotland) before working with children.

Appendix

Table 2: Word list used for child speakers.

Target lateral	Word	IPA	English	Word position
lˠ	Salach	sal̪ˠɔx	*dirty*	medial
lˠ	Balach	pal̪ˠɔx	*boy*	medial
l	Baile	palə	*town*	medial
l	Eilean	ɛlan	*island*	medial
lʲ	Duilleag	t̪ul̪ʲak	*page*	medial
lʲ	Cailleach	kʰal̪ʲɔx	*old woman*	medial

Table 3: Word list used for adolescent, middle-aged and older adults.

Target lateral	Word	IPA	English	Word position
lˠ	Latha	l̪ˠa.ə	*day*	initial
lˠ	loch	l̪ˠɔx	*lake*	initial
l	liosta	lɪsʰt̪ə	*list*	initial
l	leat	laʰt̪	*at you*	initial
lʲ	leabhar	l̪ʲɔ.ər	*book*	initial
lʲ	leugh	l̪ʲev	*read*	initial
lˠ	salach	sal̪ˠɔx	*dirty*	medial
lˠ	balach	pal̪ˠɔx	*boy*	medial

Table 3: (continued)

Target lateral	Word	IPA	English	Word position
l	baile	palə	*town*	medial
l	duilich	t̪ulɪç	*sorry*	medial
l̪ʲ	cailleach	kʰal̪ʲɔx	*old woman*	medial
l̪ʲ	duilleag	t̪ul̪ʲak	*page*	medial

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