TRACKING LINGUISTIC CHANGE IN CHILDHOOD: TRANSMISSION, INCREMENTATION, AND VERNACULAR REORGANIZATION

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The mechanisms underlying linguistic change are well documented for adolescent and adult speech, but much less is known about how such change emerges in the childhood years. In this article we address this gap by conducting a real-time analysis of the acquisition of a rapidly expanding variable in young speakers, first in preschool and later in preadolescence. By tracking a variable undergoing change at two key stages of sociolinguistic development, transmission and incrementation, we observe directly the processes operating on individual and community grammars as children shift to the leading edge of change.*

Keywords: variation, acquisition, transmission, incrementation, vernacular reorganization, children, glottal replacement

1. INTRODUCTION. Labov (2001:307) observes that 'the vernacular that we speak, the first language that we have mastered perfectly, and use without doubt or hesitation—is our mother's vernacular'. At the same time, we know that 'children must learn to talk differently from their mothers' (Labov 2001:416); otherwise, there would be no such thing as language change. These observations pinpoint two key stages in the life cycle of sociolinguistic development: TRANSMISSION and INCREMENTATION. Transmission is 'the unbroken sequence of native-language acquisition by children', where in the earliest stages of language acquisition 'children begin their language development with the pattern transmitted to them by their female caretakers' (Labov 2001:437). In doing so, they 'replicate faithfully the form of their parents' language, in all of its structural detail' (Labov 2007:349). In incrementation, 'successive cohorts and generations of children advance [a] change beyond the level of their caretakers and role models' (Labov 2007:346), moving year by year in the direction of the change in the community. Labov suggests that this key turning point in the life cycle of change starts some time around four years old and may continue into adolescence, as the child moves from the caregiver-dominated norms of the home to the peer-dominated norms of the wider world (e.g. Nardy et al. 2013:259). In the move from transmission to incrementation, children undergo VERNACULAR REORGANIZATION, which 'may take the form of increases in frequency, extent, scope, or specificity' of a particular feature undergoing change (Labov 2007:346). As Labov points out, '[v]ernacular reorganization must take place in the window of opportunity between first learning and the effective stabilization of the linguistic system' (2001:416).

The importance of transmission, incrementation, and vernacular organization in the evolution of change is clear: to put it colloquially, it's where the action is at. However, the focus to date in sociolinguistic research has been predominately on patterns of variation and change in adulthood (e.g. Labov 1966), when vernacular norms are stabilized,[1]

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[1] We note, however, that some variables may change across a speaker's lifespan (e.g. Sankoff 2018, 2019, Werker & Tees 2005:233).

or at the tail end of incrementation, in adolescence (e.g. Eckert 1989, Tagliamonte & D'Arcy 2009). This is in stark contrast to research in first language acquisition, where longitudinal studies of the key developmental stages are crucial to understanding the mechanisms underpinning language development (see e.g. Brown 1973). While longitudinal studies do exist on the development of sociolinguistic norms (e.g. Klein & Altman 2009, Kohn 2013, Kohn & Farrington 2020, Van Hofwegen 2015, Van Hofwegen & Wolfram 2010), these focus on 'the development of vernacularity' (Van Hofwegen & Wolfram 2010:431) in the earlier years, rather than on tracking how children participate in community change. Thus, in contrast to the well-documented patterns in adolescence and adulthood in our sociolinguistic lifespan, our knowledge of the years preceding these, when a child moves from caregiver-dominated transmission to peer-dominated incrementation, is largely by proxy. We know much about the final product of linguistic change in adolescent and adult speech, and we can extrapolate from that how change has taken place. However, we have little direct evidence of the key processes that underpin this linguistic journey from childhood to adulthood in the process of change. Incrementation implies individual instability over the early lifespan, but what exactly does this look like? Capturing the move from transmission to incrementation 'in action' in the years when children shift to the leading edge of change can provide crucial insights into the mechanisms underlying language variation and change at a key stage in sociolinguistic development.

In this article we have access to a number of data sets that allow us to capture these key stages by tracking transmission, incrementation, and vernacular reorganization not by proxy, but directly. The first data set consists of caregivers in interaction with their preschool children, allowing us to investigate transmission of vernacular norms at the earliest stages of language acquisition. The second data set provides a real-time panel study of these same preschool children now in preadolescence, allowing us to investigate the details of the upward slope of incrementation. The adult community data set offers the baseline, stabilized vernacular to which these earlier stages of development are compared.

In addition to the relevant data sets, it is also necessary to have a variable that is currently undergoing change. GLOTTAL REPLACEMENT, the use of [ʔ] for /t/ in specific contexts of use,[2] is demonstrated to be 'one of the most dramatic, widespread, and rapid changes to have occurred in British English in recent years' (Trudgill 1999:136). A study of the adult population in the community under investigation (Smith & Holmes-Elliott 2018) demonstrated the same trajectory of change, providing an ideal test site from which to examine transmission, incrementation, and vernacular reorganization. We thus investigate this rapidly expanding innovation across the four key groups in the research site under examination: (i) the COMMUNITY, as in 1; (ii) the PRESCHOOLERS and (iii) their CAREGIVERS, as in 2; and (iv) the PREADOLESCENTS, as in 3.

(1) Karl, community
I tell you it's a strange thing with d— with dialect, righ[t]. I used to go down south and go into— we was in all manners of places fae rich rich to wha[t]ever to lawyers and QCs and God knows wha[ʔ] all.

[2] A number of terms are used to describe the variable realization of /t/ in specific contexts, including t-glottaling, glottal stops, glottal replacement, and glottalization (e.g. Milroy et al. 1994:330, Wells 1982:374). In this article we adopt the term 'glottal replacement', the variable realization of underlying /t/ with an auditorily distinct glottal stop [ʔ] (see also Schleef 2013:201, Wells 1982:65).

(2) Lucy, preschooler, and Lesley, caregiver
Lucy: I na like that bo[ʔ]om bi[ʔ]. Tasted the bo[ʔ]om bit now I didna like i[ʔ]. Can I have my swee[ʔ]ies?
Lesley: No, nae until you eat more of your sausage. You can have your lollipop once you've ea[ʔ]en more of your sausage.
Lucy: I dona want tha[ʔ] or the chips, okay?
Lesley: Well just the sausage.
Lucy: That bi[ʔ]y's ho[t].
Lesley: Well blow, look. Okay?

(3) Lucy, preadolescent
Well, I ken how to do i[ʔ] on the iPhone, bu[ʔ] I would na ken how to do it like— tell you fae tha[ʔ]. But there's usually like a li[ʔ]le bu[ʔ]on on your se[ʔ]ings and then it's like your Facebook, but then you can like change i[ʔ].

By tracking a rapidly expanding innovation from caregivers and transmission, to peers and incrementation, we will address first-hand the details of how vernacular reorganization unfolds against the backdrop of ongoing change in the childhood years.

The article is organized as follows. We start with a summary of the key principles of transmission and incrementation, then move on to the data on which the present study is based, describing both the community and the speakers therein. We then turn to the linguistic variable under analysis, glottal replacement, and the findings from previous research. The next section compares and contrasts use of this variable across the four data sets, and in the discussion, we consider how our results inform the bigger question of how children participate in linguistic change from preschool to preadolescence and onward into adult life.

1.1. Transmission and incrementation. First language acquisition research has shown that children acquire language rapidly and, in most cases, very successfully, as evidenced in the many studies that have been conducted in this field over the past few decades (see e.g. Clark 2019 for an overview). Whatever the mechanism responsible for language acquisition (e.g. Chomsky 1980, Tomasello 2003), a crucial element is the language environment to which young children are exposed: if a child is exposed to French, they will acquire French; if a child is exposed to Mandarin, they will acquire Mandarin. More recent work shows that the same principles apply for within-language variation: research shows that systematic social and linguistic constraints in caregiver speech are transmitted to the child in these early stages of language acquisition (e.g. Chevrot & Foulkes 2013, Díaz-Campos 2005, Foulkes et al. 2005, Green 2011, Habib 2017, Lacoste & Green 2016, Liégeois 2021, Roberts 1994, Roberts & Labov 1995, Smith & Durham 2019, Smith et al. 2007, 2009, Smith et al. 2013, Van Hofwegen & Wolfram 2010, Vaughan et al. 2015, Zenner & Van De Mieroop 2021).

In the process of transmission, while

> probability matching is perhaps the most general form of transmission of information … for children to produce the adult system, it is not enough for them to recognize the existence of two alternants and their per cent distribution. The child must identify the categories and sub-categories that constrain the adult language, and derive similar probabilities for each. (Labov 2001:419–20)

This means that in addition to providing a template in terms of rates of use, the parental model also provides a template in terms of the constraints on use. Indeed, it is only via parent-to-child transmission that complex variable patterning may be preserved. Labov (2007:354) illustrates this with reference to the New York City short-*a* system. Within the city, over time, this system has come to exhibit a set of complex and slightly irregular constraints. In addition to the traditional nasal split where production of short-*a* is

tense before nasal consonants (e.g. *can* vs. *cat*, *hand* vs. *hat*), tensing is also influenced by grammatical, morphological, and syllabic factors, many of which exhibit lexical exceptions. Despite this complexity, Labov (2007:354) reports that when this form is passed down through generations of native New York City dwellers, between parents and their children, the full complement of constraints is preserved. Parental transmission therefore creates a child's first linguistic imprint through which children inherit not only rates of variable forms from their caregivers, but also a variable yet highly systematic set of linguistic and social constraints.

The task of acquiring variable forms undergoing change may present a further layer of complexity, where children, in effect, are required to hit a 'moving target' (Roberts 1997). In this case, children have to move from the transmitted system to an incremented system. To do this, they have to attune to the speech of older peers in their community in order to infer the direction of change, shifting their own speech patterns in this direction through the process of incrementation (Labov 2007:380). Weinreich et al. (1968:184–85) state that the transfer of innovating features 'seems to take place between peer groups of slightly differing age levels', as children move away from their parents' patterns and toward 'those of the peer group which dominates their preadolescent years'. Labov (2012) refers to this as the 'outward orientation' of children, and the process of incrementation is enabled by what Bermúdez-Otero (2020) identifies as 'momentum-based learning': children look to intergenerational patterns of change and infer the direction and magnitude of an ongoing change during the process of incrementation and situate their systems accordingly (see also Holmes-Elliott 2021).

This process of incrementation can be observed, albeit indirectly, in apparent time. When change in progress is charted across generations of speakers, the common pattern is a linear, monotonic increase of an incoming form that is negatively correlated with speaker age: young adults show higher rates of innovative forms than middle-aged speakers do, who in turn show higher rates than older speakers. However, the trend is upset when children are added to the perspective: they are shown to lag behind the leading adolescents. This creates what Labov (2001:106) terms an 'adolescent peak' in apparent time. This peak occurs as a direct result of transmission: children inherit conservative rates of use from the input they receive from their caregivers, but then slough off the conservative systems they have inherited and begin their ascent toward the leading edge of change. At the end point, once they have surpassed the current leaders, the process of incrementation is complete and their systems will stabilize, around late adolescence.

The implication from this model is that while transmission involves the faithful replication of caregiver input, incrementation of language change involves a breakaway from this parental model. Studies that have compared groups of differently aged children indicate that this is the case. For example, Kerswill and Williams's (2000) study of vowel forms in the speech of forty-eight children aged four, eight, and twelve years old in the new town of Milton Keynes, UK, reveals a statistically significant correlation between caregiver and child rates of use across a number of variants in the four-year-old speakers but not with the older children (Kerswill & Williams 2000:94). Put simply, preschool children sound like their caregivers, while school-age kids sound like their peers and wider community. Thus, the initial break between caregiver and peer-group influence is located sometime between the ages of four and eight, with a continuing movement away from parental norms in the following years.

Our real-time study of these young speakers, first in preschool and later in preadolescence, will allow us to observe—not through apparent time, but directly—how speakers shift their systems away from the conservative rates of their parents and toward the innovative levels of their peers and wider community.

FIGURE 1. The research site Buckie, Scotland (© Buckie, Moray. Map Data. Google Maps. Google, accessed 6 August 2018).

2. THE COMMUNITY. Buckie is a small fishing town situated on the northeast coast of Scotland, sixty miles from Aberdeen (Figure 1), with a population of c. 8,000 people.

Our previous research has demonstrated that the tight-knit nature of this community provides a highly controlled environment for tracking linguistic patterns across the generations (e.g. Holmes-Elliott & Smith 2018, Smith 2001) and thus for tracking transmission, incrementation, and vernacular reorganization.

2.1. THE SPEAKERS. In this analysis we include four sets of data: the CAREGIVER CORPUS, the PRESCHOOLER CORPUS, the PREADOLESCENT CORPUS, and the COMMUNITY CORPUS. These corpora are summarized in Table 1 and explained more fully below.

	COMMUNITY	CAREGIVERS	PRESCHOOLERS	PREADOLESCENTS
Year collected	2012–13	2003–4	2003–4	2012–13
# of speakers	15	14	14	14
Word count	c. 250,000	c. 250,000	c. 100,000	c. 150,000

TABLE 1. The four corpora in the present study.

THE CAREGIVER AND PRESCHOOLER CORPORA. In order to examine transmission of glottal replacement, we utilize a corpus of speech from caregivers (all mothers), targeting CHILD-DIRECTED SPEECH (CDS), and their preschool children collected from 2003–2004 (see details in Smith et al. 2007). The original corpus contained twenty-nine caregiver-child dyads, in which the child was between the ages of 2;6 and 4;0, recorded in the home in everyday interaction: playing, eating lunch, learning about colors, getting dressed. Here we use a subset of these original participants—seven males and seven females—who we later tracked in preadolescence, as detailed below.

THE PREADOLESCENT CORPUS. We returned to the community in 2012 in order to record fourteen of the original preschool children (aged two to four) now in preadolescence (aged eleven to thirteen). These preadolescents were recorded as part of a larger study (Smith 2013–16) with a community insider. Classic sociolinguistic interview techniques were employed, a tried and tested methodology that aims to tap the most vernacular form of speech (Labov 1984), including the discussion of gaming, friendship groups, and school life, among other topics.

THE COMMUNITY CORPUS. The community data we employ here as a baseline for comparison was also collected as part of the larger research project noted above. To provide the best comparison possible, we use the middle-aged speakers' data only. This is because when we factor in time of data collection (caregiver and preschooler corpus in 2003, community corpus in 2013), the caregivers in these data—in their late twenties and early thirties at the time of recording in 2004—would now be close in age to the middle-aged generation in 2013, that is, in their thirties and forties. These data included seven men and eight women, aged thirty-five to fifty-five.

In sum, comparison of the caregiver and preschooler data sets allows for the analysis of transmission; the preadolescent corpus provides the opportunity to investigate incrementation and the potential for vernacular reorganization. The community corpus provides a comparison of stabilized adult norms. Figure 2 schematizes the relationship between the various data sets and how they are used to investigate the processes of transmission and incrementation within the context of wider community trends.

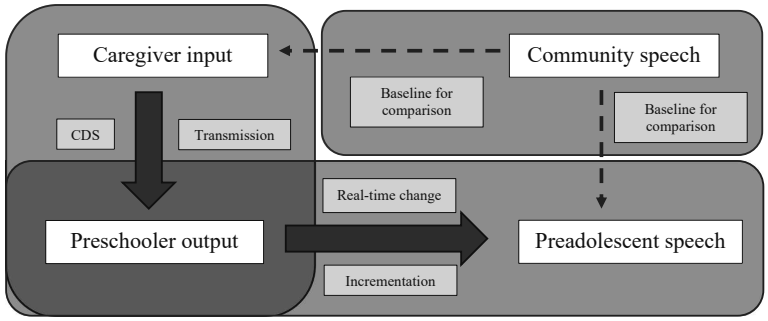

FIGURE 2. Schematized use of data sets in the investigation of transmission and incrementation.

2.2. THE VARIABLE: GLOTTAL REPLACEMENT. As detailed in the introduction, glottal replacement has shown rapid expansion throughout the British Isles in the twenty-first century, with studies demonstrating a number of linguistic and social constraints in the move from [t] to [ʔ] (e.g. Docherty & Foulkes 1999:50, Flynn 2012:294, Macaulay 1977:45, Marshall 2001:54, Mathisen 1999:110, Stoddart et al. 1999:75, Stuart-Smith 1999:191).

As glottal replacement is a socially evaluated and stigmatized feature, it is unsurprising that studies often report strong social conditioning, with gender, class, and style all implicated in its patterning within the community (e.g. Fabricius 2000:141, Stuart-Smith 1999:194). For gender, in some communities males lead the change (e.g. Kerswill 2003:230–31, Macaulay 1977:45, Marshall 2001:54), while in others females are in the lead (Kerswill 2003:230–31, Mathisen 1999:117, Milroy et al. 1994:341). Others report a neutralization of the gender differences as the change progresses (e.g. Schleef 2013:211, Stuart-Smith 1999:199–200). Glottal replacement has been described as one of the 'most stereotypically stigmatized features of British English' (Milroy et al. 1994: 328); thus it is not surprising that studies often report lower rates of use in the middle classes and with more formal styles (e.g. Stuart-Smith 1999:191, Trudgill 1999:132). However, in step with its rapid spread, it may have 'gone upmarket' (Fabricius 2002:124), as it has increasingly diffused to the middle classes and to more formal styles (Marshall 2001:62, Stuart-Smith 1999:199). The loss of stigma may not apply in all cases, however: Foulkes et al.'s (1999, 2005) studies of glottal replacement in word-medial intersonorant (e.g. *better*) and word-final prevocalic (e.g. *get off*) /t/ in pre-

school children and their caregivers in Newcastle found that the caregivers used far higher rates of standard [t] in CDS as compared to general community norms (Foulkes et al. 2005:187, 192). Moreover, mothers used higher rates of [t] in CDS when talking to girls as opposed to boys, revealing gendered linguistic behavior even at the earliest stages of language development.

Alongside social constraints, all studies show that the linguistic context in which the variable occurs has a significant influence on variant choice (Docherty & Foulkes 1999: 50, Docherty et al. 1997:294, Drummond 2011:292, Flynn 2012:292). The majority of studies show that there are lower rates of glottal replacement in word-medial contexts, as in 4a, when compared to word-final contexts, as in 4b (e.g. Fabricius 2002:120, Flynn 2012:294, Stuart-Smith 1999:192, Wells 1997:19–21).

(4) a. WhatsApp's pre[ʔ]y much just texting but it's free. (Ricky, preadolescent)
b. Wow, that would be cool, wouldn't i[t]? (Judy, caregiver)

Within codas, three environments are typically compared: preconsonantal (PreC) as in 5a, prevocalic (PreV) as in 5b, and prepausal (PreP) as in 5c.

(5) a. Mammy, who's tha[t] called? (Kevin, preschooler)
b. Do you think you'll be able to ge[t] all the chocola[t]e off there? (Eileen, caregiver)
c. I've actually got a nae bad teacher for that so it's alrigh[ʔ]. (Luke, preadolescent)

A dominant constraint hierarchy for variable glottal replacement emerges in these coda environments across many areas in the UK: PreC > PreP > PreV (e.g. Docherty & Foulkes 1999:50–51, Flynn 2012:294, Mathisen 1999:115, Mees & Collins 1999:198, Tollfree 1999:171, Williams & Kerswill 1999:147). These different linguistic contexts are implicated in the change from [t] to [ʔ]. For example, Baranowski and Turton (2015: 310) show that 'glottaling started as a process targeting /t/ in the coda (i.e. final position) and over time advanced to all unstressed positions (e.g. intervocalic positions)'. However, a number of 'regional particularities' (Schleef 2013:203) in this constraint hierarchy also exist, particularly in more northern areas (e.g. Milroy et al. 1994:341, Stuart-Smith 1999:194–95), suggesting that the origins and subsequent development of these forms may differ across varieties.

In addition to hierarchies of use, there may also be qualitative differences across varieties. Baranowski and Turton (2015:310) note the use of glottal replacement in 'so-called *-ee*/*-oo* environments such as *tattoo*, *canteen*, *eighteen*' in their Manchester data. They suggest that although [ʔ] in this context is extremely rare, the very fact that it occurs at all provides evidence of a highly advanced stage of glottal replacement. In other varieties, however, [ʔ] is blocked in this context of use, despite extremely high rates elsewhere. This is demonstrated in Glasgow (e.g. Ryan 2018:189), a city where glottal replacement is not found in this context, despite rates at around 90% in all other contexts (e.g. Ryan 2018:189–91; see also e.g. Earnshaw & Gold 2019, Tollfree 1999). This mismatch between high rates and glottal replacement in *-ee*/*-oo* environments suggests that pressures beyond simple frequency are implicated in the distribution of glottal replacement.

In line with all other varieties in the UK, Buckie has seen a dramatic increase in use of glottal replacement across the adult population (Smith & Holmes-Elliott 2018). The results show that [ʔ] moves from 38% use in the older speakers to a full 90% in the younger speakers. Within this trajectory of change, Buckie, too, demonstrates 'regional particularities'. In contrast to the constraint hierarchy across most varieties, with higher rates of glottal replacement in coda positions when compared to medial, our results

showed that this community exhibits the opposite pattern: high rates in medial contexts, as in 6a, and lower in coda environments, as in 6b. In addition, Buckie permits robust glottal replacement in word-internal syllable onset positions (the *ee*/*oo* environments such as *sometimes* and *nineteen*), as in 6c. As noted above, glottal replacement is marginal or even blocked in this context in many British English dialects.

(6) a. I'd say it's go[ʔ]en be[ʔ]er since I star[ʔ]ed doing the exercises more regularly. (Kieran, preadolescent)
b. I wouldna say I enjoyed school, I done i[ʔ]. (Christopher, preadolescent)
c. Then some[ʔ]imes the detectives used to come up. (Mary, community)

As the above demonstrates, glottal replacement is a pandialectal variable that is increasing in every variety studied. It is subject to both social and linguistic constraints, with some of these constraints shared across all dialects and some particular to specific varieties. Such a profile provides an ideal opportunity to examine transmission, incrementation, and vernacular reorganization in the context of change. As implied by the apparent-time studies and the incrementation model of change, we hypothesize that the children will inherit conservative rates of use for this form from their caregivers and should then shift their rates toward the vanguard of change in real time. Further, as a form that exhibits dialect-specific constraints, it also provides a good test case for examining the relationship between transmission and incrementation with regard to the patterning of constraints. Will the young speakers, as suggested by Labov's NYC short-*a* illustration, preserve their parents' system 'in all of its structural detail' (Labov 2007:349), or will they diverge from this aspect of the parental template? If they diverge, will this take place from the moment of transmission, or will it, like the incrementation of rates, take some time to develop across the young speakers' lives? Our data enable us to answer these questions via caregiver-to-preschooler transmission, followed by the real-time comparison of these early systems with their later preadolescent ones, and further contextualized by the ambient patterns of the community. By doing so, we are able to observe the mechanism that brings these changes about in the individual grammars of speakers as they shift toward the leading edge of the change across the early lifespan.

2.3. PROCEDURE. As the focus of the present study is on the sociolinguistic correlates of glottal replacement rather than on its acoustic profile, we follow the majority of studies in conducting an auditory analysis of forms (e.g. Drummond 2011, Schleef 2013, Trudgill 1974, Williams & Kerswill 1999).[3] The examples were initially extracted and coded by a team of research assistants at the University of Glasgow. All contexts that were preceded by a vowel (*pretty*, *water*) or sonorant consonant (*belt*, *want*, *start*) and followed by a vowel (*pretty*, *water*), sonorant consonant (*little*, *bottom*), or pause (*stop it!*) were included. In line with previous research (e.g. Flynn 2012:276, Macaulay 1991:33, Stuart-Smith 1999:188), tokens with a following nonsonorant consonant as in 7 were excluded, due to the tendency for the [t] to assimilate to the following consonant (e.g. Holmes 1995:441, Shockey 2003:38).

[3] As noted in previous studies (e.g. Docherty et al. 1997:293, Straw & Patrick 2007:395, Stuart-Smith 1999:188), a number of different variants can exist in the continuum between [t] and [ʔ]. In our data we also identified a number of different variants, including the [t̚] variant, with alveolar contact but no oral plosive release, and the voiced alveolar tap [ɾ]. However, our analysis revealed that [t] and [ʔ] accounted for 95% of the data overall; thus we excluded the remaining minority variants across all corpora and concentrated on a binary distinction between [t] and [ʔ] (see also Drummond 2011, Fabricius 2000, 2002, and Straw & Patrick 2007).

(7) a. You'll get a grea[t] big fat tummy wummy. (Carol, caregiver)
b. If it hi[ʔ]s the net then I count it as a goal. (Ricky, preadolescent)

We extracted approximately 100 tokens per speaker. To ensure that the data were not derived solely from very high-frequency items such as *it* and *that*, these items were capped at ten tokens per speaker interview, with the result that the data contain a range of lexical items and linguistic contexts for analysis (see e.g. Wolfram 1993:214). We started ten minutes into each recording, extracting every instance that satisfied the set criteria for inclusion until the target number of variable tokens was reached.[4] The extracted tokens were then checked by both authors. Ambiguous tokens—those that were difficult to distinguish auditorily—were discarded from the analysis. These accounted for less than 2% of the overall instances. The total number of tokens across all four data sets is 5,214.

We then coded for a series of social and linguistic constraints that are shown to exert the biggest influence on variant choice: gender, speaker group (community, caregiver, preschooler, preadolescent), and linguistic context.[5] As noted in §2.1, previous research shows that linguistic context is implicated in the rise of [ʔ] for /t/, where certain contexts lead the change (e.g. Baranowski & Turton 2015). However, these leading contexts can be dialect-specific: they cannot be predicted based solely on their linguistic characteristics. Our previous study of the community determined five categories of linguistic context (see details in Smith & Holmes-Elliott 2018). We adopt these categories in the current study: word-final before a vowel (CodaV), as in *put off* (8a); word-final before a pause (CodaP), as in *I like it.* (8b); word-medial before a syllabic consonant (MedSC), as in *bottle*, *bitten* (8c); word-medial intervocalic (MedV), as in *better*, *computer* (8d); and word-medial in *ee-oo* and onset contexts (MedOns), as in *nineteen*, *tattoo*, *sometimes* (8e).

(8) a. That's the brand new ain just ou[ʔ] at Christmas. (Dillon, preadolescent)
b. Ken it was like, I used to drive abody abou[ʔ]. (Rachel, community)
c. Stars must be gree[ʔ]in. Mam, the stars must be gree[ʔ]in. (Gus, preschooler)
d. Mister Spud, ta[ʔ]ie spud. (Suzie, caregiver)
e. We went in the can[t]een and they'd done like jelly. (Lisa, preadolescent)

By examining a rapidly expanding innovation across four key speaker groups, we address a number of research questions. Specifically, in terms of both rates of and constraints on use of glottal replacement:

(i) Do the caregivers match the community?
(ii) Do the preschoolers match the caregivers in transmission?
(iii) Do the preadolescents match their younger preschool selves in incrementation?

By answering these questions, we will be able to contribute to the bigger questions surrounding the role played by transmission, incrementation, and vernacular reorganization in the context of linguistic change.

[4] $N = 100$ is approximate. In some cases, forms were removed at later stages in the process of analysis, thus decreasing token count. In other cases, some individuals had fewer than 100 instances in their data.

[5] We note that some studies include a number of other potential constraints on glottal replacement (e.g. Schleef 2013). In our preliminary analyses, we fit a series of exploratory models that tested many more factors than are included here. With the addition of multiple factors, however, the models were at risk of becoming overfit; thus, we concentrated on the most powerful factor—linguistic context—in uncovering transmission and incrementation.

3. RESULTS. We first provide a series of descriptive statistics in order to show the dialect patterns of use in these data across individual, group, and linguistic context. We then test these patterns in our statistical model.[6]

3.1. DESCRIPTIVE ANALYSIS. Table 2 shows the total number of tokens across the community, caregivers, preschoolers, and preadolescents.

	COMMUNITY	CAREGIVERS	PRESCHOOLERS	PREADOLESCENTS
Token count	1,523	1,171	1,153	1,367
% glottal	75%	67%	60%	88%

TABLE 2. Overall distribution of glottal replacement across the community, caregivers, preschoolers, and preadolescents.

Table 2 shows that the community uses glottal replacement at an overall rate of 75%, and caregivers are slightly lower at 67%. Despite this being an overtly stigmatized variable, caregivers in interaction with their children use it at rates nearing those of the community in adult-to-adult interaction. Although the preschooler rates are slightly lower, at 60%, they are not dramatically different from those of the community or caregivers. When we compare the preschoolers to their older preadolescent selves, we see an increase in overall rates of use of [ʔ] from 60% to 88%.

To capture potential individual variability within these summary percentages across speaker groups, Figure 3 plots central tendencies, with individuals overlaid as points and shaded by gender.

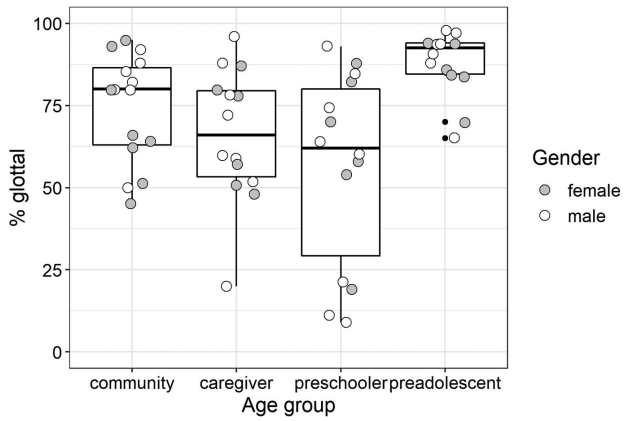

FIGURE 3. Use of glottal replacement across the community, caregivers, preschoolers, and preadolescents by individual and gender.

Figure 3 shows that within the aggregate means in Table 2, there is variability in rates of use across individuals in the community and among caregivers, and in particular, within the preschoolers. Note that there is less variability in the preadolescents, with the majority having rates of glottal replacement approaching ceiling. Figure 3 also shows

[6] See the online supplementary materials, available at http://muse.jhu.edu/resolve/145, for a data file containing all tokens and coding used in the analysis, and for the annotated R script, which includes all commands and modeling syntax.

that individual use by gender is mixed: across all four groups males and females have both high and low rates.

As noted in the introduction, 'probability matching is perhaps the most general form of transmission' (Labov 2001:419). Figure 3 shows that while the central tendencies between caregiver and child are quite similar, there is a wide range of individual variability within each group. In order to test whether there is a relationship between individuals in the transmission of forms, Figure 4 plots the correlation within the specific caregiver/preschooler pairs.

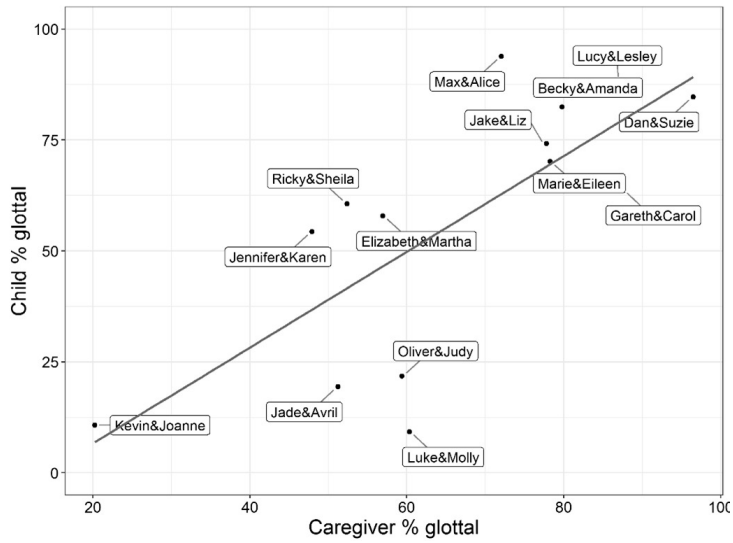

FIGURE 4. Correlation within individual caregiver/preschooler pairs in use of glottal replacement.

Figure 4 shows that despite the wide range of variation between individual speakers, the caregiver/preschooler pairs show a strong positive correlation in rates of glottal replacement ($r_s(12) = 0.739$, $p = 0.003$). Simply put, if caregivers use a lot of [ʔ], then their children do too, and vice versa. The one exception to this is Luke and his caregiver Molly: while Molly uses glottal replacement around 60% of the time, Luke shows much lower rates, at around 10% of the time.

These descriptive statistics, at both the aggregate and individual levels, provide evidence for the transmission of rates of glottal replacement between caregiver and child. Table 2 and Fig. 3 also suggest incrementation of forms, demonstrating an upward trajectory of use both across overall rates and within individuals. Figure 5 shows the patterning in real time across the individuals in comparing rates of use in preschoolers to their older preadolescent selves. The upward trajectory in Fig. 5 shows that all fourteen speakers increase their use of [ʔ] in the move from preschool to preadolescence: that is, they all increment in terms of frequency of use. The interspeaker variability of the individuals also demonstrates a degree of convergence in overall rates: as noted for Fig. 3, within the preschooler group data there was a wide range in overall rates, with the difference between the lowest user (Jade, 19%) and the highest (Max, 93%) spanning 74%. The range across the preadolescents' lowest (Oliver, 64%) and highest (Max, 98%) has narrowed to 34%, with a visible cluster of speakers around the group overall average of 88%. This convergence in rates is demonstrated by the incline of the speak-

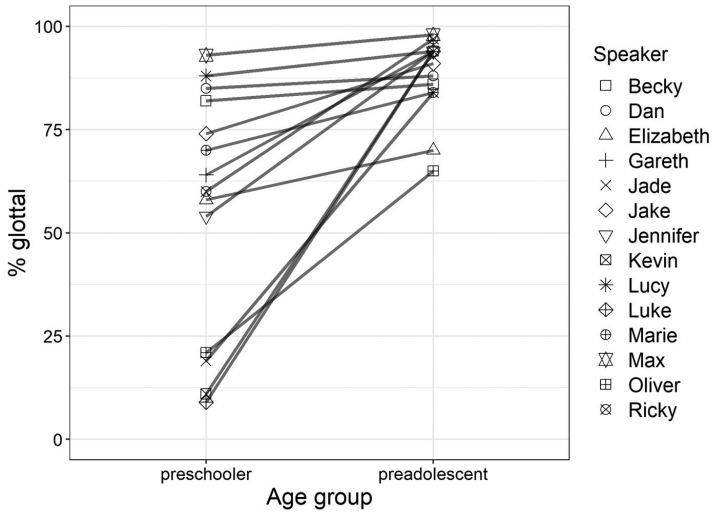

FIGURE 5. Real-time change in use of glottal replacement for individuals across preschoolers and preadolescents.

ers' real-time slopes. Some speakers, such as Max, Becky, Lucy, and Dan, already had very high rates of [ʔ] in their younger years; thus in the upward slope of incrementation they have made minimal adjustments to their percentage of usage. Others, such as Jade, Kevin, Oliver, and Luke, were slower off the starting block, with relatively low rates in the initial preschool years. For these speakers, the upward slope of incrementation has involved a dramatic increase in use of [ʔ], with a necessary sprint to catch up with their cohort in preadolescence. Despite these different rates of incrementation, the finish line is the same, with all speakers converging on the preadolescent norm of extremely high rates of glottal replacement, with twelve of fourteen speakers using glottal replacement at a rate of 80% or higher.

In terms of rates of use, these initial results indicate a correlation between caregiver input and child output in transmission of [ʔ], and an increase in use of [ʔ] from preschool to preadolescence in incrementation. However, transmission, incrementation, and vernacular reorganization implicate more than simply rates of use: as also noted in the introduction, a 'child must identify the categories and subcategories that constrain the adult language, and derive similar probabilities for each' (Labov 2001:419–20).

As detailed in §2.2, our analysis of the adult data in Buckie (Smith & Holmes-Elliott 2018) showed dialect-specific patterns of use of glottal replacement across linguistic contexts. Figure 6 displays the patterns in these data across the four speaker groups, with overall means across each linguistic context. The figure shows a number of indicative patterns by linguistic context across the four groups. The overwhelming pattern is similarity across the four groups, but with a number of points of difference. The community and caregivers look similar to each other across the different linguistic contexts. The exception to this is the MedV contexts (*water*, *pretty*), where caregivers show lower central tendencies and a wider spread. The preschoolers mirror the trend of the caregivers, but also have lower central tendences in MedSC (*bottle*) and MedOns (*sometimes*). More generally, with the exception of MedOns, this group has a wider range of use across all environments, as indicated by the spread of the boxes. The preadolescents look quite different from the preschool pattern, with an increase in over-

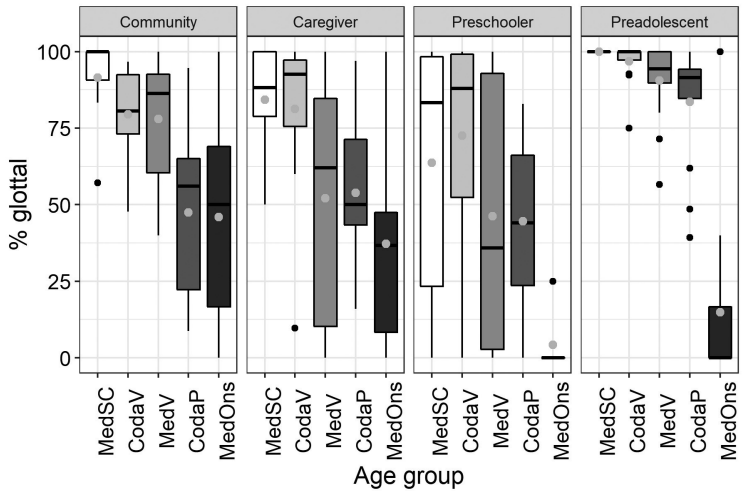

FIGURE 6. Use of glottal replacement across linguistic context in community, caregiver, preschooler, and preadolescent speech.

all rates in four of the five linguistic contexts. The preadolescents are reaching ceiling in these environments, as shown by the clustering at the top of the graph. This results in a reduction in variable spread, but with vestiges of the community pattern, as indicated in the hierarchy from more to less use. MedOns contexts in the preadolescent group stand out, however, at the opposite end of the graph, with near-categorical absence of the glottal variant.

The descriptive statistics above suggest that while individual variability needs to be taken into account, speaker group and linguistic context are important in terms of both rates of use and constraints governing the use of glottal replacement. We now test these initial usage patterns through statistical modeling.

3.2. STATISTICAL ANALYSIS. The model was built using the 'glmer' function of the lme4 package in R (Bates et al. 2015), with 'word' and 'speaker' included as random intercepts. SPEAKER GROUP was entered as a fixed factor. To provide the most useful set of contrasts for our specific research questions, CAREGIVER was set as the baseline contrast, as it enabled us to test for a significant difference in rates (intercept) between each speaker group and the caregivers. GENDER was entered as a fixed factor, with males used as the baseline contrast. We set the levels for LINGUISTIC CONTEXT using difference contrasts, with the community patterning used to set the order as follows: MedSC, CodaV, MedV, CodaP, MedOns. The model also included an interaction term between Speaker group and Linguistic context. Through setting Caregiver as the baseline group contrast, and setting the Linguistic context contrast as described, the interaction term enabled us to test whether there were differences in the patterning between the caregivers and the other three groups. Do the speaker groups exhibit the same pattern as the caregivers, or do they show statistically significant points of departure?

Fully saturated models were stepped using the 'drop1' function of the lmerTest package (Kuznetsova et al. 2016). Stepping the model revealed a significant interaction between Speaker group and Linguistic context; Gender was not significant. The final model, based on 5,214 tokens, is presented in Table 3.

In terms of rates of use, Table 3 shows that the community, preschoolers, and preadolescents are not significantly different from the caregivers. This is not surprising for the community and preschoolers, who show relatively similar rates and model esti-

FIXED EFFECTS		EST	*SE*	*z*-VALUE	*p*-VALUE
(intercept)		0.27	0.43	0.64	0.52
Speaker group					
	Community	0.8	0.57	1.40	0.16
	Preschooler	−0.9	0.61	−1.49	0.14
	Preadolescent	4.61	4.37	1.06	0.29
Linguistic context contrasts					
	CodaV – MedSC	−0.92	0.43	−2.16	0.031
	MedV – CodaV	−1.06	0.33	−3.26	0.001
	CodaP – MedV	−0.5	0.31	−1.63	0.1
	MedOns – CodaP	−1.9	0.84	−2.29	0.02
Group : Linguistic context contrasts					
Community	CodaV – MedSC	−0.89	0.54	−1.64	0.1
	MedV – CodaV	1.33	0.36	3.71	0.0002
	CodaP – MedV	−1.73	0.36	−4.86	< 0.001
	MedOns – CodaP	1.81	0.92	1.96	0.049
Preschooler	CodaV – MedSC	0.91	0.45	2.00	0.046
	MedV – CodaV	0.12	0.40	0.30	0.76
	CodaP – MedV	−0.28	0.36	−0.78	0.44
	MedOns – CodaP	−1.24	1.33	−0.94	0.35
Preadolescent	CodaV – MedSC	−13.56	21.65	−0.63	0.53
	MedV – CodaV	0.34	0.47	0.72	0.47
	CodaP – MedV	−0.91	0.40	−2.28	0.023
	MedOns – CodaP	−2.6	0.77	−3.35	< 0.001

N observations: 5,214; Groups: Word (569, *SD* = 1.02), Speaker (57, *SD* = 1.41)

TABLE 3. Glmer of glottal replacement across the community, caregivers, preschoolers, and preadolescents.

mates. It is surprising, however, for the preadolescents, who have extremely high rates of glottal replacement: log odds 4.6 times more than the caregivers. Despite this, there is no significant difference between these two groups. However, the standard error for the preadolescents is also extremely high, thus explaining why there is no significant difference between this group's rates and those of the caregivers. This is further illustrated in the effects plot in Figure 7.

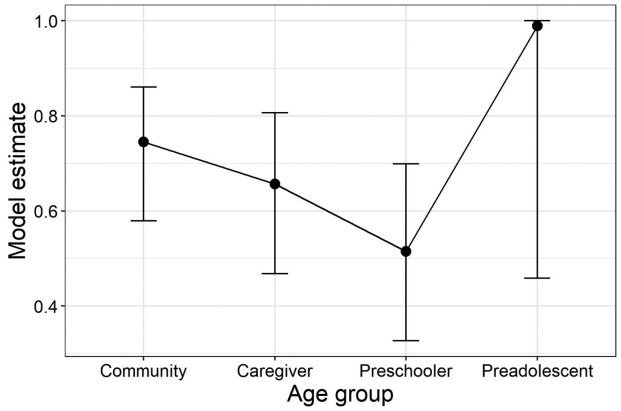

FIGURE 7. Effects plot of rates of glottal replacement across community, caregiver, preschooler, and preadolescent speech.

The high standard error is likely due to the fact that many of the preadolescents are reaching ceiling in their use of glottal replacement, which increases the standard error estimate of the model. Preadolescents have incremented in terms of rates of use, but due

to the categorical levels of many of the individuals in this group, the increase is not statistically significant.

Moving beyond rates to the underlying variable patterns, the interaction term in our model enables us to investigate the constraint patterns revealed by our descriptive analysis. Our model showed the following hierarchy of use for the caregivers: MedSC >* CodaV >* MedV > CodaP >* MedOns (* denotes that the difference is significant). The model also returned a significant effect for the interaction term, which indicates that there are significantly different points of contrast in the patterning of linguistic context across the four groups. We discuss these differences with reference to the model estimates and associated *p*-values; Figure 8 illustrates these differences in an effects plot.

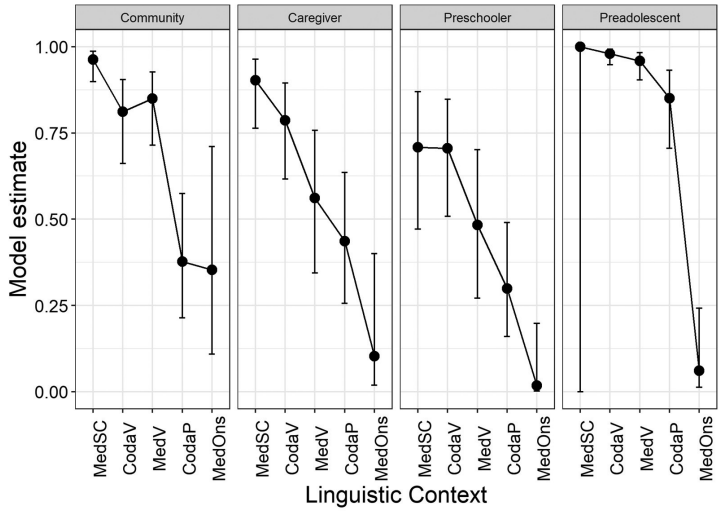

FIGURE 8. Effects plot of rates of glottal replacement across community, caregiver, preschooler, and preadolescent speech by linguistic context.

We start by highlighting the differences between the first three groups. The first difference to note is that between caregivers and community in CodaV (e.g. *put off*) vs. MedV (e.g. *better*) positions. There is no significant difference between these two contexts for the community, but there is for the caregivers, who show significantly lower rates for the MedV environments. The second difference is between caregivers and preschoolers in MedSC (e.g. *bottle*) vs. CodaV positions. In both groups, CodaV is significantly lower than MedSC. However, as shown in the comparative model estimates, the magnitude of the difference in the caregivers is much larger than that of the preschoolers, as further demonstrated in the effects plot in Fig. 8. The third difference relates to CodaP (e.g. *I like it*.) vs. MedOns (e.g. *sometimes*). For the caregivers, the model shows a statistically significant difference between these two contexts, where MedOns is markedly lower than CodaP. The preschoolers match the direction and degree of difference observed in the caregiver group. For the community, there is a difference in the same direction, but the degree of difference is smaller.

In comparing the first three groups of speakers, these differences show that caregivers drop their rates in comparison to the community in contexts such as *water*, *better*, and *computer*. For contexts such as *bottle* and *bitten*, preschoolers show rates of use that are lower than caregiver and community use. Finally, when compared to the com-

munity, caregivers and preschoolers use lower rates of [ʔ] in contexts such as *sometimes*, *nineteen*, and *tattoo*.

In turning to the preadolescents, the first difference to note is MedSC (*bottle*) vs. CodaV (*put off*), where CodaV is markedly lower than MedSC. In this way, preadolescents closely resemble the caregivers and community with respect to these linguistic contexts, but not their younger selves.[7] The second difference to note is MedV (*better*) vs. CodaP (*I like it.*). The caregivers show no significant difference in these contexts of use, and neither do the preschoolers, but in line with the community, the preadolescents do, with higher rates of use in MedV. The third difference is with MedOns vs. CodaP. The preadolescent contrast is significantly different from that of the caregivers, showing a much lower rate of glottal replacement in MedOns than in CodaP.

In examining the preadolescents, we find that this group increases their rates in contexts such as *better* and *computer* in comparison to caregivers and their younger preschool selves. In doing so, they now look more like the community. For contexts such as *bottle* and *bitten*, preadolescents show rates of use that are higher than those of both the caregivers and the preschoolers. In this context too, they look more like the community. In contexts such as *nineteen* and *sometimes*, preadolescents have very low rates of use compared to all other groups. Finally, barring these contexts, we note the very high rates of use across all other linguistic contexts for this preadolescent group.

Overall, these results suggest that caregivers transmit a system that is similar but not identical to that of the preschoolers, when compared to the community norms. Likewise, the preschoolers produce a system that is similar but not identical to that of the caregivers. The preadolescent cohort, by contrast, look quite different from their younger selves. Instead, their patterning across linguistic context looks more like that of the community, although at elevated levels. The one stark exception to this is MedOns, where they show very low rates of glottal replacement. We return to possible explanations for these points of departure across the four age groups in the discussion.

4. DISCUSSION. Sociolinguistic research across apparent time shows us how intergenerational change proceeds. Through the real-time analysis we report here, we have observed the mechanism that brings these changes about in the individual grammars of speakers as they shift toward the leading edge of the change. As such, we are now in a position to return to our findings on transmission, incrementation, and vernacular reorganization.

4.1. TRANSMISSION AND INCREMENTATION: RATES. We first compared overall rates of use across the groups, and found that despite this being a stigmatized variable, glottal replacement was used at a relatively high rate across all four. This is particularly surprising with caregivers, since previous research has shown that nonstandard forms are suppressed in CDS (e.g. Foulkes et al. 2005). Moreover, when we examined the individual caregiver/preschooler pairs, there was a strong correlation between caregiver input and child output in use of glottal replacement.

In examining the preschoolers now in preadolescence, we first showed that there was an overall increase in use of glottal replacement. Perhaps more crucially, all children in our real-time data had incremented their rates of [ʔ]. Some children made very small adjustments in rates of use across time, as their starting point was already quite high. Others

[7] We note the huge spread as shown in the standard error in the model and represented by the error bars in the plot for the MedSC context. This is due to the fact that in this context, the majority of the speakers are at 100% glottal replacement, which inflates the spread in log-odds space.

with relatively low rates in the preschool years played catch up—at some point in the intervening years between preschool and preadolescence, these children upped their rates of [ʔ] to fall in line with the glottal-full environment around them. In terms of rates of use, the preadolescents are no longer looking toward their caregivers, but instead are looking to their older peers and wider community norms. This real-time comparison shows the preadolescents moving away from their younger linguistic selves and toward, and eventually surpassing, the most innovative members of the community. The end result is that by the time they reach the 'finishing line' in preadolescence, all children had rates of use at 80% and above, providing a textbook example of the process of incrementation, where 'successive cohorts and generations of children advance [a] change beyond the level of their caretakers and role models' (Labov 2007:346).

4.2. Transmission and incrementation: constraints. When we turned to the more detailed constraints on use, we found that caregivers show differences from the community, and preschoolers show differences from their caregivers across linguistic contexts.

First, consider the difference in MedV contexts such as *better* and *pretty*, where both the caregivers and the preschoolers use rates of [ʔ] that are lower than those of the community. We suggest that a social explanation best captures this difference. Although glottal replacement is claimed now to be more socially acceptable across a number of linguistic environments (e.g. Fabricius 2002:132), [ʔ] for /t/ 'word-medially intervocalically, as in *water*, still remains stigmatised' (Cruttenden 2014:184). Previous research has shown that caregivers avoid overtly stigmatized forms in CDS (e.g. De Vogelaer et al. 2017, Foulkes et al. 2005, Smith & Durham 2019, Smith et al. 2007, Smith et al. 2013). Although the overall rates we found in caregiver speech were not significantly different from community rates, suggesting a general lack of negative evaluation, we suggest that such a stigma may operate in suppressing rates of [ʔ] in these specific intervocalic contexts in caregiver speech, and thus also in preschooler speech. In fact, our data contain examples of children being corrected in use of the glottal in these exact contexts, as demonstrated in the interaction in 9, but show no such corrections in other contexts of use (see also Smith & Durham 2019).

(9) Charlie, preschooler, and Amy, caregiver
Amy: Do you want some toast darling?
Charlie: No.
Amy: Would you like anything?
Charlie: Toast.
Amy: You want some toast? What would you like on your toast?
Charlie: Jam and bu[t]er.
Amy: Okay, Mammy'll go and make some.
[Two minutes later, the toast is ready.]
Amy: Do you want jam and bu[t]er on here, Charlie?
Charlie: Yeah.
Amy: Jam and bu[ʔ]er on your toast?
Charlie: Jam and bu[ʔ]er.
Amy: What is it? What is it, darling?
Charlie: What Mummy?
Amy: What would you like?
Charlie: Bu[t]er.
Amy: Bu[t]er, that's right.

Thus, while glottal replacement may be 'widely regarded as ugly and also a lazy sound' (Wells 1982:35), some contexts are regarded as uglier and lazier than others. This, in turn, may be at the root of the observed dip, where stigma influences caregiver use in CDS, and thus their children's use too.

The second difference is found in MedSC contexts (e.g. *bottle*), where preschoolers use lower rates of glottal replacement than both the caregivers and the community. In contrast to the explanation for the intervocalic contexts above, we suggest that the source of this difference is developmental. When we reexamined these contexts of use, we found that while the following environment in items such as *bottle* and *bitten* were syllabic consonants in the adult data, they were realized as [bɒtə**ɬ**] and [bɪtə**n**] in the child data; that is, they were realized as ambisyllabic items with a following vowel. Articulatory constraints and, specifically, the maturational stage of the preschooler group may account for this difference. Syllabic consonants are said to arise from rapid speech processes (e.g. Coleman 2001:32), but as children's speech is noted to be generally slower than that of adults (e.g. Kent & Forner 1980), these sounds are thus not acquired until later in the acquisition process (e.g. Stoel-Gammon 1987). Until that point, words like those above are realized with a vowel + consonant, as opposed to a syllabic consonant. This explains why contexts such as *bitten* and *bottle* show rates of use equivalent to those of contexts such as *water* and *better*: preschoolers are treating these as the same phonetic context. Thus, this mismatch between caregivers and preschoolers arises from articulatory constraints at this stage of development.

The third difference is in MedOns contexts such as *sometimes* and *nineteen*: although these have the lowest rates of [ʔ] in the community and caregiver data, they are still at around 50% use. There are much lower rates in the preschooler data, and in fact only one token appears with [ʔ]. This result may be an artefact of the data, as there are very few tokens ($N = 15$) in this younger age group. Another possibility is that systemic phonological processes may explain this absence more generally. Across the world's languages, [ʔ] in onset position is rare (e.g. Flack 2009). In other words, this is a marked form, where 'marked' is here defined as infrequent, complex, and/or lacking generality. Markedness is said to play a key role in accounting for acquisition patterns, where children start with relatively simple and unmarked phonological patterns, which then become more marked as the child's linguistic system develops (e.g. Clark 1970, Jakobson 1941). As [ʔ] in onsets is highly marked, we suggest that this form has not yet been acquired by these young children, who opt instead for the less marked pattern with [t] in these early stages of development.

In sum, the explanations for the differences between caregivers and preschoolers are rooted in very different causes: social, developmental, and typological. The lower rates of [ʔ] in MedV contexts in both caregiver and preschooler speech is explained in terms of negative social pressures that operate on this particular context of use. Despite the rapid rise in glottal replacement throughout the system, this context remains stigmatized, and this stigma is played out in the caregiver speech and, in turn, the preschooler speech. The lower rates of [ʔ] in MedSC in the preschoolers is accounted for in terms of stage of development, and specifically in the fact that connected speech processes have yet to be acquired. Finally, based on these findings, we suggest that the low rates of use in MedOns by the preschoolers are due to the typologically marked nature of the glottal variant in onsets more generally.

It has been suggested that when and how a child acquires the variable forms evident in adult speech may be mediated by both social and linguistic influences. Specifically, 'the linguistic level [and] the complexity of the conditioning' of the variable in question

(Kerswill 1996:199) and 'the perceptual salience of the variants in question, … and their sociolinguistic value in a given community' (Chevrot et al. 2000:296) are strong determiners of what is acquired when. Our analysis is a clear demonstration of that mediation: children learn the rates and constraints of systematic heterogeneity from their primary caregivers, but the pathway of acquisition contains detours arising from competing social and developmental pressures, just as Kerswill (1996) and Chevrot et al. (2000) point out.

Our analysis also shows what happens to these differences in patterns of use in incrementation, when the preschoolers move from caregiver input to 'the detailed template provided by older members of the speech community, at home, on the street, and in the school' (Labov 2001:416). Specifically, we wanted to investigate the possibility of vernacular reorganization, which 'may take the form of increases in frequency, extent, scope, or specificity' of a particular feature undergoing change (Labov 2007:346). In other words, does incrementation see the increase of rates but the preservation of the variable system, or do children also reorganize the variable conditioning?

Figure 5 showed that each and every preadolescent increased their rates of [ʔ] in the intervening years: the descriptive and statistical analyses indicate that they had done so across four of the five linguistic environments. In tandem with this increase, two of the key differences that were noted from the preschoolers—(i) the lower rates in MedV contexts (e.g. *water*) when compared to the community, and (ii) the lower rates in MedSC contexts (e.g. *bottle*) when compared to the caregivers and the community—are no longer apparent. The social and developmental explanations for these departure points observed in infancy are now resolved in preadolescence. In addition, in increasing their use of glottal replacement in nearly all linguistic environments, these speakers move toward and, in fact, beyond community norms, with a flattening out of constraints, as indicated by the descriptive statistics by linguistic context in Fig. 6 and the effects plot in Fig. 8. In the upward trajectory of glottal replacement in incrementation, childhood patterns are first eradicated, but as the change progresses to near-categorical levels, so too are extant community norms.

Guy (2011:197) suggests that

> what changes across time is typically the overall rate of use of the innovative variant. Just as speakers and social groups differ in overall use while preserving the same constraint effects, and vary their overall rate in different speech styles while leaving contextual effects unaltered, successive age cohorts across the course of a change will increment the overall rate of use, leaving context effects unchanged. Change is change in the value of p_0, while the constraints on variable selection (p_i, p_j, p_k …) do not change.

This has been demonstrated in countless studies of incrementation in apparent time. Our real-time data provide further, more direct, support for this claim in that we see remnants of the community patterns in the preadolescent speech. However, these patterns become eroded as each context reaches its ceiling in the ongoing rise of glottal replacement. Once speakers reach the limit, there is nowhere else to go.

One context stands out in this system of regular, stepwise incrementation across constraint effects: MedOns (e.g. *sometimes*, *nineteen*). We suggested that the categorical absence of [ʔ] in these contexts in the preschooler data may arise from systematic typological pressures, where these young children, in keeping with more general pathways of language acquisition, had not yet acquired this marked form. If this were the case, we would then expect preadolescents to show a marked increase in use of glottal replacement in this context, in line with community norms. Instead, these contexts show much lower rates in the preadolescent data. In fact, the majority of this group—nine of fourteen—have no use of glottal replacement in these contexts at all. As detailed in §2.2,

Baranowski and Turton (2015:310) suggest that a phonological process applies to more inclusive environments as it advances, with glottal replacement in this context indicating very advanced change. Our results show that in Buckie, glottal replacement is extremely advanced in this preadolescent group, yet this context appears to resist or, in fact, with some speakers, completely reject [ʔ]. The question is why?

One potential explanation is that the glottal variant in this context was never acquired by the majority of the preadolescents: they did not use it as preschoolers, and they have not used it since. In this scenario, these speakers have reanalyzed this system, where medial onsets block glottal replacement. This explanation is akin to Lightfoot's (1998) imperfect learning hypothesis in language change, where residues of the intermediate grammars created by children during the acquisition of language are carried over into the adult system. This reanalysis might be aided by the unusual typology combined with the relative rarity of this context ($N = 124$) across the entire sample. If this were the case, this raises the question of why this process happens now and not with previous generations, where typological and numerical pressures would still apply. An alternative explanation is that these young speakers acquired the form sometime in incrementation, but subsequently withdrew from this use. In other words, there was a reversal of the change in this particular context. If this is the case, we believe this is motivated by external pressures, where young speakers gravitate away from highly localized, marked forms in favor of supralocal systems. On the ground, these young speakers hear glottal replacement throughout Scotland and indeed the rest of the UK. Beyond their own community, however, they would hear it in this very marked context only rarely or not at all (e.g. Earnshaw & Gold 2019, Ryan 2018), leading to them leveling toward the more widespread system of use. While sheer numbers can govern the trajectory of change, with [ʔ] pushing into more contexts of use as overall rates rise (e.g. Baranowski & Turton 2015), here we instead see a powerful social impetus to push against the rising tide, with the preadolescents rejecting the highly localized form in favor of the supralocal variant. These findings echo ongoing patterns of dialectal variation and change recorded throughout the UK (e.g. Britain 2010, Kerswill 2003) and, more generally, demonstrate that glottal replacement is 'subject to phonological generalizations but driven by social evaluation' (Labov et al. 2013:30).

5. CONCLUSION. As we pointed out at the beginning of this article, most of the work on language change in variationist sociolinguistics has focused on adolescent and adult speech. We know little about the initial stages of transmission and subsequent incrementation, and the knock-on effect of vernacular reorganization in this process. As noted by MacKenzie (2019:17), 'there is still very little real-time evidence of change in constraints on sociolinguistic variation'. This study has attempted to redress that balance through the analysis of a rapidly expanding linguistic variable in the speech of the community, caregivers, preschoolers, and preadolescents in a small community in northeast Scotland. By examining children in the key stages of transmission, incrementation, and vernacular organization across a range of variables, future research will be able to track language change at all stages of its linguistic journey, thus providing a fuller picture of the evolution of linguistic change from initial acquisition in the preschool years through to stabilization in later life.

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