PHONOLOGICAL VARIATION IN CHILD-DIRECTED SPEECH

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Segmental features of child-directed speech (CDS) were studied in a corpus drawn from thirty-nine mothers living in Tyneside, England. Focus was on the phonetic variants used for (t) in word-medial and word-final prevocalic contexts since it is known that these variants display clear sociolinguistic patterning in the adult community. Variant usage in CDS was found to differ markedly from that in interadult speech. Effects were also found with respect to the age and gender of the children being addressed. Speech to girls generally contained more standard variants than speech to boys, which, by contrast, contained higher rates of vernacular variants. The differentiation by gender was most apparent for the youngest children. The findings are assessed in comparison to other studies of CDS. It has previously been claimed that modifications made in the CDS register help children to learn linguistic structures and also to learn that speech is a social activity. Our findings suggest that CDS may play an additional role, providing boys and girls as young as 2;0 with differential opportunities to learn the social-indexical values of sociolinguistic variables.*

1. INTRODUCTION. We present here the findings of a study of child-directed speech produced by speakers from Tyneside, northeastern England. The methodology, findings, and theoretical implications of our study differ in several respects from previous studies of child-directed speech (henceforth CDS).

First, our focus is on the segmental phonological and phonetic properties of CDS. This level of analysis is relatively rare compared with studies of syntax, vocabulary, and suprasegmentals. Previous studies (reviewed in §2) have consequently painted an inconsistent picture of the nature and potential functions of segmental modification in CDS. Second, we employ an innovative methodology, integrating a quantitative sociolinguistic approach with auditory and acoustic phonetic analysis. The quantitative method leads us to draw on a considerably larger sample of informants than is usual in CDS studies, enabling us to make more robust generalizations. Our speakers are furthermore drawn from a vernacular community in which the local dialect differs markedly in many respects from the standard dialect. Other investigations of CDS have invariably targeted relatively standard language varieties. We selected the Tyneside community because the structured sociolinguistic variation characterizing the local dialect has been studied extensively. We are therefore able to assess how those patterns of structured variability are presented in speech to children. In assessing the performance of our speakers in CDS mode we take account of the full range of phonetic variants in use in the community. This approach allows for a more sophisticated interpretation of the segmental modifications we observe in CDS, and in turn enables us to offer a new perspective on the functions of CDS in the acquisition process.

Before entering into the detail of the CDS study it is important to explain the context in which this study is situated. The CDS research presented here forms part of a larger

* The research discussed in this article has been funded by the UK Economic and Social Research Council (grant numbers R000 234892 and R000 237417). The main project (ESV) involved a large team of researchers. We are grateful to Mike Caygill, Barbara Dodd, Ali Geall, Lesley Milroy, Jenny Tillotson, and clinicians from the Newcastle Paediatrics Speech and Language Therapy Team for their contributions to this project. We are further indebted to Tom Chadwick of the University of Newcastle School of Population and Health Sciences for his advice on statistical matters. We have also benefited from comments on earlier versions of the material presented here, and we wish to record our thanks to Ghada Khattab, Lesley Milroy, Jane Stuart-Smith, and the editors and referees of *Language*.

project entitled *The emergence of structured variation in the speech of Tyneside infants* (henceforth abbreviated to ESV; Docherty et al. 2002). The overarching aim of ESV has been to investigate the acquisition of structured phonological variation by a group of Tyneside children aged two to four years. That is, we have been interested in tracking both the emergence of contrastive phonological units, and also the development of those segmental features that are known to vary sociolinguistically, for instance according to speaker gender and age.

A crucial baseline for ESV was provided by a previous study of adults from the same Tyneside community (Milroy et al. 1997). This yielded a detailed picture of socially structured variability in the realization of several consonant and vowel features in the dialect. For example, words of the NURSE lexical set (*nurse*, *shirt*, *bird*, etc.; Wells 1982) may be pronounced with a range of vowel qualities, including [ɔː] and [øː]. The former variant is used almost exclusively by males, while the latter is statistically more frequent in women's speech (Watt & Milroy 1999, Watt 2000).

On the one hand our interest in ESV has been to assess the impact of variability like this on the children's acquisition of knowledge about sound structure. The specific questions that have concerned us include the following:

(i) How do children acquiring the dialect cope with socially meaningful variables? For example, do phonetic alternatives dominant in female speech have a better chance of being acquired? Labov (1990) predicts this will be the case given the typical asymmetry in childcare, which is likely to offer children greater exposure to female speech.

(ii) If variants characteristic of female speech are indeed acquired most readily by children of both sexes, at what age does gender-correlated differentiation emerge in the speech of children themselves?

(iii) Are sociolinguistically variable forms less readily acquired than phonological features that display more phonetic consistency within the ambient language?

In order to answer these questions much of the work carried out as part of ESV has compared features in the children's speech production with those found in the speech of adults (a discussion of some aspects of the children's performance can be found in Foulkes et al. 1999, 2001, Docherty & Foulkes 2000, and Docherty et al. 2005). On the other hand, however, we have also been wary of the fact that speech from adults to children is known to differ in many respects from speech between adults. In order to assess how the children acquire variable forms we must take account of variability in the actual input the children receive, as well as that which characterizes the mature dialect (see Lieven 1994). As part of our research program we have therefore also sought to assess whether the phonological properties of CDS differ from those that were found in the study of interadult communication. It is the findings from this line of the analysis that we present here.

In what follows we first evaluate the existing literature on CDS, concentrating on those studies that analyze segmental features. We then describe in detail the methodology of the ESV project, as well as the specific procedure followed for the analysis of CDS. After presenting the results of our analysis we offer a general discussion of our findings in relation to the functions of CDS in general, and the impact of variability on children's acquisition of phonology.

2. Background: child-directed speech.

2.1. General characteristics and functions of CDS. It is well known that aspects of linguistic structure may be modified in speech addressed to children. Recurrent tendencies include simplified syntax and vocabulary, shorter utterances, many repeti-

tions, use of a wide pitch range, adaptation of common words to fit CVCV structure, slow speaking rate, and longer pause durations. Gallaway & Richards 1994 and Snow 1995 provide a comprehensive review of research in these areas.

Debate about why adults should make linguistic adjustments in speech to children has centered on the potential functions of CDS in facilitating learning of various kinds. Different authors have produced various taxonomies of the kinds of functions CDS might play (e.g. Cruttenden 1994:139ff.). Most of the functions listed by different commentators can be categorized for simplicity's sake under two main headings, which Garnica (1977) labels ANALYTIC and SOCIAL.

The SOCIAL function of CDS is defined by Garnica (1977:81) as a means 'to initiate and maintain communication'. Features characteristic of CDS such as wide pitch range and high-rising terminals may serve the purpose of gaining and holding a child's attention (Vihman 1996:90ff.). The child therefore makes progress in learning that speech is a social, interactive, activity.

Features that contribute to the ANALYTIC function are 'thought to assist the child's analysis of linguistic materials' (Garnica 1977:81). To facilitate the analytic function, linguistic modifications are made in CDS to provide linguistic input to children in simplified or clarified form. For example, slow speech rate and multiple use of repetitions may perform a role in helping the child to locate words within the stream of fluent speech, which may in turn assist in the long-term acquisition of linguistic units. The structure of CDS has therefore been described as a 'simpler, cleaner corpus from which to learn language' (Snow 1995:180).

Many studies have analyzed the linguistic features of CDS in detail, to assess their potential impact on learning. Overall, more attention has been paid to the analytic functions, particularly in debate over the role of CDS as a resource for facilitating language learning.

Several researchers have questioned whether CDS can justly be described as 'simpler' than interadult speech. In a much discussed article, for example, Newport, Gleitman, and Gleitman (1977) analyzed various syntactic structures used in CDS. They argued that CDS is in some respects more rather than less complex (evaluated in terms of generative transformations). The apparently complex structures that adults select may nevertheless facilitate in situ communication, for example by shifting the main referent of a sentence to a position of focus.[1] As a result of findings such as this it has become clear that, while CDS MIGHT help in language learning, this is not the prime concern of adults (consciously or not) when they adapt their segmental patterns in CDS. Instead, CDS seems to be adapted primarily to enable communication with children who are not yet in possession of a fully elaborated linguistic knowledge (Brown 1977:5). The analytic function of CDS may therefore serve short-term communicative goals as well as—or instead of—long-term language-teaching ones.

2.2. AGE AND GENDER VARIATION IN CDS. Features of CDS may vary as a function of the age of the child, and with the gender of both child and parent. Dealing first with age, it is perhaps self-evident that CDS disappears gradually from parents' repertoires as their children develop, and therefore it must logically be the case that features of parents' speech to children change over time. Bellinger (1980) demonstrated some such changes. He examined a series of syntactic, semantic, and pragmatic features in the speech of forty mothers whose children ranged in age from one to five years. The

[1] For a summary of the debate on this article see Pine 1994.

patterns varied according to child age, with differences particularly marked between the ages of 1;8 and 2;3. Garnica (1977) suggests that the relative importance of the analytic and social roles changes over time as CDS itself gradually gives way to more mature speech styles from parents to children. Specifically, Garnica suggests that those aspects of CDS that favor the social functions tend to disappear earlier. For example, older children are better able to maintain attention in communicative settings, and therefore they do not rely so much on linguistic cues that may have had attention-holding functions for them at younger ages.

With respect to the effects of adult gender on CDS, there is a wealth of research showing that fathers and mothers behave differently when interacting with children.[2] Greif (1980), for example, showed that fathers interrupt their children more than mothers do, and that both mothers and fathers interrupt daughters more than sons. Ely, Gleason, Narasimhan, and McCabe (1995) showed that mothers used more reported speech to their children than did fathers, who preferred narratized (summary) reporting of speech. Ely, Gleason, and McCabe (1996) found that mothers elicit more narratives from children than fathers do, while Gleason, Perlmann, Ely, and Evans (1994) demonstrated that parents' use of lexical diminutives (*doggie* etc.) is more frequent to daughters than sons. Reese, Haden, and Fivush (1996) examined narrative structures used by parents to children. They found some differences in performance patterns between fathers and mothers, but more striking differences emerged according to the gender of the child, and mothers proved to make greater distinctions than fathers depending on whether they were addressing boys or girls. Men in general appear to make fewer adjustments to their speech patterns when addressing children (Snow 1995:183).

2.3. SEGMENTAL FEATURES OF CDS. In spite of the wealth of literature on CDS, relatively little attention has been paid to its segmental phonological and phonetic properties (compare comments in Ferguson 1977, Grimshaw 1977, Local 1983, Cruttenden 1994, and Snow 1994). Moreover, the work that has been done presents a highly inconsistent picture in describing the characteristics of CDS and their potential functions.

As with other linguistic features, discussions of segmental adjustments have centered on the analytic and social functions of CDS. Some researchers have argued that segmental modifications in CDS play first and foremost a language-teaching role. Kuhl and colleagues, for example, have carried out a series of experiments to analyze the acoustic vowel space used by mothers in speech to children up to eight and a half months old (Kuhl et al. 1997, Andruski et al. 1999). The acoustic space was defined in terms of a two-dimensional area defined by the first two vowel formants. For all of the languages tested they claimed that the overall vowel space tended to be larger in CDS than in interadult speech. As a result, the acoustic differences between peripheral vowels were greater in speech to infants. The findings are explained as evidence for an unconscious strategy on the part of the mothers to maximize acoustic contrasts, thereby helping the children to distinguish the contrastive phonemic elements of their language. CDS may therefore help children to construct phonological prototypes (Kuhl 1994). Kuhl and colleagues encapsulate their views in their conclusion that 'language input to infants has culturally universal characteristics designed to promote language learning' (1997:686).

A similar conclusion was reached by Malsheen (1980) and Bernstein Ratner (1984a,b). Malsheen examined the separation of voiced/voiceless stop pairs in terms

[2] A useful annotated bibliography is provided in Thorne et al. 1983:313ff., while a review of more recent work can be found in Barton & Tomasello 1994.

of voice onset time (VOT) measurements and found evidence for exaggerated separation of pairs in speech to children who were just learning to talk. She explicitly interpreted this difference as resulting from a maternal drive to aid language learning:

> as soon as the child first attempts to articulate phonological segments that contrast in voicing, the mother begins to issue phonological instructions, through a special set of phonetic cue-enhancement rules. Consequently, the mother is presenting her language-learning child with an idealized corpus of voiced and voiceless segments—one that contains fewer less carefully articulated, categorially ambiguous segments than does normal A[dult-to]-A[dult] speech. (Malsheen 1980:184)

Bernstein Ratner (1984a) analyzed vowel production in the CDS of nine mothers. She concluded, echoing Malsheen, that CDS may be modified to 'produce more canonical phoneme articulation' (573). The same corpus of data revealed fewer phonological reductions in CDS than in speech to adults (Bernstein Ratner 1984b) and also greater vowel lengthening in preboundary positions to the three children who were prelinguistic (Bernstein Ratner 1986). Similarly, Fernald (2000) highlights the role of CDS in reducing the variability that is so characteristic of mature fluent speech. She identifies CDS as a form of hyper-speech (following Lindblom 1990), arguing that its role is 'to reduce phonetic variability and provide clearer exemplars for the inexperienced listener' (Fernald 2000:243).

Not all phonological studies of CDS concur, however, with the view that CDS is adapted to reduce variability or provide more canonical input to children in order to encourage language learning. Davis and Lindblom (2001) analyzed vowel qualities in CDS, following a method similar to that of Bernstein Ratner 1984a and Kuhl et al. 1997. They found substantial variability in vowel qualities used, and overall the CDS vowels were no less variable than in speech between adults. In their interpretation, then, CDS did not offer a clearer model for the construction of prototypes. Davis and Lindblom therefore argue against the claims of Kuhl (1994).

Admittedly, Davis and Lindblom analyzed only two vowel categories from one mother. Other studies, however, offer support to their interpretations. Baran, Laufer, and Daniloff (1977) examined VOT measurements in the speech of three women to children aged around one year. Unlike Malsheen (1980) they found no clear evidence that mothers were maximizing contrasts between stop pairs. Bard and Anderson (1994) analyzed repeated utterances extracted from CDS recordings. Their findings showed that the repetitions tended to involve loss of articulatory detail in comparison with initial utterances and with similar sentences in interadult speech. They conclude that '[w]hatever help parents may give children in cracking the linguistic code, it does not seem to include continuous exposure to unusually clear word tokens' (Bard & Anderson 1994:624). Shockey and Bond (1980) drew similar conclusions. They examined speech addressed to British children aged two to four years. They found increased phonological 'reduction' in CDS compared with speech between adults, for example in greater use of glottal forms of /t/ and deletion of /t/ and /d/ in consonant clusters. They explained their findings with reference to the affective intent of the mothers in their study. Specifically, Shockey and Bond suggested that the mothers were signaling intimacy with their children by means of relaxed and informal speech, which was replete with nonstandard variants and high degrees of coarticulation. As a consequence CDS appeared less 'canonical' than adult-to-adult speech.

Roberts (2002) provides an interesting twist on what the instructional functions of CDS may be. Roberts reports the findings of a pilot study of CDS produced by four women from Memphis, Tennessee. She focused on the pronunciation of (ay), that is, the vowel of words such as *kite*. In southern US dialects the vernacular pronunciation

used is often a long monophthong, [aː]. In her CDS data Roberts found all four mothers used a greater proportion of the standard diphthong [aɪ] than they did in speech to an adult interviewer. One mother made explicit attempts to demonstrate the diphthongal articulation to her child when presenting new vocabulary. Roberts suggests that the mothers are implicitly—and in one case even explicitly—giving their children the chance to learn about regular and salient sociolinguistic variability in their dialect.

2.4. AGE AND GENDER VARIATION IN SEGMENTAL FEATURES. Within the rather restricted canon of phonological research on CDS there has been virtually no work on the effects of the child's age on segmental features, leaving us unable to make many valid generalizations (Cruttenden 1994). Malsheen (1980) and Bernstein Ratner (1984a) both found variable effects in CDS related to children's age, but their studies disagreed on what the key ages were in triggering change to CDS. Malsheen's VOT study pointed to the onset of speech production by the child as the factor inducing change in mothers' performance (recall the quotation from Malsheen cited above). She found no significant VOT differences when comparing interadult norms with speech to children who either were at the babbling stage, or were fairly advanced in speech production. Bernstein Ratner, however, found a more consistent effect across the children in her sample, with mothers' vowel spaces increasing gradually in size as the children got older.[3] It has been suggested, in fact, that the differences in findings across the various studies may result from analysis of CDS to children of different ages. Bernstein Ratner (1984b) set out to replicate Shockey and Bond's 1980 study, and attributed the differences in findings to the age of the children involved (see also comments in Cruttenden 1994, Davis & Lindblom 2001).

Since so few studies have attempted to discuss this issue, it remains unclear just how a child's age affects the segmental features of CDS. Even more unclear is what effects, if any, are exerted by gender on the segmental characteristics of CDS. We discussed earlier some of the evidence pertaining to syntactic and pragmatic features of CDS, showing that the gender of both the child and the parent may introduce variability. But we are not aware of any work that takes account of either parent or child gender in analysis of segmental features.

2.5. SUMMARY. In sum, then, rather little is known in general about segmental effects in CDS, particularly with regard to the age and gender of the participants. Moreover, discussions about the potential values of CDS for children's learning have been contradictory. We turn now to our own study of speech to children. This study takes account of child age and gender. It also examines segmental features within a sociolinguistically informed framework, in order to make a full assessment of the range of phonetic and phonological targets available to the children and the impact of sociolinguistic variables on learning.

3. METHODOLOGY.

3.1. FIELDWORK DESIGN. The fieldwork for the ESV project comprised two parallel informant samples. First, forty children and their caregivers were located to fulfill a cross-sectional design structured according to the children's age. The sample design is shown in Table 1. The second strand of the study followed a number of children longitudinally across part or all of the same age range. The age range was chosen on

[3] Bernstein Ratner (1984a,b) does not specify the ages of the children in her study, but Kuhl and colleagues (1997:686, n. 10) estimate that they range from c. 0;9 to c. 4;0.

	AGE				
	2;0	2;6	3;0	3;6	4;0
BOYS	4	4	4	4	4
GIRLS	4	4	4	4	4

TABLE 1. Cross-sectional study sample design, ESV project (all ages ± 1 month).

the basis that the level of phonological development typically achieved at 2;0 would probably be the earliest feasible starting point for addressing the research questions (recall that a prime concern was to analyze the speech production of the children as well as that of their mothers). Beyond age 4;0 it would be difficult to control for other sources of linguistic input, such as speech from the peer group and younger siblings. The fieldwork yielded a total of ninety-six recordings from fifty-three children.

All informants were drawn from the same broadly working-class neighborhoods that were investigated in the earlier study of the adult community (Milroy et al. 1997; see §3.4 below). This aspect of the fieldwork design was crucial in order to facilitate direct comparison between speakers: on the one hand to assess the performance of the children, on the other to assess whether any significant segmental modifications occurred in CDS.

The children were selected according to various criteria. Both parents had to be monolingual English speakers. The children were all born after full-term pregnancy and had otherwise normal development (as reported by the parents). The children furthermore had normal hearing, no recurrent otitis media, and no referrals for speech and language therapy. We also selected only first-born children, to minimize the potential impact of communication with siblings. In all cases the mother was the main caregiver.

3.2. DATA COLLECTION. The goal of each recording session was to obtain as much data from mother and child as reasonably possible, with the focus of the interaction geared by the fieldworker towards eliciting tokens of relevant phonological variables. Recordings typically lasted between thirty and forty-five minutes. The principal material collected was a sample of interaction between mother and child, mediated by the fieldworker.

No systematic attempt was made to record adult males, for two reasons. First, in practical terms it was difficult to arrange recording sessions at convenient times where the father was the main breadwinner. Second, the role of the father in child-rearing was highly variable across families, which meant that it was extremely difficult to control for the extent to which the father's input played a role in the child's linguistic experience. However, some men (both fathers and grandfathers) were present for parts of some recordings. In such cases the males were encouraged to interact with the children in the same activities as the mothers, and recordings continued as normal.

Activities centered on a book and a bag of toys brought by the fieldworker. Materials included in the toy bag were chosen to elicit words containing phonological variables of interest. These included a rubber shark, a set of play teeth, and all four Teletubbies. The Teletubby Po, for example, elicited a realization of the vowel (oː),[4] which is an interesting sociolinguistic variable in Tyneside (Watt & Milroy 1999), while Tinky

[4] We use the variable notation (oː), (t), and so forth, following the usual practice in sociolinguistics. We do this to circumvent potential controversy over phonological or phonetic status of the features concerned, and to avoid ambiguous use of IPA symbols in phonological and phonetic transcriptions.

Winky elicited initial (t) and two examples each of word-medial (k) and word-final (iː). The book contained similar materials, and was based on a confrontation naming task using a pictorial adaptation of Barbara Dodd's (unpublished) 25-word consistency test (a commercially available adaptation of this is Stow et al. 1998). No attempt was made to manipulate infants' or adults' speech style.

Recordings were made in as quiet surroundings as could be achieved at the subjects' homes, using Trantec radio lapel microphones and a Sony TCD-D10 Pro II digital tape recorder. Fieldwork was performed by a group of speech and language therapists, all with extensive experience in obtaining language samples from infants and their parents.

3.3. ANALYSIS. Analysis of the resultant data made use of a combination of acoustic and auditory methods. Auditory analysis was used to record unitary transcriptions using IPA symbols. This was supplemented by acoustic analysis using Sensimetrics SpeechStation 2. Acoustic analysis was used both to register measurements of key parameters (e.g. voice onset time) and also to compile a detailed profile of the acoustic properties found in each token (see further Docherty & Foulkes 2005).

In the case of (t), for example, the acoustic profiling recorded the presence or absence of features including:

- periodicity during the stop (reflecting voicing)
- release burst (reflecting release of an oral closure)
- creaky phonation (the main acoustic correlate of 'glottal' variants in this dialect; Docherty & Foulkes 1999)

All tokens were analyzed where possible. For (t) this amounted to over 7,500 tokens from children, and over 3,000 from mothers engaged in CDS.

The data reported in the present article are drawn from the mothers in the cross-sectional study. One recording proved unsuitable for analysis, and therefore our main CDS corpus consists of speech from thirty-nine mothers. Analysis of the longitudinal data is currently in progress.

The effects identified as significant are based on a range of statistical analyses. In the adult-centered project (see §3.4 below) variation in phonological variables with respect to social variables was analyzed using log-linear models (for further details, see Docherty et al. 1997). Within ESV a range of statistical procedures were used in order to investigate the relationships between linguistic patterns in CDS (and in child performance) and the independent variables of child age/gender and phonological context. These included the use of chi-square comparisons, linear regression models, and the identification of disjoint 95% confidence intervals for the proportion of use of the phonological variants for different subgroups of the whole population. Given the anticipated 'noisiness' of the data (as a reflex of varying sample sizes from individual speakers and the between-speaker variability characteristic of child speech) all statistical analyses were designed to provide a conservative means of identifying differences and relationships between groups of speakers. Differences referred to as 'significant' were found to be so at an alpha level of $p < 0.05$.

3.4. CONTROL MATERIALS. The ESV data enable us to make direct comparisons between children's phonological and phonetic performance and that of their mothers. However, as noted above, a crucial baseline for comparisons is also provided by the results of an earlier study that focused on adult-to-adult speech in the same neighborhoods. We refer to the adult study as PVC, an abbreviation of the project's full title *Phonological variation and change in contemporary spoken British English*.

PVC involved thirty-two informants, divided equally according to criteria of age, gender, and broadly defined social class. The fieldwork design is summarized in Table 2. Recordings were again made in informants' homes using digital recording facilities. The main materials collected were (i) unscripted conversations from self-selected pairs of informants, and (ii) readings of word-lists to elicit specific variables of interest. For fuller details of the fieldwork and results of the adult study, see particularly Docherty et al. 1997, Milroy et al. 1997, Docherty & Foulkes 1999, and Watt & Milroy 1999.

WORKING CLASS				MIDDLE CLASS			
YOUNGER (15–27)		OLDER (45–67)		YOUNGER (15–27)		OLDER (45–67)	
male	female	male	female	male	female	male	female
4	4	4	4	4	4	4	4

TABLE 2. Fieldwork design of Tyneside adult study (PVC).

We therefore compare phonological variants used by the mothers with those produced by the adult speakers in the PVC study to assess the evidence for segmental modifications in CDS. We focus particularly on the young working-class females, since they share the demographic profile of the mothers in the ESV corpus. To ensure that these comparisons of CDS with interadult speech are robust, we also make reference to findings from independent empirical studies carried out on other groups from Tyneside (e.g. Allen 2005). Some aspects of our findings with respect to CDS have also been subject to replication with data gathered from additional mothers in the same neighborhoods (Parsons 2000, Johnson 2003).

4. RESULTS. The main focus of our analysis has been the realization of the variable (t), because our work during the PVC project showed (t) to be the locus of a particularly complex pattern of sociolinguistic and phonetic variation. We have examined (t) in several phonological contexts. The two most interesting contexts insofar as CDS is concerned are word-medial intersonorant position (for example, *water*, *winter*, *bottle*) and word-final prevocalic position (*get in*, *hat on*). In adult-to-adult speech the variants used in both contexts display significant sociolinguistic patterning. In the following sections we outline the results for each context in turn. In each case we begin with a description of the variant patterns found in speech between adults, before explaining the patterns found in speech to children. We also comment on variability within the CDS corpus, since some of our findings varied with respect to the age and gender of the children.

5. WORD-MEDIAL INTERSONORANT (t).

5.1. PATTERNS IN INTERADULT SPEECH. In Tyneside there are two main variant types used for (t) in word-medial intersonorant position. The first is a standard-like voiceless stop, [t]. The second consists of a range of laryngealized forms, all of which are characterized by a period of creaky phonation and which usually but not always involve a simultaneous oral occlusion. The majority of such tokens are best transcribed [d̰]. Tokens with complete glottal occlusion and no oral gesture (i.e. those conforming to the IPA definition of a glottal stop) are very rare. For brevity's sake, however, we refer to this entire range of variants as GLOTTALS. Docherty et al. 1997

and Docherty & Foulkes 1999, 2005 provide further discussion and spectrographic illustrations.[5] Similar glottal forms are also found for medial (p) and (k) (*happy*, *baker*).

The glottal variants are extremely salient auditorily, probably because the relative timing of oral and laryngeal components differs from the norm found in most British accents (Wells 1982:374). Within the UK they are so characteristic of the Tyneside accent that they conform to Labov's definition of a STEREOTYPE variable (Labov 1994: 78). That is, they are the subject of overt comment by both Tynesiders and outsiders, and may be avoided in more formal speech styles (see below). They are also typically used as symbols of the dialect in imitation by outsiders (e.g. professional comedians).

The overall distribution of variants in interadult speech is shown in Table 3. These data are derived from analysis of the unscripted conversations involving the four young working-class women in the PVC study.

[t]	GLOTTALS	OTHER	N
10	90	< 0.5	163

TABLE 3. Realizations of (t) in word-medial context, unscripted conversation, young working-class women (percentages).

Table 3 confirms that the glottal forms are by far the most frequent variant in this context. The young working-class women produced glottals in an average of 90% of cases, with individual scores ranging from 80% to 100%. Indeed, a similar pattern was found for most of the thirty-two speakers in the PVC corpus (the exceptions all being older women). Allen (2005) reports similar results from a separate study of over forty adolescents, with usage of glottal variants for almost all informants in excess of 90%. The high level of consistency in variant choice for medial context is therefore a very striking feature of the interadult speech mode, with glottal usage approaching categorical status.

As befits a stereotype variable, style-shifting was also found in the PVC data, particularly by female speakers. In word-list readings, which were designed to yield a more formal, self-conscious speech style, most men continued to use glottals to more or less the same extent as in conversational style. Most women, however, preferred near-categorical use of [t].

5.2. PATTERNS IN CDS. From the CDS recordings we extracted a total of 570 tokens of medial (t), an average of 14.6 tokens per mother. The number of data points per speaker was obviously small in some cases, with a minimum of 2 and maximum of 37 (see Appendix A for a full account of the data for each individual). The general findings are nevertheless clear. Figure 1 presents the overall quantification of the data, showing proportions used of the two main variants, [t] and glottals. Other variants, including deletion, were in short supply, as they were in interadult speech; hence they

[5] In Docherty et al. 1997 and Docherty & Foulkes 1999, 2005 we discuss in detail the different types of glottal phones in the PVC recordings. We found both acoustic and structured sociolinguistic differences in glottal forms used by different speakers and speaker groups. For the purposes of this article, however, we have conflated the various phonetic forms, as the main issue at stake in the analysis of CDS is the contrast between glottals and nonglottal [t]. Very typical sound files of Tyneside speech, illustrating the glottal variants, can be accessed through http://www.phon.ox.ac.uk/~esther/ivyweb/.

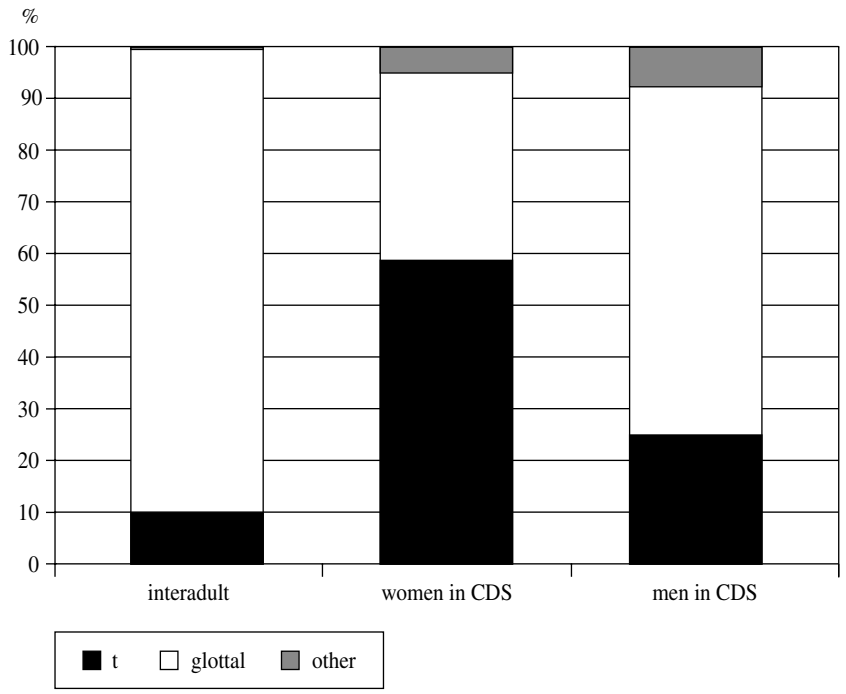

FIGURE 1. Use of medial (t) variants.

have been grouped together in Figure 1. The CDS data from the mothers are shown in the middle bar. The inter-adult data from Table 3 are also shown for comparison (left bar). The right-hand bar represents a small amount of data extracted from the speech of three men who were fortuitously present during recording sessions.

Analysis of the mothers' speech to children reveals striking differences compared with the findings from the interadult speech. In speech to children the proportion of [t] increases to an average of 59%, contrasting with the average 10% used in interadult mode. Use of glottals, however, drops from 90% to just 36% in the CDS corpus. Not surprisingly chi-square comparisons yield highly significant results for these differences ($p \lll 0.001$).

The data in Table 4 offer further support for the observation that mothers use more [t] and fewer glottals in speech to their children, compared with women engaged in speech with other adults. Table 4 focuses on the four individuals whose interadult speech forms our principal baseline. The figures represent the rank position of these four within the overall corpus of forty-three adults (thirty-nine mothers + four in

SPEAKER	[t]	GLOTTALS
Helen	= 31	9
Kelly	= 39	= 1
Lindsey	36	5
Tracey	34	8

TABLE 4. Rank positions (out of 43) of PVC informants in usage per variant.

interadult mode), in terms of their percentage use of each variant. Thus, for example, Kelly's proportional usage of glottals ranks equal highest among the forty-three women analyzed, and her rank for [t] usage (= 39) is concomitantly low. It is clear from Table 4 that all four speakers recorded in interadult mode rank consistently high in terms of glottal usage, and that they produce low scores for [t]. These rank positions confirm the impression that the four control women show different patterns of variant use from the majority of the mothers in CDS.

The data in Fig. 1 are of course drawn from different groups of women. In order to further corroborate our findings, Parsons (2000) undertook a supplementary study, collecting samples of CDS from five more mothers in the same neighborhood, along with a substantial sample of interadult speech from the same women. Comparison of their interadult speech with their CDS did indeed show similar results, as Figure 2 demonstrates. Four of the five mothers in Parsons's study showed a substantial increase in [t] usage in CDS compared with interadult speech. The differences are statistically significant for subjects 1, 3, and 4 (chi-square comparisons, $p < 0.05$ in each case; subject number 2 produced only one token of word-medial (t) in CDS mode, and therefore her results should be ignored).

The data from men shown in Fig. 1 comprise only thirty-six tokens from three individuals, but they are included because they are particularly intriguing. While the mothers display a very clear difference in variant choice compared with the PVC women, the performance of the men appears more similar to the interadult patterns. For the men, [t] accounted for only one quarter of the tokens, while glottals were used in two thirds of cases.

Closer analysis of the mothers' CDS data further revealed effects for the gender and age of the children. First, the overall distribution of variants differed depending on

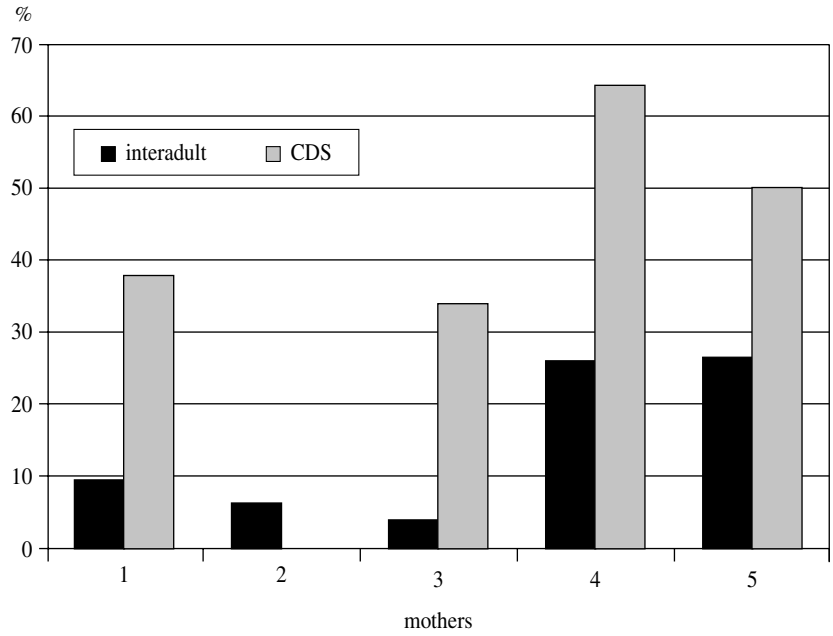

FIGURE 2. Use of [t], word-medial context (from Parsons 2000).

whether the child was male or female. As Table 5 indicates, mothers of girls used [t] significantly more than the mothers of boys (chi-square, $p < 0.0001$). The latter used more of the local glottal variants.

	[t]	GLOTTALS	N
MOTHERS OF BOYS	48	45	293
MOTHERS OF GIRLS	70	28	277

TABLE 5. Use of variants in CDS, word-medial context, by gender (percentages).

Linear regression analysis was carried out to refine the analysis of CDS with respect to child gender and age.[6] Analysis of the full data set revealed an interaction for the age and gender of the child, which first of all confirmed the finding reported in Table 5 that overall usage of [t] was higher in speech to girls. In light of this interaction results are presented separately for mothers of girls and mothers of boys in Table 6.

Table 6 reveals two main findings. First, variant usage by girls' mothers differs according to the age of the children. Specifically, [t] usage was highest in speech to the two-year-olds, and decreased in speech to older children. The difference reached statistical significance for the four-year-olds ($p = 0.048$). In compensation, glottal usage increased across the age range and was significantly higher for the mothers of the oldest group of girls ($p = 0.046$). The second main finding is that the mothers of boys displayed no significant variation, showing that their use of variants remained relatively stable across the boys' age range. But, the boys' mothers mirrored the overall trends shown by the girls' mothers; that is, [t] usage decreased across the age range, and glottal usage was found to increase.

To illustrate the distribution of variants by child age and gender, the data are displayed in scatter plot form in Figure 3. We have arbitrarily chosen to display the data in terms of proportional usage of [t] (use of glottals presents more or less a mirror image of Fig. 3 rotated around the horizontal axis). The data from girls' mothers are plotted with open circles and the dotted trend line, while the boys' mothers' data are shown with filled triangles and a solid trend line. Figure 3 confirms that [t] scores for girls' mothers are generally higher than those for boys' mothers. It further illustrates the interaction of child age and gender on the [t] scores revealed by the statistical analysis. The trend lines show that the usage of [t] decreases in line with increasing child age, but with a steeper descent for mothers of girls ($r = -0.474$ for girls' mothers, $r = -0.284$ for boys' mothers).

[6] Three separate statistical analyses were performed on the full data set, to take account of the small numbers of tokens from some subjects. The first analysis included all subjects, the second removed subjects with fewer than five tokens, and the third removed subjects with fewer than ten tokens. The general patterns reported were consistent across the three analyses. We have chosen to present results from the second analysis (i.e. $n > 5$) as the best compromise between numbers of tokens and numbers of subjects. For the medial (t) analysis this policy left thirty-two of the original thirty-nine speakers (sixteen mothers of boys and sixteen mothers of girls).

[t] VARIANT, MOTHERS OF GIRLS

	ESTIMATE	STD. ERROR	*t* VALUE	*p* VALUE	SIG.
INTERCEPT	86.56	12.45	6.95	2.42e-5	***
age 2;6	−28.98	19.02	−1.52	0.156	
age 3;0	−16.56	17.61	−0.94	0.367	
age 3;6	−25.31	21.57	−1.17	0.265	
age 4;0	−42.39	19.02	−2.23	0.048	*

GLOTTAL VARIANTS, MOTHERS OF GIRLS

	ESTIMATE	STD. ERROR	*t* VALUE	*p* VALUE	SIG.
INTERCEPT	11.17	10.49	1.07	0.310	
age 2;6	28.21	16.02	1.76	0.106	
age 3;0	15.26	14.83	1.03	0.326	
age 3;6	27.58	18.16	1.52	0.157	
age 4;0	36.06	16.02	2.25	0.046	*

[t] VARIANT, MOTHERS OF BOYS

	ESTIMATE	STD. ERROR	*t* VALUE	*p* VALUE	SIG.
INTERCEPT	53.15	17.75	2.99	0.012	*
age 2;6	−10.34	25.11	−0.41	0.688	
age 3;0	2.40	25.11	0.01	0.926	
age 3;6	−31.97	23.49	−1.36	0.201	
age 4;0	−14.35	25.12	−0.57	0.579	

GLOTTAL VARIANTS, MOTHERS OF BOYS

	ESTIMATE	STD. ERROR	*t* VALUE	*p* VALUE	SIG.
INTERCEPT	42.40	18.41	2.30	0.042	*
age 2;6	3.59	26.03	0.14	0.893	
age 3;0	−1.66	26.03	−0.06	0.950	
age 3;6	30.86	24.35	1.27	0.231	
age 4;0	7.38	26.03	0.28	0.782	

TABLE 6. Linear regression analysis, word-medial CDS, by gender of child (minimum 5 tokens per mother).

5.3. SUMMARY. Our results for word-medial context suggest that:

- variant usage in CDS differs from variant usage in interadult speech. Specifically, in mothers' CDS there is a dramatic decrease in frequency of glottals, with [t] used far more than in speech between adults.
- variant usage is affected by an interaction of child age and gender. Speech to boys contains more glottals and fewer [t] forms than speech to girls. Glottal forms increase in currency as the children get older, while the frequency of [t] gradually reduces; this effect is significant only for mothers of girls.

In general, then, in CDS the mothers used far fewer of the characteristic local glottal variants than the PVC women did. Instead they preferred [t], a variant that is more standard. Recall too that in the PVC study the usage of [t] also increased in more formal styles, particularly in the speech of women (§5.1). We identified the glottal variants as an example of a Labovian stereotype, that is, sociolinguistic variants of which speakers are overtly conscious. In fact, during the recordings of mothers and children the social-indexical values of these variants surfaced on a few occasions. Some mothers explicitly 'corrected' their children when the children used glottal forms for medial (t) in word-naming tasks.

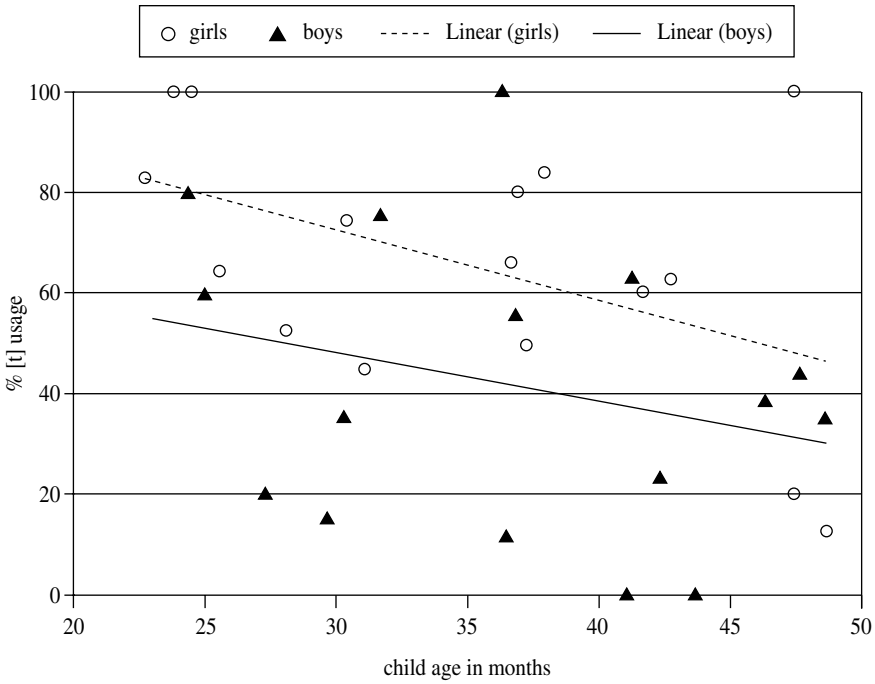

FIGURE 3. Use of [t] in CDS, word-medial context, by child age and gender (34 informants with $n \geq 5$ tokens).

6. WORD-FINAL PREVOCALIC (t).

6.1. PATTERNS IN INTERADULT SPEECH. The two variants discussed in the previous section also occur when (t) is word final and followed by a vowel, for example *get in*. Their relative frequencies are quite different in this context, however. Moreover, in addition to [t] and glottals two other variants are also frequently used. The first of these is the approximant [ɹ]. This variant has a tightly restricted lexical distribution, occurring mainly in a small set of common monosyllabic verbs and nonlexical words such as *get*, *put*, *not*, *that*, and *what* (Wells 1982:370). The second additional variant for this context may be transcribed [t̬], to cover what is in fact a range of voiced but nonglottalized obstruents. These are usually [d]-like or an alveolar tap [ɾ]. We refer to this group as VOICED variants.

Many individual speakers use all four variant types to a greater or lesser extent. A phrase such as *get in* might therefore be pronounced [gɛt ɪn], [gɛd̰ ɪn], [gɛɹ ɪn], or [gɛt̬ ɪn]. There are again sociolinguistic and stylistic constraints on the use of the variants. As in word-medial context, [t] is relatively rare, but increases in more formal styles. Glottals are more common in the speech of males than females, although the gender differentiation is least apparent among young working-class informants. The variant [ɹ] has a much wider geographical distribution than [d̰], being found in many nonstandard dialects in the north and midlands of England. Its usage appears somewhat idiosyncratic, being highly variable across individuals. Overall in Tyneside it is used more frequently by women than men, particularly among the working-class groups. By contrast, the voiced variants are more commonly used by males. The voiced variants

[t]	VOICED	[ɹ]	GLOTTALS	N
5	39	21	33	402

TABLE 7. Realizations of (t) in word-final prevocalic context, young working-class women (percentages; adapted from Docherty et al. 1997:293).

are clearly sociolinguistic INDICATORS (Labov 1994:78): speakers seem not to be consciously aware of them. The status of [ɹ] as a marker or indicator is less clear, although Wells (1982:370) refers to it as 'stigmatized' and its use decreases in more formal styles. It is therefore probably best to consider it a marker.

Table 7 displays quantified data for (t) variants in word-final prevocalic context. The data are again drawn from the four young working-class women in the PVC study, extracted from unscripted conversation. We can see clearly that the local variants are favored, with [t] accounting for only 5% of the data. Allen (2005) found closely comparable scores in his study of adolescents. There was some variability across the four individuals, most notably in the use of [t] and [ɹ]. We comment further on this in the next section when comparing these data with those found for mothers in CDS mode.

6.2. PATTERNS IN CDS. From the recordings of the thirty-nine mothers we extracted a total of 1,128 tokens of (t) in word-final prevocalic context, which gives an average of 28.9 tokens per person. In Figure 4 we present the overall quantification of the data, variant by variant. The CDS data are shown by the black bars. The interadult data from Table 7 are also shown for comparison (grey bars).

As with the adults described in §6.1 there was variability in the performance of individuals (see Appendix B for a full tabulation of variants used by each mother),

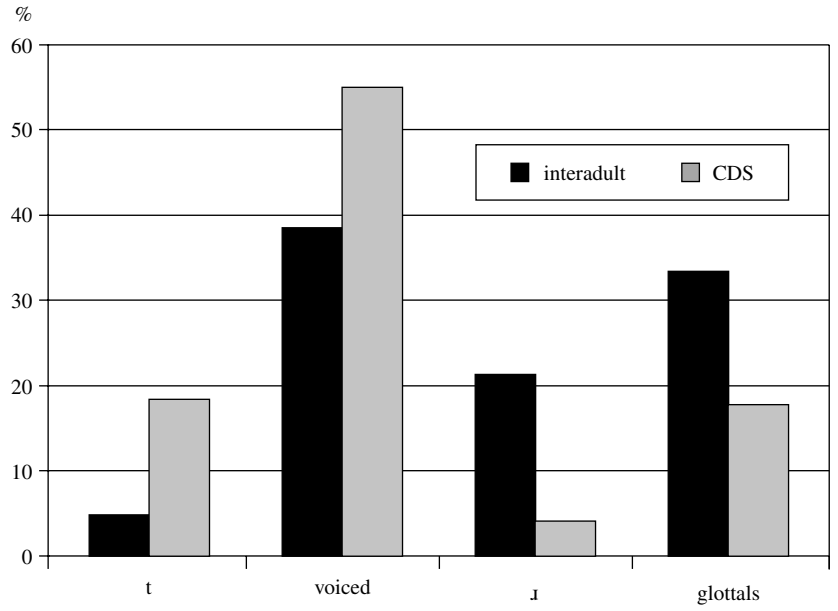

FIGURE 4. Use of variants in CDS and interadult speech.

but clear general trends are suggested by the results. Moreover, these trends parallel those described earlier for word-medial context. Figure 4 shows evidence that patterns of variant usage differ according to whether adults or children are being addressed. CDS is characterized by a lower incidence of [ɹ] and glottals. Compensating for the reduction in these variants is a higher usage of both [t] and also the voiced variants (chi-square comparisons show all four effects to be highly significant, with $p < 0.001$ in each case).

The data in Table 8 offer further support to these observations. Table 8 presents the rank positions for variant usage by the PVC informants, comparable to those shown in Table 4. Thus, for example, Helen's use of [t] places her thirty-sixth highest of the forty-three informants (thirty-nine mothers + four PVC controls), while Kelly's proportional usage of the variant [ɹ] ranks second highest overall. The rank positions enable us to take stock of the individual variability within the corpus as a whole. As Table 8 indicates, the control speakers generally rank low in usage of [t] and voiced variants, but they rank high in their use of [ɹ] and glottals. These rankings therefore reveal similar patterns to those in Table 4, showing that the PVC informants displayed higher use of local variants and lower use of more standard variants than did the mothers engaged in CDS.

SPEAKER	[t]	VOICED	[ɹ]	GLOTTALS
Helen	36	12	16	17
Kelly	34	32	2	16
Lindsey	29	30	8	5
Tracey	6	39	6	8

TABLE 8. Rank positions (out of 43) of PVC informants per variant.

Significant variation was again found within the CDS data, as illustrated in Figure 5, which shows the overall distribution of variants by child gender. The most noticeable feature of Fig. 5 is that [t] usage, while relatively low overall, was twice as frequent in the speech of mothers of girls.

Linear regression analysis was again undertaken to test for effects of child gender and age on mothers' variant usage.[7] The results are shown in Table 9. A main effect for child gender on [t] usage was found to be significant in this analysis ($p = 0.04$), thus supporting the interpretation of Fig. 5. No significant effects emerged for the other variants, although it is noteworthy that the significant difference in [t] usage is compensated for by a higher usage of both glottals and [ɹ] in the speech of boys' mothers. Note that these patterns parallel those found for medial context (Table 5), where girls' mothers were also found to use more [t] and fewer glottals than boys' mothers.

With regard to child age, no significant effects emerged in analysis of voiced variants, glottals, or [ɹ]. However, a significant age effect was found within the analysis of [t]

[7] As with the medial data, three separate analyses were performed. We again report results from the analysis that removed informants with fewer than five tokens. For word-final (t) only two informants had to be removed from the analysis to satisfy this criterion.

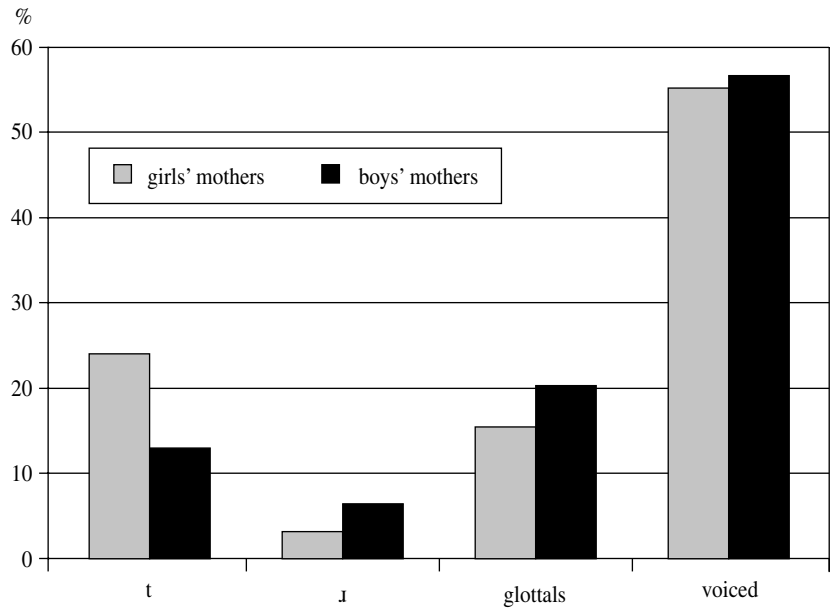

FIGURE 5. Use of variants in CDS, mothers of girls vs. mothers of boys.

usage. The results are less clear-cut than those reported for medial context, but the trends mirror those found for medial [t]. Use of [t] was lower in speech to older children than to children aged 2;0, with a significantly lower score for the 3;0 cohort ($p = 0.045$). The score for the 2;6 group narrowly missed significance ($p = 0.053$), while the trend was maintained for the older groups.[8]

	[t] VARIANT, ALL MOTHERS				
	ESTIMATE	STD. ERROR	*t* VALUE	*p* VALUE	SIG.
INTERCEPT	34.99	6.94	5.04	2.74e-5	***
age 2;6	−19.83	9.82	−2.02	0.053	(*)
age 3;0	−20.68	9.82	−2.11	0.045	*
age 3;6	−18.10	12.03	−1.51	0.144	
age 4;0	−14.44	9.82	−1.47	0.153	
gender (male)	−21.22	9.82	−2.12	0.040	*
age 2;6:gender (male)	22.28	14.45	1.54	0.135	
age 3;0:gender (male)	28.32	13.89	2.04	0.051	(*)
age 3;6:gender (male)	7.19	15.53	.46	0.647	
age 4;0:gender (male)	11.55	13.89	.83	0.413	

TABLE 9. Linear regression analysis, word-final prevocalic CDS (minimum 5 tokens per mother; no significant effects of variants other than [t]).

[8] The effect for age was clearer in the statistical analysis that removed informants who had token counts lower than ten (leaving a total of thirty-four subjects). In this analysis the 2;6, 3;0, and 4;0 groups all scored significantly lower than the 2;0 group ($p = 0.036$, 0.03, and 0.011 respectively). The 3;6 group again followed the same trend but missed significance ($p = 0.11$).

The distribution of [t] variants by age and gender is displayed in scatter plot form in Figure 6. Data from girls' mothers are again plotted with open circles and the boys' mothers' data are shown with filled triangles. Figure 6 shows that the overall level of [t] usage is higher in speech to girls, especially in the 2;0 group. With respect to age, there is a general lowering in frequency from left to right, as indicated by the trend lines. The marked difference in the data for the 2;0 group is also clear, with three high scores for mothers of girls.

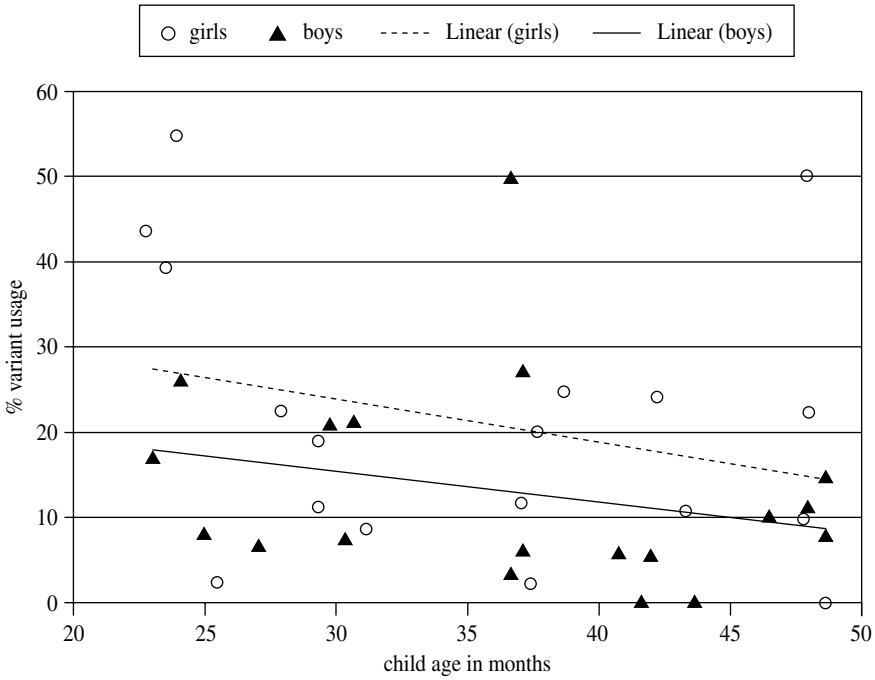

FIGURE 6. Use of [t] in CDS, word-final prevocalic context, by child age and gender (37 informants with $n \geq 5$ tokens).

6.3. SUMMARY. The findings for (t) variants in word-final prevocalic context suggest the following:

- variant usage in CDS differs from variant usage in interadult speech. Specifically, the use of [t] is significantly higher in CDS. By contrast, there is a lower incidence of [ɹ] and glottals—sociolinguistic markers that show signs of negative evaluation and that are characteristically local.
- variant usage is influenced by the gender of the child. Specifically, speech to boys contains fewer [t] forms than speech to girls.
- [t] usage is influenced by the age of the child. Speech to the youngest cohort of children contains more [t] than speech to older children, and the gender-correlated difference in [t] usage is most apparent for the youngest cohort.

The relatively high degree of variability across the sample of mothers means that we should exercise caution in interpreting these results, particularly with respect to the children's age and gender. Mothers' [ɹ] usage, for instance, showed low overall usage

and a high degree of variability across individuals (from 0% to 37%, with only seven individuals reaching double figures). But the general trends apparent in these data are persuasive, and consistent with those found for medial context.

7. DISCUSSION. We now offer an interpretation of our findings and we also explore the possible theoretical implications of our study, relating our results to other studies of CDS and offering our interpretation of the potential role of CDS in language acquisition.

Our results reveal three main patterns. First, there are differences in variant choice according to whether the addressee is an adult or a child. Speech to children generally contains more [t] and fewer vernacular variants than does interadult speech. Second, variant choice in CDS is constrained by the gender of the child. Speech to girls generally contains more [t] than speech to boys, where vernacular variants are more abundant. Third, age of the child has a significant effect, with vernacular variants increasing in speech to older children. A fourth pattern can also be mentioned, although it is based on rather scant data—adult males appear to make fewer segmental modifications in their speech to children than adult women do.

These results bear comparison with previous studies of the segmental characteristics of CDS in showing very clearly that segmental patterns may differ markedly in comparison with speech between adults (Malsheen 1980, Shockey & Bond 1980). In both contexts analyzed, CDS was characterized by a reduction in use of phonetic forms with connotations of nonstandardness, stigma, and/or local currency. In both contexts there was a lower rate in CDS of glottals, while in word-final prevocalic context the frequency of [ɪ] was also lower than in interadult speech. The reduction in use of these forms goes hand in hand with an increase in forms that are more standard, or that lack negative evaluation in the community. The use of [t] is higher in both contexts in CDS, while in word-final prevocalic position the use of voiced variants is also higher. Recall that the voiced variants are indicators in Labov's terms—that is, any sociolinguistic values they may convey fall below the level of overt consciousness.

How might we interpret the motivations behind such differences across speech modes? Do the segmental choices of parents enhance the value of CDS as a resource for learning? If so, what aspect(s) of learning do they facilitate? Do they better serve the analytic functions or the social functions that have been posited for CDS in general (Garnica 1977)?

At first glance it might be tempting to interpret our findings in the same spirit as Malsheen 1980, Bernstein Ratner 1984a,b, or Kuhl et al. 1997, who all argue that CDS serves primarily as a good resource for long-term language learning. From one perspective, the segmental effects we see in our (t) study could be argued to enhance phonological 'clarity' or 'simplicity'. An increase in use of [t] might contribute to improving clarity, since it is the standard form and also perhaps the most transparent version for parents of the letter *t*. Increasing its frequency in speech to children therefore presumably renders speech closer to the canonical norm (Bernstein Ratner 1984a:573). Use of [t] further serves to reduce variability in phonetic form across phonological contexts, since a similar variant is also used word-initially. A child might be aided in learning that words such as *water* and phrases such as *get up* contain the same phonological element that is found at the beginning of *teddy*.

We might also interpret our CDS findings with reference to the hyper-hypo continuum, in line with Fernald 2000. Hyper-speech refers to relatively canonical pronunciation, while hypo-speech is characterized by greater degrees of underarticulation. Speak-

ers shift toward the hyper end of the continuum if the context of interaction demands particularly clear speech for the sake of the listener's comprehension. The variant [t] would presumably represent an alternative at the hyper end of the range since it is the canonical form. CDS is furthermore a heavily listener-oriented register, and thus we would predict that adults speaking to children would incline to use [t] at a high frequency. We would further predict that hypo forms should become more frequent in CDS as the children's linguistic abilities become more sophisticated, and interaction between adult and child in turn becomes more reciprocal. The increase in glottals to older children would be consistent with this prediction.

Closer analysis of the variability within the CDS data suggests, however, that explanations based purely on the issue of clarity cannot be wholly satisfactory. The first difficulty concerns the distribution of variants across and within contexts in the CDS data. The increased use of [t], as we have seen, could be argued to make CDS more canonical in form, and might reduce variability in form across contexts. If we focus purely on variant use WITHIN contexts, though, we could equally argue that the child's task in learning appropriate contextual variants is made MORE difficult. The clearest piece of evidence in favor of such a view comes from the word-medial findings. In casual adult-to-adult speech (§5.1) the choice of variant is extremely consistent, with almost all Tynesiders using glottals in preference to [t] more or less categorically. From the child's point of view, speech between adults would therefore present a very useful body of evidence for language learning, providing highly consistent and largely invariant information about the pronunciation of words such as *water* and *bottle*. In CDS, mothers eschew this consistency, using a much higher frequency of [t] than occurs in typical interadult mode (compare Davis and Lindblom (2001), who found vowel forms in CDS to be no less variable than in speech between adults). As a result, children are exposed to a corpus of input that contains alternative forms for *water*, *bottle*, and so forth in reasonably high frequencies. From this perspective CDS displays more rather than less variability than interadult speech. In consequence, while the choice of variants may help the child to link phonological elements in different contexts, it is hard to see how CDS could enhance opportunities for the learning of word-medial stops alone.

Further evidence against the notion that CDS serves purely to enhance phonological clarity comes from the variability in our data correlated with the gender of the participants. We have seen that mothers' choice of variants differs according to whether their child is male or female. Important corroborative evidence has recently emerged in a follow-up study to the research we have described (Johnson 2003). Johnson recorded five more samples of CDS from mothers in the Tyneside area, but this time from mothers of male-female twins (their ages ranged from 2;5 to 3;9). She again analyzed (t), categorizing variants as [t] or glottal. In two of the three phonological contexts she analyzed (word-final prevocalic and prepausal), the CDS produced to sons contained significantly higher overall rates of glottals than CDS to daughters. Johnson's results are therefore very similar to the ESV findings reported earlier.

These gender-correlated differences in CDS are hard to reconcile with the hypothesis that CDS serves primarily to enhance language learning: why should boys and girls be treated differently? The differences are, however, precisely what variationist sociolinguistic theory would predict. It is well known from many sociolinguistic studies that females generally use fewer stigmatized or localized variants than males do (see e.g. the review of studies in Chambers 2003:116ff.). A possible interpretation of our data,

then, is that mothers are tuning their phonological performance in line with their child's developing gender identity. Mothers of boys use a high proportion of nonstandard or local variants in speech to their sons, since they expect their sons to grow up to use those variants. By contrast, mothers of girls may be more concerned to ensure that their daughters learn to use the positively evaluated variants in preference to the more localized ones. As a result, the girls' mothers may make more of an effort to use those positively evaluated forms when speaking to their daughters.

With the exception of Johnson's (2003) study, gender-correlated patterns of this kind have not been noted in other studies of the segmental features of CDS. However, there are also parallels in investigations of pragmatic and syntactic structures (outlined in §2), as well as many aspects of nonlinguistic behavior (e.g. Block 1983, Lytton & Romney 1991). Gleason et al. 1994, for example, found that speech to girls contained more diminutives than speech to boys, while Reese et al. 1996 and Ely et al. 1996 found differences in narrative structures according to the child's gender. Interpreting findings of this kind, Ely and colleagues (1996) suggest that parents' linguistic performance varies because parents make different assumptions about appropriate behavior for boys and girls. Girls, for instance, might be expected to be more sensitive and interested in other people, while boys are expected to be 'tougher'. As a consequence parents' behavior toward their children is tuned in line with these assumptions, and may thus in turn provide differential opportunities to boys and girls to learn socialized patterns of behavior. BEHAVIOR here may include linguistic behavior. CDS to boys, for example, might contain fewer diminutives, since use of such immature speech forms is less appropriate for boys who are assumed to be developing a 'tough' identity.

The findings of our analysis of (t) variants can be seen in a similar light. Speech from parents to boys differs from that to girls because parents have different expectations about appropriate speech patterns for boys and for girls, respectively. Girls are given more chances to learn phonological variants that are positively evaluated, because there is a heightened expectation that girls will—or should—grow up to use those variants.

Indeed, it could be argued that CDS may contribute to the creation of gender-based differentiation. The fact that gender-differentiation in our CDS data was more apparent for younger children would support such a claim. Recall that in medial position relatively high rates of [t] are used in speech to girls aged 2;0, after which point they begin to fall, becoming significantly lower at age 4;0. Usage of [t] to boys shows a similar trend but no significant changes across the age range. One reason for this pattern is that young children are less able to speak for themselves and to assert their own identity through linguistic choices. As a consequence, mothers of young children may be more sensitive to their infants' developing identity than are mothers of older children. They might therefore also be more inclined to provide linguistic cues by proxy, with a tendency to use variants which they perceive to be appropriate for the gender of their child.

Segmental choice in CDS must therefore be viewed with one eye on the social-indexical values of the alternatives. Note that explanations based on a continuum from standard to nonstandard (or canonical to noncanonical, or hyper to hypo) fail to offer an adequate account of the choices involved for Tyneside (t). In our study, parents do not choose standard or canonical forms to the exclusion of nonstandard or noncanonical ones; instead they use both standard and nonstandard variants to differing degrees according to their child's gender. Moreover, some nonstandard variants (e.g. [t̬]) remain

quite acceptable choices in CDS. Variant selection depends in part on the sociolinguistic evaluation of forms. Glottals, which are highly salient local features, may be considered stigmatized by some adults, and therefore avoided to some extent in their speech to children. But this is more likely to be the case for mothers of girls, because the social evaluation of glottals differs according to the gender of the speaker—it is more acceptable for males to use them than females.

A better framework for describing these choices is in terms of speakers' orientation towards LOCAL versus SUPRALOCAL forms. In a discussion of vowel variants used by Tyneside adults, Watt and Milroy (1999) suggest that the local/supralocal dichotomy offers a better generalization of differences in male/female behavior than reference to standard/nonstandard or prestige/stigma. Watt and Milroy argue that men tend to orient themselves towards those linguistic forms most closely indexical of the local community. Women, by contrast, are more prone to adopt and use supralocal forms, that is, variants with a wider geographical and/or social currency. In many circumstances the linguistic alternatives may indeed range on a standard/nonstandard continuum, but this is not necessarily the case. For example, standard versions of the vowel variables in Watt and Milroy's study are barely in evidence at all. Instead, men display greater use of the most localized forms, while women prefer variants that are used quite widely across neighboring dialects as well as in Tyneside itself.

Studies of CDS have tended to invoke notions of standardness to explain deviations from interadult speech (e.g. Brown 1977:8). Our (t) findings suggest that it may be more enlightening to take a closer look at the full range of choices available to adults and assess the sociolinguistic meanings of those choices within the community. The findings of Roberts (2002) support this conclusion (see §2.3). The use of both monophthongal and diphthongal forms of (ay) in Memphis CDS serves not only to reveal regular variability to children, but also to bias them toward the most positively evaluated variant. Monophthongal variants are characteristic and stigmatized markers of southern American dialects; mothers increase their use of standard diphthongs in their speech to children to encourage their use by the children themselves.

Whatever role CDS might play in facilitating the acquisition of phonological contrasts, it is clear that it also has a very important social value: the choices parents make serve to introduce children to socially structured linguistic alternatives. CDS presents children with the range of phonetic forms found in interadult speech. It furthermore offers the opportunity to learn the sociolinguistic values of those alternatives.

A further contribution to this cause may be the differential behavior of mothers and fathers in CDS. Recall from §5.2 and Fig. 1 that some evidence suggests that men make fewer diversions from their vernacular speech patterns when addressing children. Specifically, they use more glottals in word-medial position than do mothers. If the small amount of data we have from males is a fair representation of the broader picture, the input children receive from their fathers typically differs from that produced by their mothers. In analyzing different forms of input, children may thus come to associate [t] as a feature predominantly of female speech. Similar deductions should follow from analysis of other segmental variables when any sort of statistical imbalance is found across the input.

Note that similar findings have emerged in studies of linguistic structures at levels higher than phonology (e.g. Reese et al. 1996). In most cases men make fewer modifications to their speech when addressing children (Snow 1995:183). Gleason and Greif (1983:149) suggest that men's speech acts as an important model for children. Its closer

similarity to mature registers therefore acts as a 'bridge to the outside world', enabling children to break free of the constraints of baby talk and communicate appropriately with a wider range of people (Mannle & Tomasello 1987). Our findings for (t) do support the view that male CDS is less differentiated than female CDS. Interestingly, though, our data also highlight the fact that MOTHERS' speech serves to link children with the outside world. It does this by virtue of its heavy use of linguistic forms that have wide geographical and social currency. While fathers' speech may provide a model for developing mature registers, mothers' speech provides greater opportunities to learn variant forms in use in other dialects and in other styles that are important for the construction of a full sociolinguistic repertoire.

One obvious question remains about the value of CDS for language learning: do the children's speech patterns correspond in any way to the patterns evident in CDS? We do not have space here to offer a detailed analysis of the children's data, but our analysis has revealed evidence to show that mothers' patterns in CDS are reflected in their children's performance (see Docherty et al. 2005 for a full exposition). In word-medial context there was a weak correlation between mothers' and children's use of variants: the use of glottals, for example, just missed significance at the 5% level. However, a significant correlation was obtained for (t) variants in a third context, prepausal position (which includes turn-endings). Use of pre-aspirated stops again narrowly missed significance at the 5% level when all data were considered together, but reached significance when pairs with small Ns were excluded from the analysis. Use of glottals in prepausal context also showed a highly significant correlation between mothers and children ($p < 0.01$).

We found little evidence, however, of gender-differentiation in the children's productions. Boys and girls display similar patterns of variant usage for most of the variables analyzed so far. One possible exception occurs with pre-aspirated variants in prepausal position. Among adults, pre-aspiration is very strongly associated with women's speech. For our children, girls significantly outscore the boys on pre-aspiration at age 3;6, a trend that is maintained (but short of the 5% significance level) at age 4;0 (Docherty et al. 2005). These findings converge with those of other studies of gender-differentiated patterns in child language (see e.g. Menyuk 1963, Stoneman & Brody 1981, Roberts & Labov 1995). It seems that expression of gender identity through sociolinguistic variables typically begins to emerge at 3;0 at the earliest. Before that stage, variants characteristic of mothers' speech have the greatest chance of being acquired, all things being equal, by both girls and boys (Labov 1990).

CDS does clearly contribute to a child's learning of phonological variants. But if we refer back to the terms used by Garnica (1977), it is hard to characterize the learning value for the child of (t) variants in CDS as a strictly analytical or social function. Instead, we might propose that their main value is one of uniting the analytical with the social—providing opportunities to learn linguistic forms, their alternatives, and the social meanings of those alternatives.

8. CONCLUDING COMMENTS. We noted in §2 that relatively few studies of CDS have targeted segmental properties. Therefore rather little is known about segmental features in speech from adults to children, or the potential values of those features. As Cruttenden (1994) points out, there are few clear generalizations to be made when comparing previous studies. Their results are not always consistent with each other, and thus different interpretations have been drawn of both the motivations

of parents in making segmental modifications, and also the potential effects of these on the acquisition process.

The results of our (t) study certainly do not resolve such tensions. Our findings show that sociolinguistic values may need to be taken into account when assessing the motivation behind parental choices in CDS, and also in making claims about the value of CDS for the acquisition process. Our study, however, differs in significant ways from previous studies, and our results are in general consistent with them.

First, we have examined (t) precisely because we are aware of its sociolinguistic variability. We need not expect all segmental features to be subject to the same forces in CDS. Previous studies have generally targeted features that have no obvious sociolinguistic function for the speakers who were analyzed (Malsheen 1980, Bernstein Ratner 1984a, Kuhl et al. 1997). There is no reason, for example, to expect VOT values to differ significantly in speech to boys versus speech to girls.[9]

Second, there is variability in the age of the children involved in the various studies. It is quite possible that mothers of prelinguistic infants respond to universal instincts to 'clarify' salient phonological features for the sake of their children's comprehension, as Kuhl and colleagues (1997) claim. The sort of culture-specific behavior found in our study may begin only when children reach the stage of becoming active producers of speech. There is some evidence in support of this conclusion from the age-related differences in our data. In both contexts the difference in usage of [t] according to the gender of the child is most marked for the younger children, with variant usage to the older cohorts becoming more similar. This stage of the child's development has also been cited by Bellinger (1980), Malsheen (1980), and Bernstein Ratner (1984a,b, 1986) as an important one for influencing parental behavior in CDS. Parents' speech then gradually becomes more similar in character to that of interadult mode as the children get older. From our evidence it seems that CDS as a register cedes gradually to more mature styles after the age of 2;0.

Finally, it may simply be the case that generalizations about CDS are much harder to make with respect to phonological and phonetic features than syntax, vocabulary, or pragmatics. Phonological features are probably subject to a much wider set of sources for variability than features on other levels. Control of one feature in the interests of the child may have consequences for other features. Phonological features in particular may be affected by choices of syntactic, prosodic, or discourse structure, or by choices of other phonological features. The side effects may in fact complicate other tasks faced by the child in acquisition. For example, parents' use of relatively high fundamental frequency or a wide intonation range might elicit a child's attention, and thus serve to enhance the socializing role of CDS. But a side effect of wide intonation contours is to affect vowel qualities, since the changing intonation patterns result in rapidly changing spectral qualities within vowels (see comments by Davis and Lindblom (2001)). The task of learning vowel targets is presumably rendered more difficult as a result, since the child is not pre-

[9] It is certainly possible, however, that VOT might display structured variability in some communities. VOT clearly varies geographically, with /p t k/ typically having short VOT in some accents of the north of England and Scotland (Wells 1982:370, 409) but very long VOT in some Welsh accents (Wells 1982:388). Particularly conservative varieties of RP may also be characterized by short aspiration of voiceless stops (Wells 1982:282), suggesting that degree of aspiration may therefore provide sociolinguistic information.

sented with a stable acoustic target. Likewise, Bard and Anderson (1994) focused on repetitions in speech to children. Repeating utterances clearly serves to help the child understand the immediate content of those utterances by providing the child with more than one opportunity to analyze the relevant linguistic structures. However, the greater redundancy that repetition brings about permits phonetic liberties to be taken, which may therefore be regarded as detrimental to long-term phonological learning.

Further conflict may arise from different levels of interest in the analytic versus the social functions of CDS. In Shockey and Bond's (1980) experiment, for example, it seems that the social functions of CDS (specifically the desire to evoke intimacy) took precedence over the analytical. This may have encouraged various consonantal effects in the mothers' speech which have no parallel in a study such as that by Malsheen (1980), since duration of VOT is not thought to have social functions for the speakers of English involved in that study.

In light of such factors, generalizations about segmental variability in CDS are likely to remain elusive. Our ongoing research, however, seeks to elaborate various aspects of the evidence and interpretations that we have presented here. We are analyzing other phonological variables, including those vowels we know to be sociolinguistically patterned in the adult community. We are analyzing data drawn from adults in the longitudinal study to assess more accurately any changes in their CDS performance. We also hope to further investigate adult males' CDS patterns.

In spite of the difficulties in interpreting segmental patterns, our findings suggest that investigation of socially sensitive segmental features provides an interesting—and still relatively untapped—source for discussion of the nature and role of CDS in children's language development.

APPENDIX A: RAW DATA, VARIANT USAGE BY MOTHERS IN CDS, WORD-MEDIAL CONTEXT.

CHILD	SEX	AGE[a]	COHORT	[t]	GLOTTAL	OTHER	N
Sabrina	f	23.4	2;0	19	4	0	23
Eleanora	f	24.3	2;0	22	0	0	22
Josie	f	24.8	2;0	35	0	0	35
Louise	f	25.5	2;0	7	3	1	11
Amber	f	27.9	2;6	10	9	0	19
Lara	f	29.5	2;6	28	7	2	37
Sammy	f	29.5	2;6	4	0	0	4
Alison	f	31.0	2;6	12	14	1	27
Helen	f	36.5	3;0	8	4	0	12
Roberta	f	36.7	3;0	7	5	2	14
Roxanne	f	36.8	3;0	8	2	0	10
Lisa	f	38.1	3;0	20	4	0	24
Octavia	f	42.0	3;6	6	4	0	10
Emily	f	43.1	3;6	5	3	0	8
Leanne	f	43.1	3;6	0	3	0	3
Eva	f	47.6	4;0	0	3	0	3
Alice	f	47.8	4;0	8	0	0	8
Hayley	f	47.8	4;0	3	10	2	15
Tina	f	48.6	4;0	1	6	1	8
Ethan	m	23.4	2;0	2	0	0	2
Danny	m	24.6	2;0	20	5	0	25
Josh	m	25.0	2;0	22	15	0	37
Arran	m	27.3	2;0	3	10	2	15
Tristan	m	29.8	2;6	3	14	2	19

[a] Age given in months, expressed as decimal fractions.

CHILD	SEX	AGE[a]	COHORT	[t]	GLOTTAL	OTHER	N
Guy	m	30.3	2;6	5	9	0	14
Orlando	m	30.6	2;6	10	0	3	13
Warren	m	31.6	2;6	1	0	1	2
Oscar	m	36.1	3;0	1	8	0	9
Kyle	m	36.2	3;0	2	0	2	4
Rowan	m	36.4	3;0	19	0	0	19
Leonardo	m	36.5	3;0	10	6	2	18
Laurence	m	40.9	3;6	0	5	0	5
Lowell	m	41.6	3;6	5	3	0	8
Andrew	m	41.9	3;6	2	6	1	9
Simon	m	43.2	3;6	0	8	1	9
Zebedee	m	46.2	4;0	5	4	4	13
Gareth	m	47.9	4;0	10	13	0	23
Justin	m	48.7	4;0	10	18	1	29
Carl	m	48.8	4;0	4	0	0	4

APPENDIX B: RAW DATA, VARIANT USAGE BY MOTHERS IN CDS, WORD-FINAL INTERSONORANT CONTEXT.

CHILD	SEX	AGE[a]	COHORT	[t]	[ɹ]	GLOTTAL	VOICED	OTHER	N
Sabrina	f	23.4	2;0	20	1	17	8	0	46
Eleanora	f	24.3	2;0	13	0	6	13	1	33
Josie	f	24.8	2;0	61	0	11	35	5	112
Louise	f	25.5	2;0	1	0	4	33	0	38
Amber	f	27.9	2;6	10	1	16	17	1	45
Lara	f	29.5	2;6	4	0	7	24	0	35
Sammy	f	29.5	2;6	4	0	4	13	0	21
Alison	f	31.0	2;6	5	9	3	43	3	63
Helen	f	36.5	3;0	3	3	1	19	0	26
Roberta	f	36.7	3;0	1	1	3	37	0	42
Roxanne	f	36.8	3;0	2	0	1	7	0	10
Lisa	f	38.1	3;0	7	0	5	18	0	30
Octavia	f	42.0	3;6	3	0	4	6	0	13
Emily	f	43.1	3;6	3	1	2	20	2	28
Leanne	f	43.1	3;6	0	0	1	0	0	1
Eva	f	47.6	4;0	2	0	1	6	0	9
Alice	f	47.8	4;0	3	0	2	1	0	6
Hayley	f	47.8	4;0	2	0	5	12	1	20
Tina	f	48.6	4;0	0	0	2	21	3	26
Ethan	m	23.4	2;0	2	0	1	9	0	12
Danny	m	24.6	2;0	6	0	2	16	0	24
Josh	m	25.0	2;0	4	4	5	38	1	52
Arran	m	27.3	2;0	2	0	6	27	0	35
Tristan	m	29.8	2;6	6	1	2	20	0	29
Guy	m	30.3	2;6	2	0	3	21	3	29
Orlando	m	30.6	2;6	8	0	1	29	0	38
Warren	m	31.6	2;6	0	0	0	3	0	3
Oscar	m	36.1	3;0	1	1	11	14	1	28
Kyle	m	36.2	3;0	6	3	0	3	0	12
Rowan	m	36.4	3;0	13	1	15	19	2	50
Leonardo	m	36.5	3;0	2	0	4	26	1	33
Laurence	m	40.9	3;6	1	0	9	6	1	17
Lowell	m	41.6	3;6	0	0	14	8	0	22
Andrew	m	41.9	3;6	1	3	2	12	0	18
Simon	m	43.2	3;6	0	1	7	1	5	14
Zebedee	m	46.2	4;0	5	5	15	17	6	48
Gareth	m	47.9	4;0	3	10	2	8	4	27
Justin	m	48.7	4;0	2	3	7	11	3	26
Carl	m	48.8	4;0	1	0	1	5	0	7

[a] Age given in months, expressed in decimal fractions.

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[Received 13 January 2003;
revision invited 6 August 2003;
revision received 4 January 2004;
accepted 27 June 2004]