This does not mean, however, that the members of the word list were selected at random. Two (related) aspects of our methodology demand that only certain kinds of words may be compared in the first instance:

1. The comparison mechanism requires that all of the words compared are cognates in all of the varieties analyzed.
2. As it is our intention to develop a method that is applicable beyond varieties of English—so that, for example, (varieties of) English can be compared to (varieties of) German—these cognates must be shared by English and its Germanic relatives (see McMahon & McMahon, 2005, and McMahon et al., 2007, for further details).

Therefore, it follows that all words in our cognate list stem from the inherited Germanic lexicon; indeed their original Proto-Germanic forms stand as a "model form" through which we can match up their modern phonetic reflexes precisely, to ensure that we are comparing "like with like" between all the present-day varieties (see McMahon et al., 2007:120).

Because our method depends crucially on the comparison of cognates across a wide range of Germanic varieties (including regional dialects of many languages), this considerably restricts the number of possible cognates, because not all are attested in every variety. Additionally, because we seek to measure the phonetic similarity of these cognates in different Germanic varieties, we have sought to avoid cases where differences have arisen as a result of morphophonemic or morphological differences, in Proto-Germanic or subsequently. Thus a word such as *water* is excluded because the Scandinavian languages reflect the Proto-Germanic stem **watnan* whereas the West Germanic languages reflect the Proto-Germanic stem **watar* (Orel, 2003:451). The result is a reduced population of cognates that may be sampled for our word list. The full word list is reproduced in Table 1.

This desire for the widest possible applicability of the method across Germanic cognates was an important determiner of the choice of words for our word list, and one that acted without reference or bias toward features traditionally favored for

TABLE 1. *The word list*

all	cow	fight	hear	ice	mother	oak	salt	swear	two
ash	daughter	fish	heart	in	mouse	one	see	tear	warm
bath	day	five	holy	is	mouth	open	seven	ten	wash
better	drink	foot	home	knee	nail	out	sharp	thing	what
bite	ear	four	honey	lamb	naked	oven	sit	thorn	white
blood	earth	full	horn	leaf	name	over	six	three	wind
bone	eat	good	hound	liver	needle	quick	snow	thunder	wool
brother	eight	goose	house	long	new	rain	sore	toe	word
calf	eye	green	hundred	mid	night	red	stone	tongue	yard
cold	fast	hand	hunger	milk	nine	right	stool	tooth	year
corn	father	head	I	moon	north	ring	storm	top	young

categorizing varieties of English (and other Germanic languages), so that preselection of features was not an issue. Within the constraint of needing to compare cognates, we adjusted the particular selection in order to try to bring the frequency of particular phonological features in our word list close to being representative of the English lexicon. This was done by comparing the frequency of selected phonological features (in particular initial consonants and stressed vowel phonemes) in our word list with a standard word list—the Thorndike and Lorge (1944) list of the 1,000 most frequent words in a range of English texts from both sides of the Atlantic. This word list was chosen for comparison because it is entirely independent from our own and contains a wide selection of fairly basic (often Germanic) vocabulary. The frequency of particular features in our word list and in the Thorndike and Lorge word list are compared in Table 2 and Figure 2.

The comparison of the percentages of each of Wells' lexical sets (Wells, 1982) reveals that the two word lists match well.[3] The discrepancies that do exist may well be attributable largely to the etymological restrictions placed on our word list (entirely Germanic in origin, with no French loans). Similarly, Figure 2 reveals that the frequency of initial consonant phonemes in the two word lists is roughly comparable, with some obvious differences (e.g., /p/ and /h/) being the result of our word list containing only words of Germanic origin.

Thus despite their different origins and intentions, these two word lists are very similar in terms of the frequency of stressed vowel and initial consonant phonemes, which suggests that our word list is a reasonable representation of the sound patterns of English. Furthermore, the *quid pro quo* for any minor discrepancies is the major boon of being able to extend our comparisons across all Germanic languages and dialects (see Heggarty, McMahon, & Maguire, forthcoming).

TABLE 2. *The percentage of Wells' lexical sets in the two word lists*

LexSet	SC	TL	LexSet	SC	TL
CHOICE	.0	.9	FOOT	3.6	1.7
CURE	.0	.5	NEAR	3.6	1.0
commA	.0	.0	DRESS	4.5	12.0
PALM	.9	.2	FACE	5.4	8.3
SQUARE	.9	1.7	GOOSE	5.4	4.0
LOT	1.8	3.6	MOUTH	5.4	3.8
CLOTH	1.8	2.1	NORTH	5.4	2.2
NURSE	1.8	2.8	FLEECE	6.4	8.0
FORCE	1.8	1.6	lettER	8.1	6.9
happY	1.8	3.8	GOAT	9.1	6.8
TRAP	2.7	6.1	PRICE	9.1	8.1
BATH	2.7	2.2	STRUT	10.0	6.9
THOUGHT	2.7	2.3	KIT	11.8	10.8
START	2.7	2.4	Rhoticity	24.3	19.1

SC = Sound Comparisons; TL = Thorndike and Lorge.

TABLE 3. *Speakers and subvarieties per location*

Variety	Typical	Traditional	Emergent
Belfast	2		
Berwick	4	2	2
Black Country	1		
Bristol	7		
Buckie		1	
Buxton	3		1
Coldstream	5	3	
Cornhill	6	2	
Dublin	transcript	transcript	transcript
Edinburgh	5	2	1
Fermanagh		1	
Glasgow	1 + transcript	transcript	transcript
Hawick	3	3	
Holy Island		1	
Lewis	1		
Liverpool	2 + transcript	transcript	
London	transcript	transcript	transcript
Longtown	1		
Manchester	1		
Middlesbrough	1		1
Morley	1		
Morpeth	1	1	
North Antrim	1	1	
North Devon	10	2	4
Norwich/Norfolk	transcript	transcript	transcript
Renfrewshire	1	1	
Rhymney	10	2	
Rossendale	1		
RP	1		
Sheffield	transcript	transcript	2
Shetland		transcript	
Somerset			1
SSE	3		
Stoke	1		
Tyneside	5	3	4
Tyrone	6	1	

"Transcript" refers to phonetic transcriptions provided by experts in the dialects concerned; see text for details.

within them to be revealed. In *Similarity of varieties to RP*, we analyze one dimension of the data—the similarity of the Typical, Traditional, and Emergent varieties to RP. In *Investigating multidimensional relationships*, we analyze the multidimensional relationships that hold between the varieties more fully. As was discussed in McMahon et al. (2007:130–133 in particular), one method of representing the complexities in such matrices in a visually interpretable way without oversimplifying the data is to use network-type phylogenetic analysis programs, which draw trees where the relationships in the data are treelike, but draw networks when the relationships between varieties are more complex. In particular, the NeighborNet algorithm, part of the phylogenetic software suite

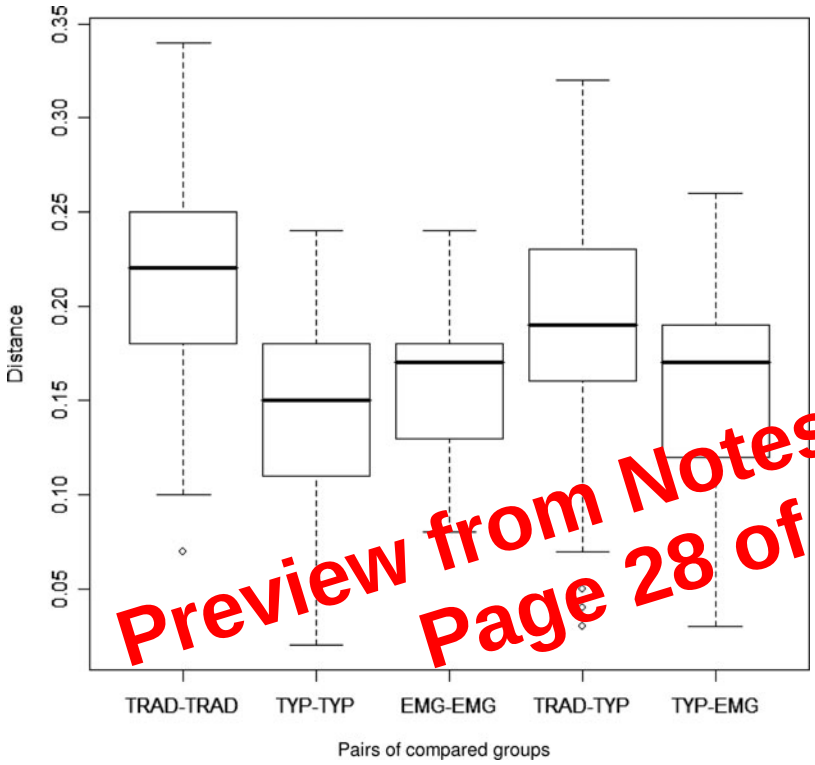

FIGURE 8. Distances between all pairs of varieties from each group (the LAX case). TRAD = Traditional; TYP = Typical; EMG = Emergent.

only in the STRICT but not in the LAX condition). The significance level used is .05, all *p* values are corrected using Holm's (1979) procedure, and the number of random permutations were generated was 10,000.

TABLE 6. *Significant corrected comparisons between pairs of varieties*

	TRAD-TRAD	TRAD-TYP	TRAD-EMG	TYP-TYP	TYP-EMG	EMG-EMG
TRAD-TRAD	–					
TRAD-TYP		–				
TRAD-EMG			–			
TYP-TYP				–		
TYP-EMG					–	
EMG-EMG						–

TRAD = Traditional; TYP = Typical; EMG = Emergent

comment by Kerswill (2003:239) that few researchers have been able to demonstrate divergence in dialects of English in the British Isles. Although the Emergent subvarieties are very slightly less similar to each other than the Typical subvarieties, this difference is not significant, and it is likely that it has other causes. It is possible, for example, that it is a consequence of the analysis containing fewer Emergent subvarieties from a wide range of geographical locations and more Typical subvarieties from a denser geographical network; or it might be that our younger speakers were less likely to suppress the vernacular when reading, in a similar fashion to the younger speakers analyzed in Stuart-Smith et al. (2007).

The transition from Traditional to Typical

Our data reveal that the Traditional subvarieties are significantly more heterogeneous than the Typical and Emergent subvarieties, and that the Traditionals are much further from RP than the other subvarieties. An apparent-time interpretation of this situation suggests that there has been a marked convergence of varieties of English at some point in the past in the transition from traditional English and Scots dialects to modern accents of English. This accords with the analysis of English dialects in Trudgill (1990). Two processes that might explain this change were identified earlier: geographical (innovation) diffusion and leveling. Leveling in particular seems likely to lead to convergence between varieties because it involves the reduction in precisely those features that make them most distinctive. Furthermore, as Trudgill (1999) pointed out, exogenous changes can have different sources, such that some changes have the effect of making varieties more similar to the "national mainstream" (including RP), whereas others bring varieties into line with other regional accents. However, the results of these two processes can look rather similar (and this is perhaps why Trudgill does not use the term "standardization"). This is particularly so with leveling changes, which eradicate highly localized variants (by their nature nonstandard), leaving features that are shared by a range of varieties (which may ultimately be of standard origin). So, for example, the word *old* may be pronounced as [ɑɬ] and [oɬd] in northeast Scotland, as [a:d] and [old] in Tyneside English, and as [ʊ̟ul] and [old] in Tyrone English. Clearly [ɑɬ], [a:d], and [ʊ̟ul] are highly localized and hence may be subject to leveling, leaving [oɬd], [old], and [old], which, not coincidentally, are nearer to RP English [əʊld] phonetically and phonologically. Even if the leveling change happens without any (further) input directly from the standard variety itself, the result may look like standardization because divergent regional varieties are already likely to share forms that have their origin in more standard patterns of speech. This may well explain why our Traditional subvarieties are further from RP than the Typicals and Emergents, and this difference need not indicate that speakers have moved toward RP English directly.

Despite this complication, it is clear that here we are dealing with a process like that described by Kerswill and Williams (1999). The differences between varieties

desirable that this analysis should be broadened to include strictly comparable samples of speakers at each location, something which we have begun to do at two urban locations, Newcastle and Edinburgh. Nevertheless, quantitative methods of this sort have much to tell us about language variation and change, and it is only through holistic quantification between varieties in both social and geographical space that we can hope to determine whether varieties are converging, diverging, or coexisting in a state of dynamic equilibrium.

NOTES

1. For more information, see Heggarty et al. (2005), McMahon and McMahon (2005), McMahon et al. (2007), Nerbonne et al. (1999), and Nerbonne and Heeringa (2001). Information is also available at www.languagesandpeoples.com/MethodsPhonetics.htm.

2. But not for traditional dialects, thanks to surveys such as the *SED*. We have not (at the time) made use of these data, however, because they do not include modern accents of English, and pose problems of strict compatibility in terms of transcription practices.

3. Note that the figure for Rhocitiy is the percentage of words that belong to NURSE, NEAR, SQUARE, START, NORTH, FORCE, CURE, and letter.

4. Thanks to Eivind Torgersen, Peter Trudgill, Mark Jones, Patrick Honeybone, and Kevin Watson, Jane Stuart-Smith, Robert McColl Millar, and Raymond Hickey, respectively. Peter Trudgill provided Typical and Emergent variant options for Norwich and a Traditional transcription for rural Norfolk. See *Incorporating social variation – the sub-varieties* for an explanation of these terms.

5. The first author also standardized the transcriptions received from other contributors in accord with his own transcription practices.

6. http://soundcomparisons.com/.

7. Note that for many such speakers, these sorts of pronunciations go well beyond a few lexicalized survivals, perhaps used to signal local identity, in the way many residents of Newcastle Upon Tyne might refer to *Newcastle* or *Newcastle United*, as the [tʰuːn] (*Toon/Town*), but never refer to other towns in this way (see Beal, 2000:349).

8. It follows that the fieldworker must be aware, in advance, of the kinds of traditional pronunciations to be expected in each area.

9. Note the speaker's use of [tʰäːk] when referring to his "mates", as opposed to [tʰɔːk] in reference to the interviewer (the lead author). The lead author can confirm that this speaker did quite a bit of [tʰäːk͡ʔn] to him too, however!

10. A randomization independent samples *t* test of TRAD-RP versus TYP + EMG-RP finds that the difference is very highly significant ($p = .00019$), with TRAD-RP (mean .171) > TYP + EMG-RP (mean .114). For details of this procedure, see *Investigating multidimensional relationships*.

11. First, for the original data (e.g., the allocation of speech varieties to Traditional and Typical categories) an appropriate statistic (or summary value) is computed and stored. As an example, for a one-way randomization ANOVA, such a statistic is $\Sigma_i(T_i^2/n_i)$, where T_i is the total and n_i is the number of observations in group i (Edington, 1987:71–74). Afterward, the algorithm randomly permutes the elements of the groups (e.g., randomly allocating varieties to the Traditional or Typical categories) and recomputes the value of the statistic for this new configuration. Finally, after a large number (in our case, 10,000) of such randomized values have been computed, the "original" value is compared to their distribution and, if an extreme (very low or high), then the original structure of the data was probably not due to random sampling (for details see Edington, 1987). Moreover, the *p* value associated with rejecting the null hypothesis is simply the proportion of permuted values more extreme than the original value and can be judged in relation to the standard alpha levels .05 or .01.

12. The box plots in Figures 7 and 8 represent the distribution of distances between pairs of varieties, one belonging to the first type and the second to the other type (e.g., the fourth box plot shows the distribution of distances between all possible pairs composed of one Traditional variety and one Typical variety).

13. Given that conducting many statistical tests of the same type inflates the chance of obtaining a significant result simply by chance, we corrected our *p* values for multiple testing using Holm's (1979) method.