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Analysis of Census migration data to assist in defining Housing Market Areas for Tyne & Wear

Final Report

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Summary

The research described in this report aims to provide inputs to policy-relevant definitions of Housing Market Areas (HMAs) in Tyne & Wear and adjacent parts of the North East region. These inputs are based on analyses of Population Census data on migration. The research makes no claims to provide definitive HMA boundaries and, for technical reasons, should be seen as somewhat exploratory. Most importantly of all, key policy considerations will need to determine how far these analyses drive the process leading to a set of fit-for-purpose HMA definitions.

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1 HMA boundary definition

Every set of boundaries needs to be defined so as to be as suited as possible to the purpose for which the boundaries will be put. In this case, Housing Market Areas (HMAs) are needed to provide the spatial framework for policy analysis for the Tyne and Wear Interim Housing Strategy which is an initial stage of a Tyne and Wear Housing Market Assessment in line with the guidance from ODPM (the Office of the Deputy Prime Minister). The HMAs will cover the area of the Bridging NewcastleGateshead housing market renewal Pathfinder initiative. The requirement for a Housing Market Assessment initiative stemmed from central rather than local government, with a clear presumption that local authority boundaries could not simply be adopted as plausible approximations to HMAs. The guidance produced for ODPM by DTZ Pieda (2004) pointed to the need for analyses of migration patterns to identify HMAs but, in more specific terms, there is little guidance on how these analyses should be carried out, apart from a cross-reference to Travel-to-Work Areas (TTWAs) which are the government's local labour market area definitions. As a result, this research has been based on the analysis of migration data using the method for defining TTWAs (ONS and Coombes 1998).

The guidance from ODPM that the method of defining TTWAs offers the appropriate starting-point for HMA definitions raises three questions.

1. Why is this method suggested?
2. How transferable is the method to the HMA definition task?
3. Can 'customising' the method lead to more suitable HMA definitions?

The next section of this report addresses the second question, and the following section tackles the third. The remainder of this section provides a brief answer to the first of these three questions.

It is likely that the TTWA definitions were highlighted by the ODPM guidance because

- * the method for defining TTWAs have been widely adopted in many other countries and so is a virtual 'international standard' solution to the challenge of identifying coherent local boundaries from a vast array of raw data, whereas
- * there has been very little research on local HMA boundaries, not only in this country but also abroad.

Jones (2002) provides one of the few illustrations of analytical HMA definitions and, in fact, explicitly acknowledges that this method was derived from the TTWA method. Derek Halden (2002) offers an alternative approach to analysing the same dataset (viz the Sasines records which, it should be noted, only record owner-occupiers' house moves). This latter analysis was part of a City Region study, and its focus on the Scottish cities' catchment areas allowed a simple form of definition which begins with each city's pre-defined local authority area and then identifies other areas with substantial migrant linkages with that city. There is no consideration of the possibility that an area may have a substantial linkage to one of the cities and yet still be more closely integrated within a sub-regional HMA which is distinct from *all* the main cities.

The simplistic structure and underlying assumptions of centre-and-hinterland analysis have been seen to be inappropriate for labour market definitions across Britain since the 1970s. It is also inappropriate for this HMA research, because the North East does not share the Scottish pattern of widely spaced cities which can be assumed to overwhelmingly dominate the sub-regions surrounding them. This key point can be illustrated by the case of Sunderland: the research needs to analyse migration patterns to assess empirically how separate the city is from Tyneside and *not* start from an assumption as to whether or not there is a separate non-Tyneside HMA of which it is the centre.

There is one other example of HMA definitions, based on migration data analysis, which is relevant here. Coombes (2000) investigated the patterns of flows which shape much of modern life, applying a slightly-adapted form of the TTWA analysis to several different datasets including 1991 Census migration flows. These analyses were only an interim stage in that research

and so were not reported in detail but the results led to some pertinent observations.

- * The method worked reasonably, but further refinements were possible.
- * Migration flows do cluster locally, as the term HMA suggests.
- * This clustering is less localised in more rural areas.
- * Where there are many local authority tenants, the local authority boundaries often shape HMA boundaries (due partly to difficulties tenants can encounter when trying to move to a tenancy with a different local authority, but also partly due to a reluctance of tenants to move longer distances which was shown recently in Newcastle where most moving tenants move less than a mile).

In summary, the limited evidence available from earlier research on HMA definitions in Britain tends to support the ODPM guidance that TTWA definitions offer a feasible starting-point for HMA-related analyses of migration flows.

2 Initial HMA analysis

This section of the report reports on applications of the TTWA method of analysis to census migration data, using the initial results to evaluate the transferability of the method to the task of HMA definitions. Before doing so, it is important to recognise the principal characteristics of the TTWA method. As with any method of boundary definition, its key characteristics reflect the way it was developed to meet a primary objective; it is being “fit for purpose” in one context which may limit its transferability to area definition for a different purpose.

Perhaps most importantly, the key objective set for the TTWA method is to define the *maximum number* of separable areas which all meet the statistical requirements set for TTWAs. As noted earlier, there is no preliminary identifications of centres for which the hinterlands are sought: the method allows single-centred areas to emerge where they are predominant among the pattern of flows *but* poly-nuclear and other forms of local geography are also recognisable among the results. This flexibility of structure helps the maximum number of separable areas to be identified, and also reveals the diversity of local labour markets in Britain, conurbations, remote uplands, coalfields and motorway corridors.

The definition of TTWAs requires that all the final boundaries include a minimum population but, away from the most remote areas, this is not a very influential constraint. Far and away the most important statistical requirement is that every TTWA should meet a minimum level of *self containment* with respect to community flows. There are two elements to this requirement.

Supply-side = % of all an area’s working residents who work in the area

Demand-side = % of all workers at an area’s *workplaces* who live in the area

TTWAs must meet the required level of self containment on *both* the supply and demand-side measures. Table 1 summarises this, and other, key features

of TTWA and outlines possible implications for the strategy of transferring this method of definition HMAs.

Table 1

Key features of TTWA definitions	Issues of transferability to HMAs
<p>Identifying localised clusters of commuting produces boundaries enclosing areas which tend to be internally integrated and externally self-contained</p>	<p>These characteristics appear to be just as much defining features of HMAs as they are of local labour market areas</p>
<p>Commuting flows reflect the successful matching of labour supply and demand but omit evidence of market failure (vacancies and unemployment or under-employment and wasted aspiration)</p>	<p>There will be a parallel, but perhaps less significant, omission of evidence on homelessness and empty housing, and certainly also no consistent data on alternative housing preferences</p>
<p>The aggregate picture is the most important single set of boundaries, but sub-groups do behave differently</p>	<p>There is a similar need to both recognise the overall picture and bear in mind the variation between different sectors (eg renters in social housing vs. owner-occupiers)</p>
<p>All parts of the country have to be in one, and only one TTWA</p>	<p>Not tolerating over-lapping <i>may</i> be equally relevant here, for the same reason of policy applicability</p>
<p>The key self-containment level chosen for TTWAs is somewhat arbitrary</p>	<p>There is no definite guideline for the level of self-containment which will be needed to define HMAs, although the value of 70% has been suggested</p>

Table 1 acts as a reminder of important features which must be borne in mind when evaluating HMA definitions based on the analysis of a dataset which, for example, cannot reflect people's unfulfilled preferences (on which no consistent data is available). That said, a fairly positive assessment of the TTWA method's potential transferability emerges. The acknowledged robustness of the TTWA method of defying local labour market area policy applicability by applying a basic logic to define localised market areas, and this seems to be potentially relevant in relation to housing too. Annex 1 lists some more technical features of the method of the TTWA definitions which can be important in understanding the detail of the results, but these will not be detailed here.

Producing a set of boundary definition shifts the focus to the dataset which is analysed. In practice, the TTWA method was developed to be applicable to the census commuting data; thus part of the question of transferability to the definition of HMAs turns on how comparable to the commuting data is the migration dataset for the Table 1 noted that each commuting flow represents a successful match of supply and demand in the labour market (although there is only one commuting flow for people with more than one job). The equivalent housing related dataset would have one record for each household: each of these would represent the matching of one or more people, because the unit of housing demand and supply is one dwelling.

In practice, the 2001 Census migration data on households-termed moving groups has been delayed due to unforeseen complexities in the data compilation procedure. This means that all the analyses here have to use individual level data in which a family of four in a single dwelling has the same weight in the analyses as four separate single-person households. This flaw can only be addressed when the moving group data is available (which may be the New Year). There is an important footnote here: the classification by key housing sectors, most notably by tenure, is applied to Census data on moving groups and not individuals so there is not yet the option of breaking down the analyses to focus only on owner-occupiers or other distinct housing sectors.

There is a far from obvious, but nonetheless crucial, difference between the commuting and migration datasets. Whereas the commuting information is a snapshot of everyone working on Census day, the migration dataset includes only people who are at a different address from where they lived 12 months previously. An equivalent commuting dataset would only include people who had changed jobs in the last year. It seems clear that analysing such a 'job changer' dataset would give a different view of the labour market to that which the full dataset provides, because the sub-group who have changed will be far from a random sample of the full labour market (e.g. including a much higher proportion of young people). By the same token, the migration dataset represents a distinctly non-random sample of people in the housing market and, in the same way, it very much under-represents older people and other groups who tend not to move. In short, the migration dataset overlooks the stable parts of the housing market where the match between demand and supply is most successful. This leads to the suggestion that an alternative dataset for HMA analysis be created by adding all non-movers to the migration data. The following section of this report includes some experiments with a (non-)mover dataset.

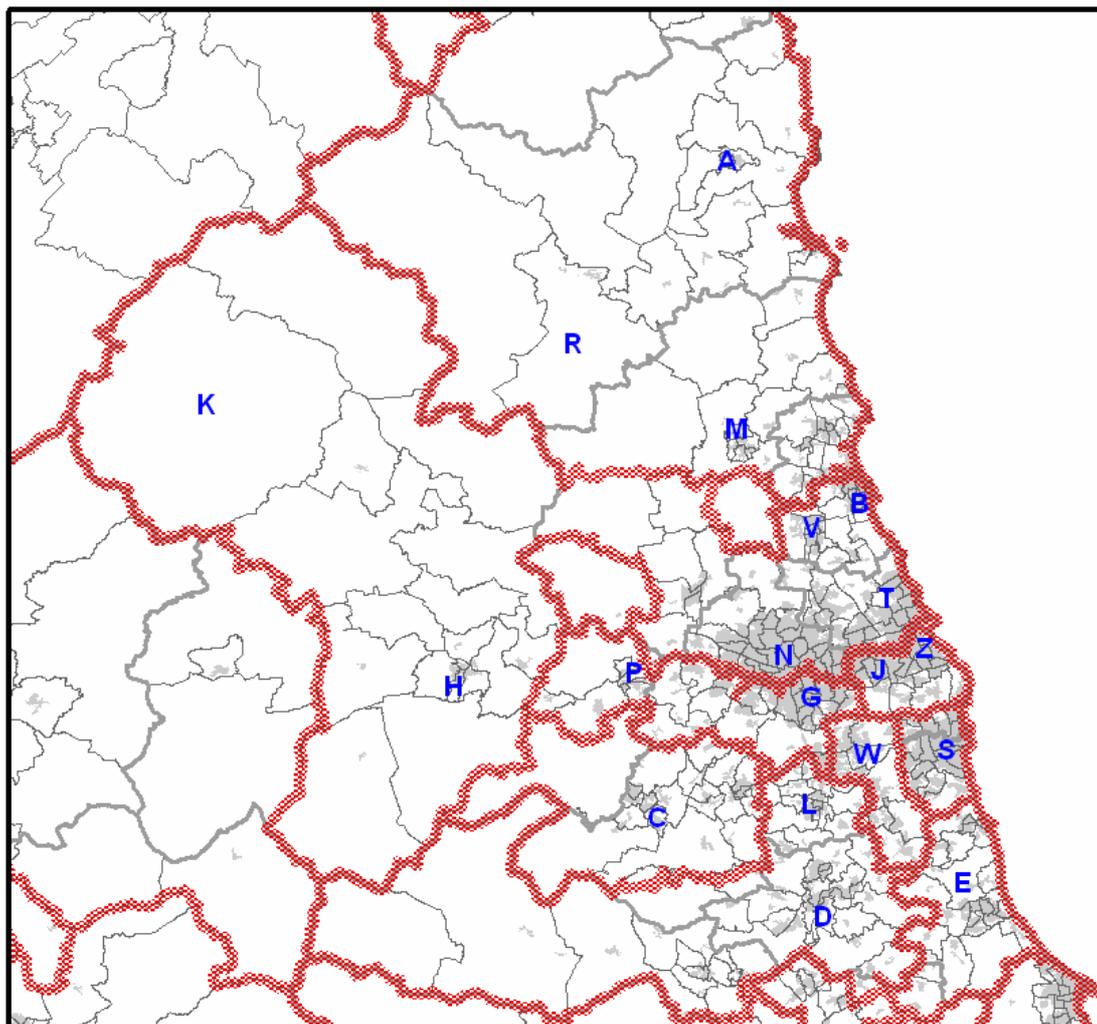
The question of the direct transferability of the TTWA method to the analysis of the basic Census migration data was at least partially answered by the research of 1991 migration flows in Coombes (2000). Map 1 shows the results in the NE region (nb. Annex 2 has the key to places identified). To summarise:

- Newcastle and N. Tyneside were part of an integrated HMA also including much of Tynedale,
- Gateshead's HMA extended to include the Prudhoe area,
- S. Tyneside had one HMA exactly matching its LA boundary,
- Sunderland LA was split into two HMAs, with the coalfield towns joining Washington rather than the main urban area, and
- Stannington (north of Newcastle) is an example of a small area which was a non-contiguous outlier of a larger HMA (in this case Gateshead).

Map 1 1991 HMAs defined by Coombes (2000)

Legend

-  Local Authorities
-  Wards (at end of 2002)
-  Built-up areas
-  1991 HMAs: 50% migrant self-containment



Map 2 raises the self-containment criterion from the 50% value used in Coombes (2000) to the 70% which is the TTWA's value and, presumably for that reason, is the value cited in the guidance of ODPM (2004). The results show that the HMA boundaries are not hugely sensitive to this substantial change in the self-containment criterion. In the Tyne & Wear area, the S Tyneside and Gateshead based HMAs remain unchanged. The large HMA north of the Tyne extends here to include the previously separate Morpeth-centred area and, more surprisingly, into Scotland too. The major change is the grouping into a single HMA of Sunderland with the Washington and Easington areas.

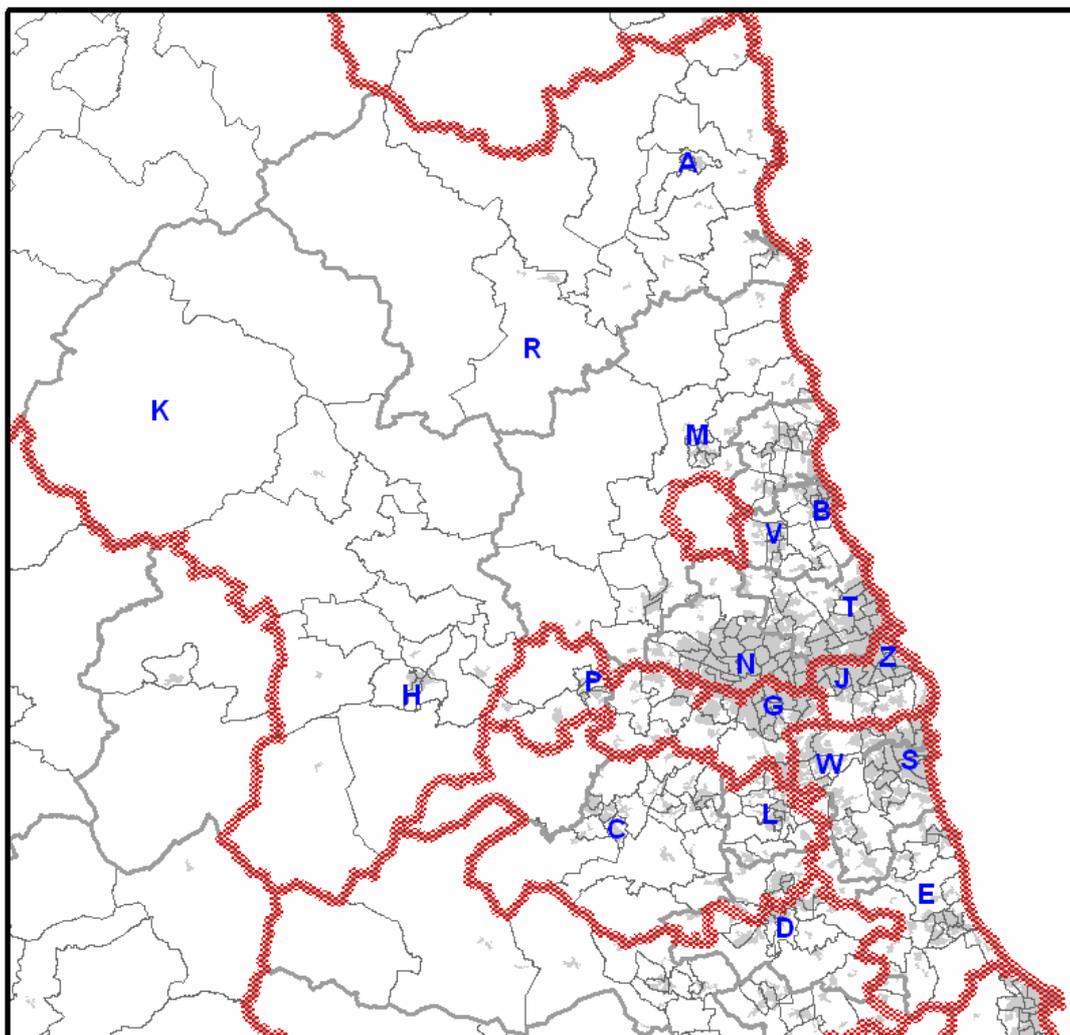
The ultimate test of the transferability to HMA definitions of the TTWA method is to apply it to the 2001 migration dataset. Map 3 shows the principal flows in that dataset, identifying those of 20 or more people from a single ward to one other ward. It is not a surprise that such very substantial flows between two wards are nearly always between two wards which are very near to each other; there is also a 'bias' here towards the metropolitan LAs wards because their substantially higher average populations makes their flows more likely to exceed the simple threshold to be included here. It seems clear that the dataset does offer suitable 'raw material' for the TTWA method's aim of identifying localised clusters of flows which provide the basis for boundaries enclosing in internally integrated areas.

Map 4 shows the final results of the direct transferability of the TTWA method, with its 70% self-containment criterion to the basic 2001 migration dataset. Although it has been argued here that applying the method to define HMAs is inherently plausible, and that the dataset does include a strong pattern of locally clustered flows, the results include one HMA which extends from Tynemouth not only towards Berwick but also far into Cumbria! At the same time there remain the separate HMAs centred on Gateshead and S Tyneside – with the latter still matching its LA boundary exactly – whilst the HMA covering Sunderland extends across Chester-le-Street to include Stanley (no doubt due mainly to links with the Washington area). These results can be seen as an extension to patterns which have been highlighted

Map 2 1991 HMAs defined as TTWAs

Legend

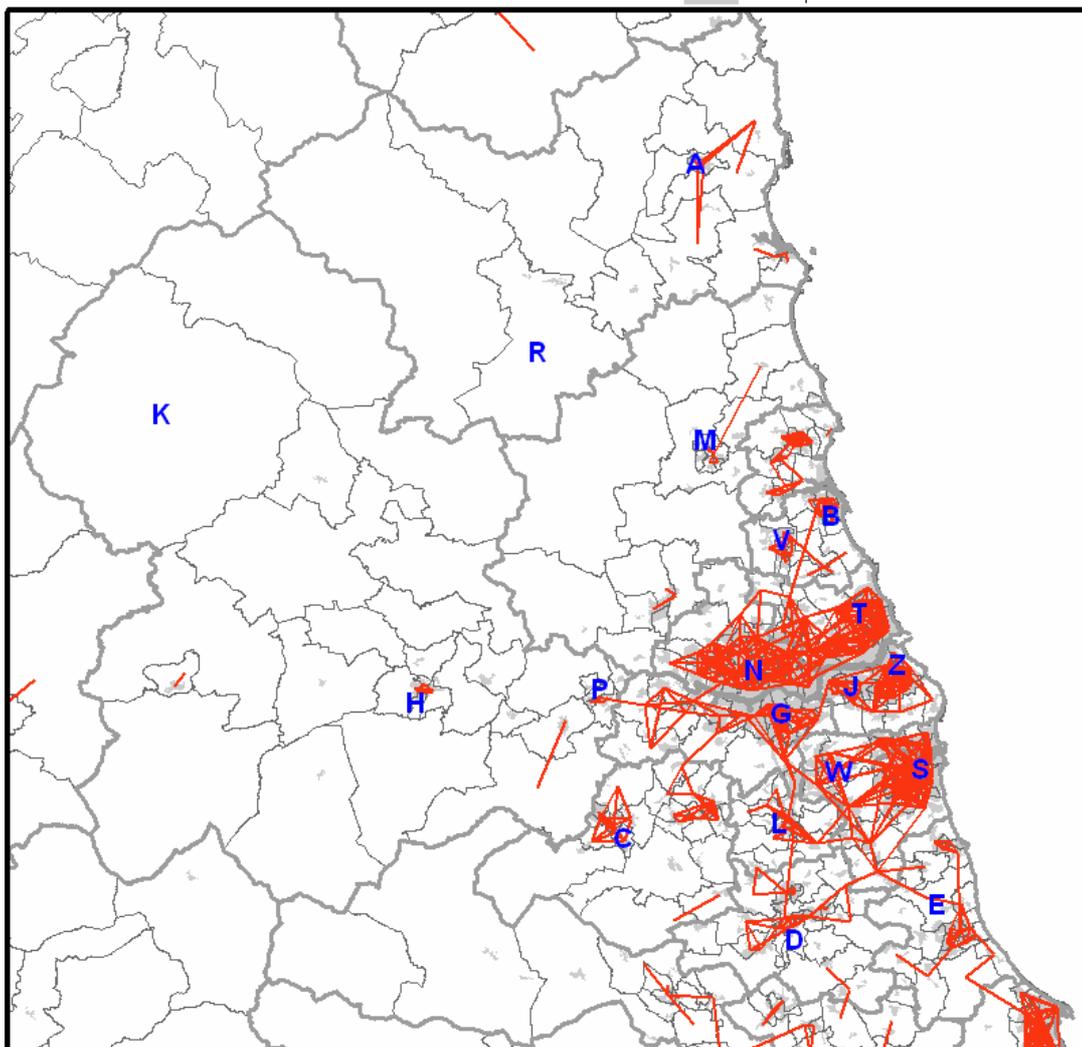
-  Local Authorities
-  Wards (at end of 2002)
-  Built-up areas
-  1991 HMAs: 70% migrant self-contained



Map 3 2001 Migrant flows

Legend

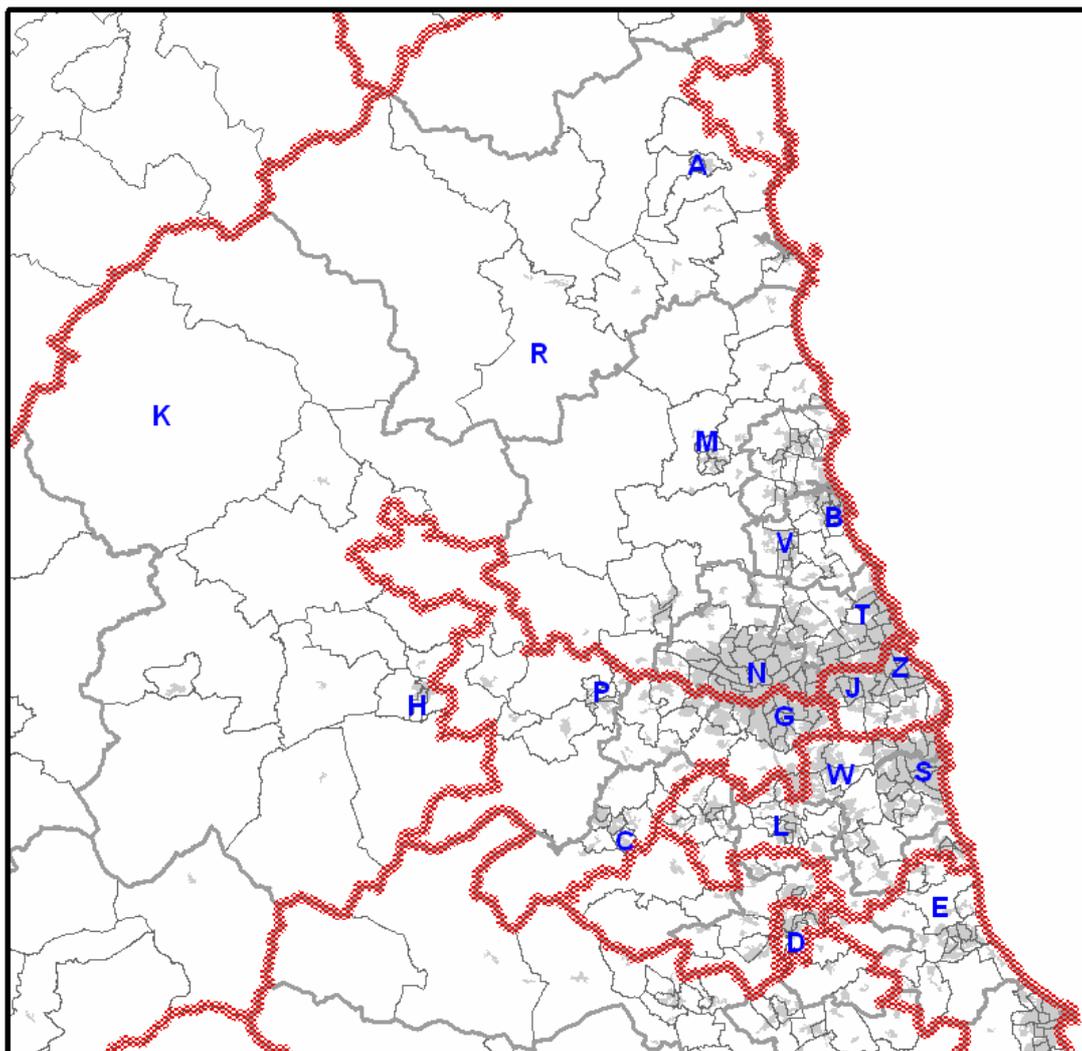
-  2001 Migrant flows of 20 or more
-  Local Authorities
-  Wards (at end of 2002)
-  Built-up areas



Map 4 2001 HMAs defined as TTWAs

Legend

-  Local Authorities
-  Wards (at end of 2002)
-  Built-up areas
-  2001 HMAs: 70% migrant self-contained



in discussions earlier in this report.

- * More rural areas have less locally self-contained migration patterns.
- * Areas with more people in council housing tend to have the highest self-containment levels.
- * S.Tyneside's extreme self-containment means that Sunderland's outward linkages are with County Durham areas.
- * Newcastle is much less strongly linked with Gateshead than with areas north of the Tyne generally, and beyond the Tyne & Wear border in particular.

Whereas a self-containment criterion of around 70% for *commuting* patterns would reveal the strong integration of all parts of Tyneside – and the lower level of linkage between the conurbation and parts of Northumberland more than 25 kms away – the migration analyses shows that flows in or out of these more remote areas tie them into a Newcastle-centred area to a greater degree than many parts of the conurbation. In short, if the test of the transferability of the TTWA method was that the resulting HMA was very similar to the TTWA's combination of the whole of Tyneside together with a fringe of nearby smaller towns, then the test was failed. Yet this 'failure' seems to be the effect of the results *correctly* reflecting genuine migration patterns, such as the more distended linkages in rural areas, as well as distinctive local phenomena such as Newcastle and Gateshead residents' very apparent reluctance to move house across the Tyne even though for many it means commuting across the river. The next section of this report provides the findings from some experiments to adapt the TTWA method, in case this can offer further valuable inputs to the definitions of appropriate HMAs for the housing policy context.

3 Towards HMA definitions

There are two main opportunities open for moving on from the results achieved so far by the research. The first innovation is to add in non-movers to the migration dataset so as to create a (non-)mover dataset which reflects the 'housing careers' of all people in an area over the 12 months leading up to census day. This extended (non-)mover dataset is much more closely equivalent to the commuting data used for TTWA definitions because

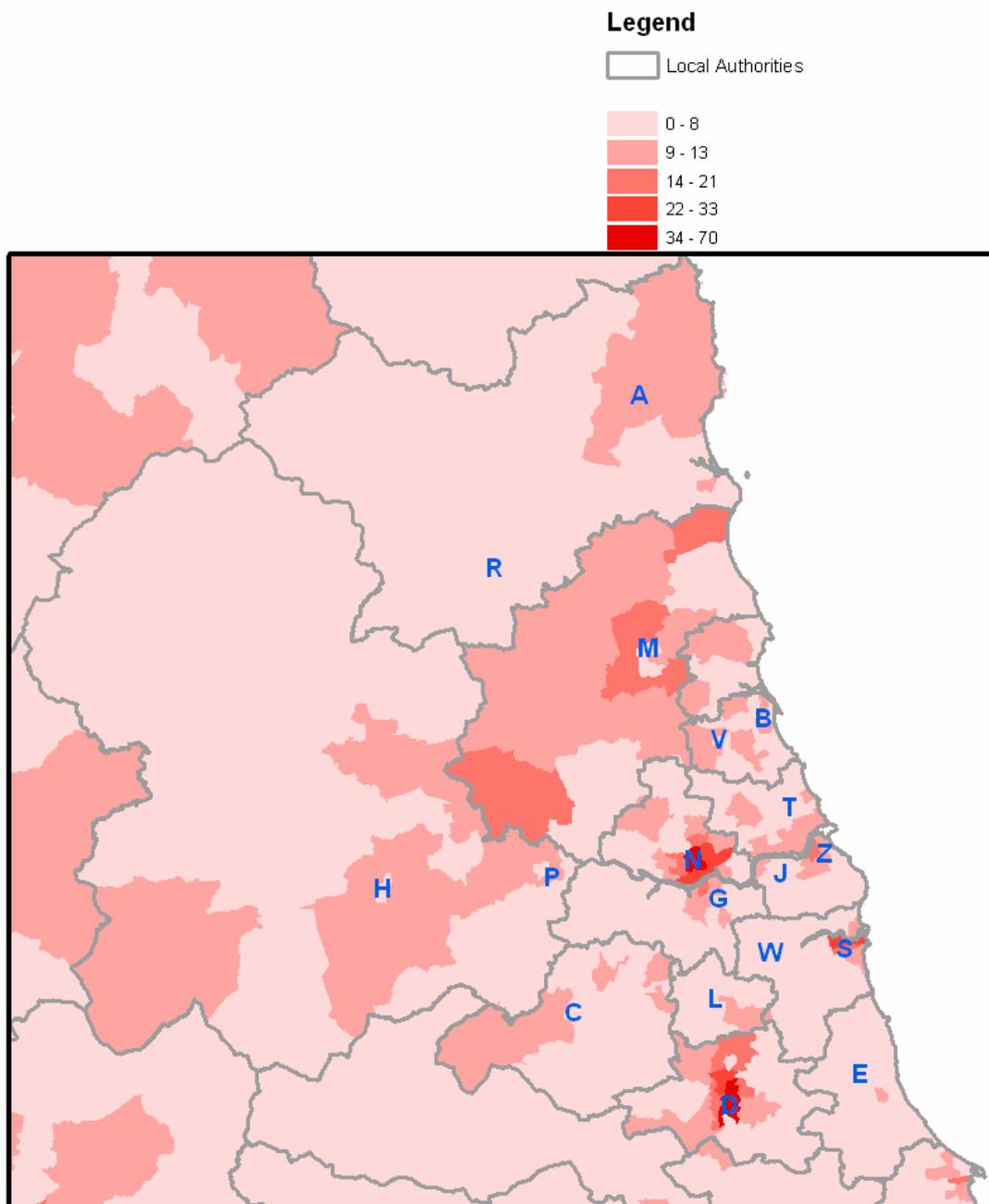
- * commuting datasets record the flows of all workers from where they live to where they work (including the non-movement of those who work at home), and
- * the (non-)mover dataset covers all people living in an area either in 2000 or in 2001 and shows both the moves of those who changed house and the non-movement of people who did not change address.

Of course, the (non-)mover dataset covers very many more people than are in the basic migration data, because only around 1 in 10 of people move in a typical year. On this basis, the roughly 9 in 10 people nationally who do not move house can be seen as part of the stable bulk of the housing market, along with those who *do* move house but remain within the same area. Clearly this means that a self-containment value of 70% is no longer appropriate. The rough equivalent appears to be 97% because

90% are non-migrants who, of course, have stayed in the same area;
the 70% criterion for migrants then needs to be applied to the roughly
10% of people who *are* migrants (thus adding 7% to the 90%).

At this point it is important to recognise that non-movers make up a strongly varying proportion of the population in different areas. To put it another way, some areas have a much higher proportion of their residents who were not living in that same house 12 months previously. Map 5 shows the proportion of these 'in-movers' in each ward of the study region. The main point to note is that less affluent areas tend to have low proportions: few of their residents

Map 5 Proportion of residents moving house



had moved to that house in the last year partly, in some cases, due to the suggested difficulty of moving in the LA-owned housing sector. Even more dramatic is the concentration of the highest values near the three city centres: this is due to the 2001 Census counting students at term-time addresses and, in some ward with many students, over a third of all residents were not living at the same address a year ago.

With the major change here of adding non-movers to the dataset, the second question is whether more technical details of the TTWA method also need to be changed. It was noted earlier that there are a number of rather complex preliminary steps built into the method to deal with the idiosyncrasies of wards (and most especially, the fact that wards such as those in the City of London have very little data or are very unbalanced in commuting terms due to having few if any residents but huge numbers of people working in them). The migration dataset is much more balanced in the flows between pairs of wards, and adding all the non-movers largely resolves the small number problems. As a result, it is sensible to omit all the preliminary steps in the TTWA method here and to attempt to produce HMA definitions with a much simpler version of the TTWA method.

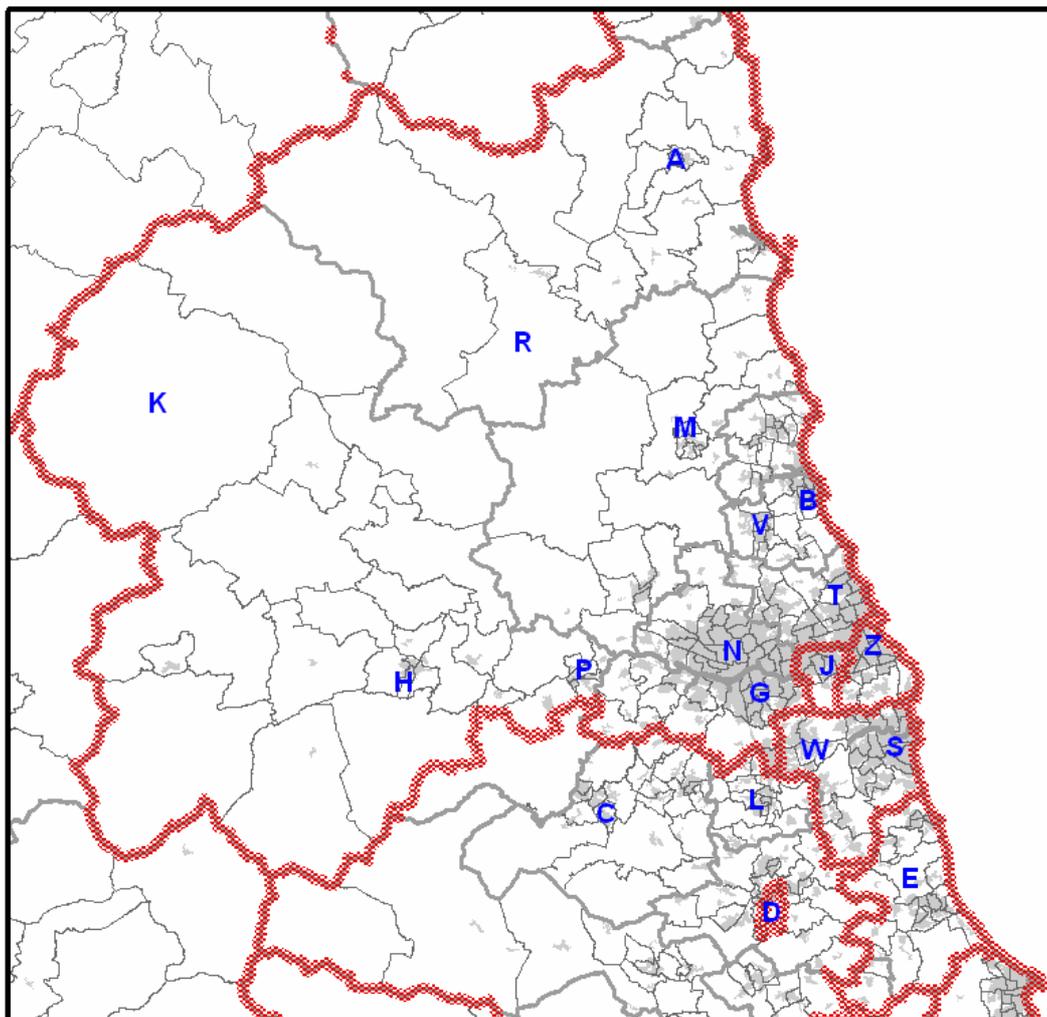
Map 6 shows the results of applying such a simplified version of the TTWA method to the (non-)mover dataset, with the 97% self-containment criterion providing a very rough equivalent to the earlier 70% analysis of the migrant-only dataset (Map 4). This new set of HMAs is quite similar to the previous one in the case of Sunderland but is more different elsewhere. Most notably, the bulk of Gateshead here joins the Newcastle-centred HMA (which does not match the previous analysis in extending into Cumbria).

The most remarkable feature is that S.Tyneside is split into two HMAs, with one covering S.Shields and Boldon whilst the other groups Jarrow with Hebburn only. Although this is a striking result, it does in fact find an echo in other studies (eg. a recent study for the Northern Consortium of Housing Associations). Recalling the basis of the self-containment measure, this means that in each of these separate parts of the LA

Map 6 2001 HMAs on new basis: 97%

Legend

-  Local Authorities
-  Wards (at end of 2002)
-  Built-up areas
-  2001 HMAs: 97% (non-)mover self-contained



- less than 3% of each area's residents on census day had lived outside that part of the LA a year ago and
- less than 3% of each area's April 2000 residents had moved to somewhere outside that area by the time of census day.

To put this degree of housing market 'closure' in context, this form of analysis needs to group together the whole of London with most of southern England before it reaches the same 97% level of self-containment for the 2000-1 period. As something of a footnote to the concerns of this report, the sheer level of influence of students on the centre of Durham city causes it to become a detached part of the huge London-centred HMA on this analysis!

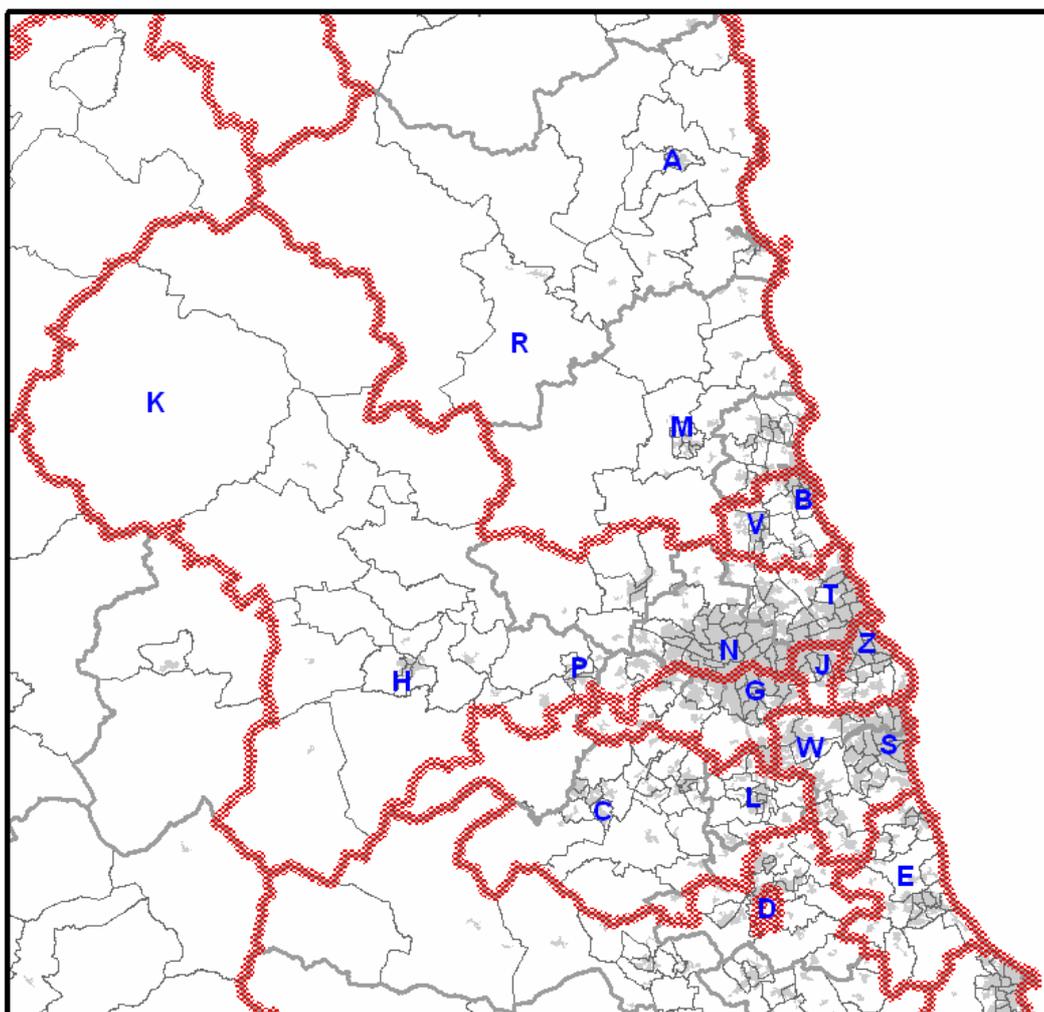
The results reported in this section of the report are the product of considerable experimentation. Map 6 had shown HMA boundaries produced by analysing a new dataset, so it is important to consider the results' sensitivity. The principal influence upon the broad pattern of HMA boundaries devised here is the minimum self-containment value which has been set, so the crucial sensitivity test involves altering this value. As explained earlier, a 97% value here has been taken to be roughly equivalent to a 70% value for the basic dataset (because 90% do not move, so for the (non-)mover dataset the equivalent value is 90% *plus* 70% of the 10% who do move). Thus values of 96.5% and 97.5% for the (non-)mover data are equivalent to values of 65% and 75% respectively for the basic dataset.

The 97.5% analysis of the (non-)mover dataset in fact produced exactly the same HMA boundaries in the study area as had the 97% analysis (Map 6). This shows that all the study area's HMAs which passed the 97% criterion have self-containment values of over 97.5% in fact. This level of insensitivity of the results is not quite matched when the self-containment criterion is not raised from 97% but lowered. Map 7 shows the resulting HMA boundaries with a 96.5% self-containment threshold applied to the (non-)mover dataset. Sunderland and S.Tyneside HMAs remain unchanged, but Chester-le-Street and Consett are here in a separate HMA from the large one which surrounds

Map 7 2001 HMAs on new basis: 96.5%

Legend

-  Local Authorities
-  Wards (at end of 2002)
-  Built-up areas
-  2001 HMAs: 96.5% (non-)mover self-contained



(but excluded) Durham city. Map 7 shows that the major change found when comparing the results of the 96.5% analysis with the 97% boundaries (Map 6) is to the large Newcastle-centred HMA which is split into four:

- Gateshead (apart from Ryton and Crawcrook with Greenside)
- Newcastle and N. Tyneside (plus Ryton and all Tynedale bar Haltwhistle)
- Blyth Valley
- Morpeth and the Wansbeck and Alnwick areas.

What needs to be remembered here, of course, is that it is not that one of these analyses is 'right' and the others 'wrong' but that each is representing genuine features of the HMAs in the study area. It is for the users to decide which of the sets of results provides more useful inputs to help make their HMA definitions as policy-relevant as possible. This decision may lead to a call for further research on local HMAs which focus on the housing needs of, for example, different age groups. When more datasets are available, it will also be possible to examine the migration of whole households rather than individuals, which will allow separate analyses by tenure categories in particular.

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ANNEX 1

Technicalities of the TTWA method	Alternative possible approaches
<p>The process starts with individual wards, combining them selectively and successively</p> <p>There are a few preliminary steps (largely to deal with idiosyncrasies among 10000 wards) but the method then gives equal weight to every flow between any pair of wards</p> <p>Wards can cluster together regardless of whether they share a boundary: the final results in fact include very few non-contiguities (and these are dealt with in subsequent consultations)</p> <p>The basic process involves ranking areas by their self-containment (and size) then allocating the lowest valued one to a group, continuing this process repeatedly until the lowest meets the minimum criteria</p> <p>During the process of allocation and re-allocation a grouping which fails the pre-set criteria is broken up and its wards then re-allocated individually</p>	<p>A very few methods start with the whole country then split it up step-by-step</p> <p>Older methods started by pre-defining “cores” then only looking at flows from non-core areas to one or other core</p> <p>When computing was slow it was necessary to limit the processing time by only considering the small proportion of ward pairs which are contiguous, but this produces sub-optimal results</p> <p>Methods which start with pre-defined cores, then allocate other areas to them, may leave some areas unallocated <i>and</i> do not guarantee that all final areas meet pre-set minimum criteria</p> <p>Most methods re-allocate prior groupings <i>en bloc</i> but these produce sub-optimal results</p>

ANNEX 2

- A** Alnwick
- B** Blyth
- C** Consett
- D** Durham
- E** Easington
- G** Gateshead
- H** Hexham
- J** Jarrow
- K** Kielder
- L** Chester-le-Street
- M** Morpeth
- N** Newcastle
- P** Prudhoe
- R** Rothbury
- S** Sunderland
- T** Tynemouth
- V** Cramlington
- W** Washington
- Z** S. Shields