Comparative analysis of the resident population of the six Olympic host boroughs

-sources and uses of locally owned administrative data

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Executive summary

Earlier this year Mayhew Harper Associates Ltd. was commissioned to produce population estimations for the six Olympic host boroughs using local administrative data. This was the second time the boroughs had commissioned MHA but on this occasion the exercise was timed to coincide with the 2011 census at 27/3/2011.

Since then full reports and a database have been provided to each local authority. They are using the information to inform their discussions with ONS who were responsible for conducting the census, as well as for their own use.

The anonymised database contains almost 1.5m geo-referenced records covering the entire population with around 50 variables attached to each record. These can be manipulated to any level of geography, by age, gender, household, and ethnicity.

Details of the methodology, known as *nkm*[1], can be found in each report and in two peer-reviewed academic articles[2]. The purpose of this summary report is four-fold

1. To present the results in summary form including a comparison with ONS estimates and with the GLA
2. To identify similarities and differences in populations, household structures, ethnicity and deprivation
3. Using examples show how the database can be combined for general use at both the individual and six-borough level
4. Show how the databases can be maintained to enhance efficiency and facilitate joined up working within and between public sector organisations

The main findings are that administrative counts using the MHA methodology are 3.5% higher than GLA estimates and 9.5% higher than ONS estimates for the same year.

Of the 135,787 six borough difference between *nkm* and the ONS, 46.2% is accounted for by Newham; of the 49,161 difference between *nkm* and GLA, 61.2% is accounted for by Newham.

In November 2011, ONS published new indicative estimates based on their revised migration methodology but not on the latest census results. These show that the gap between *nkm* and

[1] *nkm* = Neighbourhood Knowledge Management, see www.*nkm*.or.uk

[2] Harper, G. and L. Mayhew (2011) Applications of Population Counts Based on Administrative Data at Local Level. Journal of Applied Spatial Analysis and Policy.
http://www.springerlink.com/content/375672371q2w1287/fulltext.pdf

Harper, G. and L. Mayhew (2011) Using Administrative Data to Count Local Populations. Journal of Applied Spatial Analysis and Policy.
http://www.springerlink.com/content/e2480wkx9g537572/fulltext.pdf

ONS has fallen by nearly half to 67,963 or 4.9%. The next opportunity to compare *nkm* will be in July 2012 when ONS publishes headline figures for each local authority.

There is no single means of verifying any of these estimates. However, we found that the increases in population between previous administrative snapshots and 2011 were consistent with increases in the number of residential properties.

In Newham's case, which had the largest discrepancies compared with ONS, we found that population increases since 2007 of 10.7% were accompanied by a 9.7% increase in the number of residential properties.

In comparison with Child Benefit[3] data for each borough, we found that the *nkm* population 0-15 differed by only 0.075% from the Child Benefit caseload at August 2010. The Child Benefit caseload is 12.4% higher than the ONS figure for children and 5.1% higher than the GLA figure for the same age range.

The main arguments for developing and maintaining the *nkm* database include improved timeliness of data, better integration of information, better quality and less reliance on external commercial data licences. This in turn will lead to better decision making and improved efficiency and encourage joint working across organisational and administrative boundaries.

In addition, the policy landscape is also changing with the creation of local Health and Well Being Boards[4] and a greater emphasis on policies relating to Localism[5]. Both are expected to lead to demands for much better information and health intelligence at local level.

Overall the work has identified high levels of population churn and turnover[6]and structural changes particularly in terms of ethnicity and household formation. In the circumstances, it recommends that the database is updated at regular intervals - either yearly or biennially.

The report divides future applications and work with administrative data into two parts. At the six borough level or combinations thereof it identifies work on common or shared interests such as housing demand, internal migration, and income deprivation.

Areas for six borough co-operation that could be considered include:

- the Olympic legacy in terms of population change, housing, employment and deprivation
- growth strategies based on integrating population with business data and strategic transport developments
- work on ethnicity, migration and overlaps with housing deprivation and worklessness

[3] Child Benefit is a universal benefit to which all children are entitled from birth
[4] The Health and Social Care Bill is placing Health and Wellbeing Boards on a statutory footing and ascribing specific new functions to them, in addition to joining-up the NHS, social care, public health and other local services.
[5] For example see: http://www.communities.gov.uk/news/newsroom/1794971 which describes the Localism bill as: "A landmark bill that heralds a ground-breaking shift in power to councils and communities overturning decades of central government control"
[6] The difference is explained on page 22 below

- supra-local authority co-operation in shared services or investment
- environmental work e.g. on the health and other impacts of London's Low Emission Zone[7]
- calibrating the regional impact of proposed new East London river crossings as set out in the Government's Autumn Statement in 2011

Drawing on over 60 previous studies using *nkm* the report also sets out ideas for applications at Local Authority level. Six examples are designed to show the adaptability, relevance and added value of local administrative data in key policy areas. In none of these applications would it be possible to use census data as an alternative due to its inflexibility, lack of granularity and detail, and because it is always out of date.

This work has covered the six boroughs with a combined population of nearly 1.5m people and was completed in less than six months. Given its strategic value we believe that it would not be a major undertaking to extend the work to the whole of the GLA area with Local Authorities maintaining ownership of the data and pooling it where there is common purpose.

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Acknowledgement

The authors are grateful for the comments and suggestions of colleagues in the six commissioning Olympic boroughs. For those interested individual borough level reports, they should contact each borough separately.

[7] The Low Emission Zone (LEZ) was introduced in 2008 to encourage the most polluting heavy diesel vehicles driving in the Capital to become cleaner. The LEZ covers most of Greater London.

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1. Introduction

1.1 Scope

In light of uncertainty about the accuracy of official population estimates, on the 27th March 2011 all six Olympic host boroughs took snapshots of their population as held in administrative databases. These were then used to construct population estimates in each borough with the date chosen to coincide with national census day.

This work was agreed by the six host borough Chief Executives and was commissioned and conducted at Local Authority level in six separate projects undertaken by Mayhew Harper Associates Ltd. using their *nkm* methodology[8].

High level results were provided by July 2011 for each of the boroughs and these were communicated to the ONS, who are responsible for the 2011 census, to help with validation and other aspects but also to provide each LA with a set of local population benchmarks to inform any subsequent disagreements with ONS.

Full reports including population breakdowns were provided within a couple of months and full databases handed over. Trained staff in each of the local authorities are now using the data in a host of applications, not only for population estimation.

Access to the data is also being made to PCTs or their successors which provided some of the necessary administrative data involved in the work. These data sets are already being used extensively in, for example, Tower Hamlets for a range of local purposes including needs analysis and health care commissioning.

It was considered that a summary of the work in the six boroughs would be useful for comparative purposes and to provide a strategic overview. It would also be useful to scope a more detailed piece of work based on a combination of all six databases that could be commissioned across the six boroughs.

The purpose of this report is hence as follows:

1. To compare findings with contemporaneous ONS and GLA population counts for each borough and to form an opinion on their overall accuracy. This would provide host boroughs with an idea of similarities and differences within each area.

2. To analyse and compare different features of the populations in terms of age, deprivation, household structure and ethnicity and distribution without repetition of the detail in the individual reports. This would allow first identification of either common problems or issues unique to each borough.

[8] *nkm* Neighbourhood Knowledge Management, www.*nkm*.org.

3. To consider how data could be used for a range of purposes, many of them new. This would set the scene for extracting maximum value from the databases which are expected to have a shelf life of one to two years. Broadly, these divide into strategic uses spanning all six boroughs or bespoke uses based on specific issues and applications at Local Authority or six-borough level.

1.2 Background

London boroughs have been concerned for a number of years that official population counts under represent the true number of people living in London with important consequences for local funding. The significance of this problem may be illustrated by comparing what *nkm* data would provide if it were used in the relevant funding formula instead of ONS population data.

However, because the funding formulae and gap between *nkm* and ONS estimates vary the results cannot be easily generalised. An example is provided by the NHS funding formula for Tower Hamlets which uses an ONS based mid-year estimate for the population.

Based on work reported by the London Borough of Tower Hamlets, if the crude population used in the formula is compared with the minimum estimated population from *nkm* this then gives a potential under-funding of over £25 million in 2009/10 and £32 million in 2010/11 for this borough[9].

2. Comparative analysis based on administrative data sources

2.1Population estimates based on *nkm*, ONS and GLA

In this section, we compare and comment on the *nkm* estimations for the six boroughs with ONS MYE[10]s and the GLA. Details and more in-depth analyses are available in the individual reports which have been written to a common format but with allowance for particular individual host borough requests[11]. This section concentrates on macro issues only.

Table 1 shows that *nkm* estimates at 27/3/2011 are 3.5% on average higher than GLA population estimates for 2011 and 9.5% higher than ONS 2010 MYEs. The largest difference is in Newham where administrative estimates are 24.4% higher than ONS and 11.2% higher than GLA.

The smallest percentage difference is in Barking and Dagenham, where administrative estimates are 3% higher than ONS and 3.2% higher than GLA. In Tower Hamlets, *nkm* estimates fall between the GLA and ONS estimates. Totalled across all six boroughs, *nkm* finds 127,205 more people than ONS and 49,161 more than GLA.

Reasons for the differences must be speculative but it is an established fact that the six boroughs have undergone significant influxes of population since the previous census in

[9] See Tower Hamlets Population factsheet at : http://www.towerhamlets.gov.uk/idoc.ashx?docid=b2eecbdf-e64f-4294-8071-8f265f2194cf&version=-1

[10] MYE: Mid-Year Estimate

[11] For example Hackney specifically requested an analysis of the local Charedi Jewish Orthodox population and Newham for profiles of the registered and unregistered electorate.

2001. The discrepancies are the result of a combination of variable response rates to the census at the time, and increasing errors in subsequent population estimates particularly with regard to migration.

In November 2011, ONS published new indicative estimates for 2011 based on their new migration methodology. These are shown in the final two columns of Table 1. They indicate that the gap between *nkm* and ONS has reduced by almost half to 67,963 people or from 9.54% to 4.88%. The next opportunity to compare *nkm* populations will be in 2012 when ONS publishes headline counts from the 2011 census.

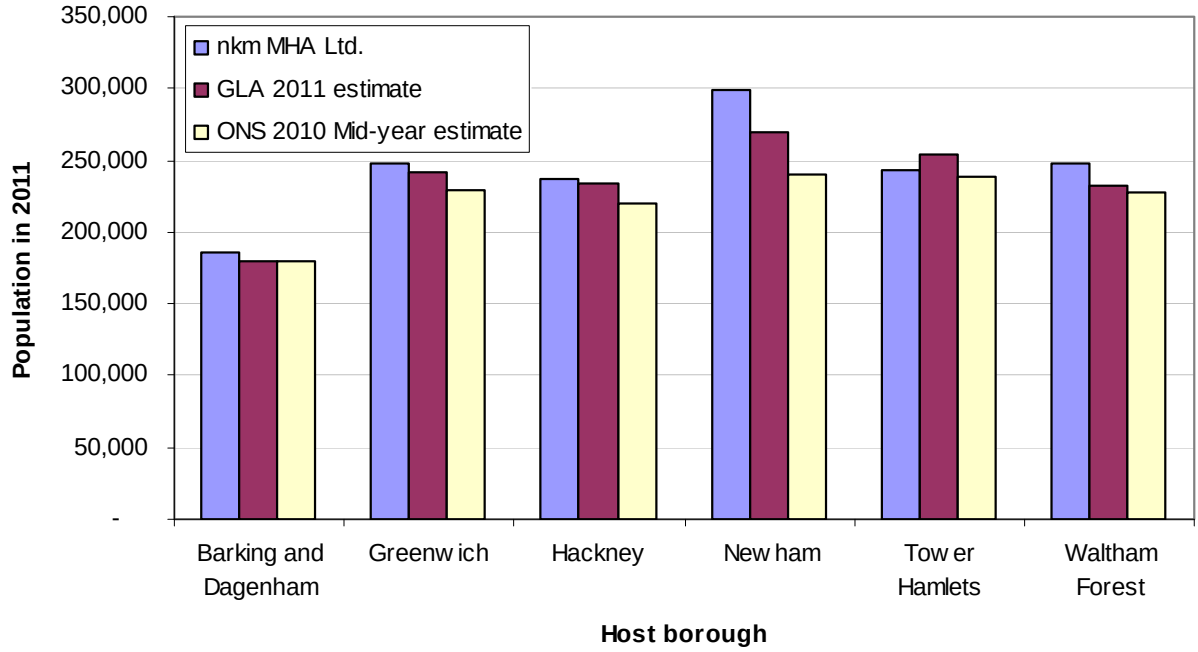

Figure 1: Chart showing population counts by local authority and source

2.2 Validation of population estimates

There are no independent verifiable or contemporaneous administrative databases covering the whole age range with which to compare any of these estimates. However, independent external checks are possible for some certain segments of the age range using Child Benefit and State Pension data. These show that *nkm* administrative estimates are closer to these than they are to alternative estimates.

For example, Child Benefit is a tax-free payment that families can claim for their children (including qualifying 16-19 year old young people in full-time non-advanced education or approved training). The payment can be claimed by anyone who qualifies, whatever their income or savings[12].

[12] Note that, although from 2013 Child Benefit for higher earners will be taxed, the money is expected to be collected through the tax system and should not affect caseload counts.

Local Authority	*nkm (A)*	GLA 2011 (B)	Population difference (A-B)	ONS MYE 2010 (C)	Population difference (A-C)	ONS 2011 indicative MYEs (D)	Population difference (A-D)
Barking and Dagenham	185,176	179,370	5,806	179,741	5,435	183,272	1,904
Greenwich	248,221	241,385	6,836	228,509	19,712	231,103	17,118
Hackney	237,646	234,209	3,437	219,228	18,418	223,508	14,138
Newham	298,916	268,854	30,062	240,200	58,716	272,115	26,801
Tower Hamlets	242,462	254,218	- 11,756	237,896	4,566	248,668	- 6,206
Waltham Forest	247,503	232,726	14,777	227,145	20,358	233,285	14,218
Total	1,459,924	1,410,763	49,161	1,332,719	127,205	1,391,951	67,973
Difference %			3.48		9.54		4.88

Table 1: Comparison of four sets of population estimates: nkm, GLA, ONS (MYE 2010), ONS (indicative 2011)

Because all children aged 0-15 qualify for Child Benefit it acts as a suitable check on population estimates in this age range. Because there are various lags and leads in the benefit system and because of other factors, HM Revenue and Customs estimate that the take up rate of Child Benefit is 97% rather than 100%[13].

The following table compares the Child Benefit caseload at August 2010 with the *nkm* and ONS population estimates. The table shows that the caseload for the six boroughs is 326,542 as compared with 299,506 based on ONS 2010 MYEs.

The *nkm* figure is slightly higher than the Child Benefit caseload at 326,542 but adjusted for take-up the Child Benefit caseload becomes 336,641 which is only 0.075% higher than the *nkm* count. Compared with ONS the adjusted Child Benefit caseload is 12.4% higher and with GLA 5.1% higher.

Such discrepancies have obvious implications for school pupil forecasts but are symptomatic of wider problems with the system. This has particular implications for the local authority settlement, health care funding and policing. For example, compared with the Child Benefit caseload and after adjusting for take up, ONS estimates 37k fewer children aged 0-15 living in the six boroughs.

Local Authority	Child benefit 0-15	*nkm* 0-15	ONS 0-15	GLA 0-15
Barking and Dagenham	46,520	47,501	44,739	42,376
Greenwich	51,600	54,677	49,128	54,364
Hackney	53,240	53,815	47,881	51,686
Newham	69,900	71,785	60,382	65,486
Tower Hamlets	50,830	52,758	47,241	51,541
Waltham Forest	54,452	53,587	50,135	54,945
total	326,542	334,123	299,506	320,398

Table 2: Comparison of Child Benefit caseload counts with nkm and ONS MYEs.

Similar checks can be made against state pension data for the 65+ population. However, the comparison is not as straightforward. Although almost universal not everybody qualifies for state pension e.g. if they have not made enough National Insurance contributions[14].

When comparisons are made we find that ONS and *nkm* are in closer alignment with state pension entitlement and with each other but that GLA is further adrift. This may be a reflection of the more stable nature of this group of the population and differences in GLA methodology.

[13] See: http://www.hmrc.gov.uk/stats/personal-tax-credits/cwtc-take-up2007-08.pdf

[14] It would be of help to demographers if DWP were to publish separate counts of state pension and pension credit recipients and counts of numbers receiving both, by single year of age and sex

2.3 Developments in housing

The significant increases in population in the host boroughs in recent years would not have been possible without accompanying increases in housing stock. Our analysis of the Local Land and Property Gazetteers between administrative snapshots shows comparable increases in the number of residential properties to accommodate the higher administrative population counts observed.

For example, the total number of residential properties in Hackney has risen by 15.1% since 2007 and in Newham by 9.7%. Significant increases in residential properties have also occurred in Tower Hamlets and Greenwich since the last snapshot but in these cases population has not expanded by the same levels.

In Waltham Forest and Barking and Dagenham the number of residential properties has remained broadly static between snapshots and this is reflected in slightly higher average household occupancy levels and proportionately a slightly smaller percentage of empty residential properties.

2.4 Ethnic structure

There have been significant changes in the ethnic structure of the host boroughs since 2001. Note that the methods of estimating ethnicity using administrative data and in the census are not the same and so the changes reported must be regarded as indicative.

Full details of the ethnic structure using the *nkm* methodology are provided in each of the host borough reports in three tiers: 1. by broad ethnic group i.e. Black, White, Asian, Mixed and Other; 2. sub-divisions thereof (e.g. Black African); and 3. according to estimated country-of-origin where this can be determined.

Whilst the total population of each borough has clearly increased, the analysis at the highest tier finds that the share of the population that is White is estimated to have fallen by 24% in Barking and Dagenham, by 12% in Greenwich and by 7.3% in Waltham Forest.

In Hackney, the White proportion has increased slightly by 3.6% and in Newham it is unchanged. In addition, the share of the population that is Black has increased by 12.4% in Barking and Dagenham and 6.7% in Greenwich. In Hackney and Newham, it has declined by around 5%.

The share of the population that is Asian has increased by 7.4% in Barking and Dagenham, 4.1% in Waltham Forest and 3% in Newham. In Hackney and Tower Hamlets, the proportion that is Asian has increased only slightly or is unchanged.

2.5 Population change and turnover

All boroughs have been subject to considerable population turnover and change in recent years. The six-borough study follows on from previous studies in each borough at different times from 2007 onwards. Because intervals between snapshots vary, annual averaging is needed to put population growth rates on a consistent basis.

The following table shows that the highest growth rate is in Barking and Dagenham at 3.1% per annum and in Newham at 2.9% per annum. The lowest growth rates have been in Tower Hamlets at 1.3% per annum and Waltham Forest at 1.2% per annum.

Borough	2011 *nkm* population at March 2011 (A)	previous *nkm* population (B)	population difference (A-B)	snapshot interval (years)	annualised *nkm* rate of population change % p.a.
Barking and Dagenham	185,176	171,851	13,325	2.5	3.1
Greenwich	248,221	240,508	7,713	2.0	1.6
Hackney	237,646	223,171	14,475	3.7	1.7
Newham	298,916	270,091	28,825	3.7	2.9
Tower Hamlets	242,462	237,817	4,645	1.5	1.3
Waltham Forest	247,503	243,280	4,223	1.5	1.2
total	1,459,924	1,386,718	73,206		

Table 3: Change in population between administrative snapshots

The previous snapshots in Hackney and Newham were in 2007 and equate to a time interval of 3.7 years. Using data from both snapshots, we found that of the 2011 stock of population 7.8% in Hackney and 6.8% in Newham were born since 2007. A further 26.8% in Hackney and 31.6% in Newham arrived from outside the borough in the interval.

In addition, 7.6% in Hackney and 7.7% in Newham moved addresses within the borough and 67.8% and 53.9% lived at the same addresses as they were in 2007. Within this broad picture there was more substantial variation by ward driven in large part by re-generation, as reported in the individual reports. These patterns tend to be repeated across the six boroughs.

Borough	population in 2011	% change since 2007	% of 2011 stock born since 2007	% of 2011 stock new to borough by in-migration	% of 2011 stock due to internal movement	% of 2011 stock unchanged since 2007
Hackney	237,646	6.5	7.8	26.8	7.6	57.8
Newham	298,916	10.7	6.9	31.6	7.7	53.9

Table 4: .Changes on population stock between 2007 and 2011in Hackney and Newham

2.6 Demographic support ratios

Support ratios are used by demographers to illustrate the pressure of either old or young populations on local economies since these can impact on adult social care, health, education and child care.

- The dependency ratio is defined as the ratio of people aged 20-64 to people aged 65+. This means that the lower the ratio the less support there is

- The child support ratio is the ratio of people aged 20-64 to children aged 0-19. Again, the lower the ratio the less support there is

- The total support ratio is the ratio of people aged 20-64 to the total number of children and older people.

The table shows that Tower Hamlets and Barking and Dagenham have the lowest child support ratios reflecting their relatively young populations. Lowest old age dependency ratios are in Barking and Dagenham and Greenwich, which therefore have the oldest populations. The lowest total support ratio is found in Barking and Dagenham.

Compared with national ratios, the populations in the six boroughs are relatively much younger. For example in England in 2011 the old age dependency ratio was 3.6 and the child support ratio 2.5 as compared with an average of 6.8 and 2.1 in the six boroughs.

This suggests that the six-borough population consists largely of working age families and households as opposed to mature older populations and households. However, this generalisation varies with borough, for example in Barking and Dagenham or Greenwich.

Local authority	2011 Old age dependency ratio	2011 Child support ratio	2011 Total support ratio
Barking and Dagenham	5.7	1.9	1.4
Greenwich	5.9	2.3	1.7
Hackney	8.1	2.4	1.8
Newham	8.8	2.2	1.7
Tower Hamlets	6.8	1.9	1.5
Waltham Forest	6.3	2.3	1.7
All	6.8	2.1	1.6

Table 5: Ratio of adults to older people and to children and young people

2.7 Household structure

Households are fundamental economic units in relation to their usage of public services, with household structure frequently determining the nature and quantum of services delivered in areas and neighbourhoods.

Examples include education and older peoples' services, housing needs and so on, but household structure is also related to levels of financial support through the benefits system, especially Council tax and Housing Benefit which are administered locally.

In *nkm* households are divided into one of eight mutually exclusive types[15]. These are A: Family households with children; B: single parent households; C: cohabiting older households; D: older people living alone; E three generational households; F: cohabiting adult households no children; G: single adult households; and H: other households (e.g. split generation households in which occupants are under 20 and over 64).

Table 6 shows there are 583,873 households in the six boroughs. The most common are type A family households followed by type F cohabiting adult households and then type G single adult households. There are roughly equal numbers of type C cohabiting older households and type D single person older households. The smallest categories are type E three generational and type H other households.

[15] These are built up from over 80 smaller sub-types and can be flexed.

Household type	Barking and Dagenham	Greenwich	Hackney	Newham	Tower Hamlets	Waltham Forest	Total all households
A	14.7	17.3	14.1	**21.6**	14.4	17.8	125,856
B	16.1	**19.3**	17.3	18.0	13.3	16.0	57,209
C	16.1	**22.0**	13.7	16.8	11.2	20.2	40,596
D	16.6	**21.7**	15.4	14.9	12.1	19.2	42,114
E	8.7	12.7	14.9	**27.0**	19.6	17.1	11,893
F	10.5	17.8	18.0	16.4	**20.0**	17.3	108,798
G	8.5	16.1	**22.0**	16.8	21.6	15.0	188,610
H	10.5	19.5	**25.9**	16.8	10.9	16.4	8,797
Percentage and total	12.1	17.8	17.9	18.0	17.3	16.9	583,873

Table 6: Percentage breakdown by household type and local authority - emboldened cells show which local authority has highest proportion of given household type

Key to Table 6:

Household type	Description
A	Family households with dependent children
B	Single adult households with dependent children
C	Older cohabiting households
D	Older person living alone
E	Three generational households
F	Cohabiting adult households no children
G	Single adult households
H	Other households

It is noteworthy that Greenwich has the highest proportions of types B, C and D households and Newham the highest proportion of type A households. Cohabiting adult households and single adult household are most highly represented in Tower Hamlets and Hackney. Type E three generational households are most common in Newham.

Each household type makes a different imprint on an area and with distinctive age related trajectories in terms of their usage of local services. Figure 2 is a plot of household types in Waltham Forest by LSOA according to occupancy and the average ages of occupants.

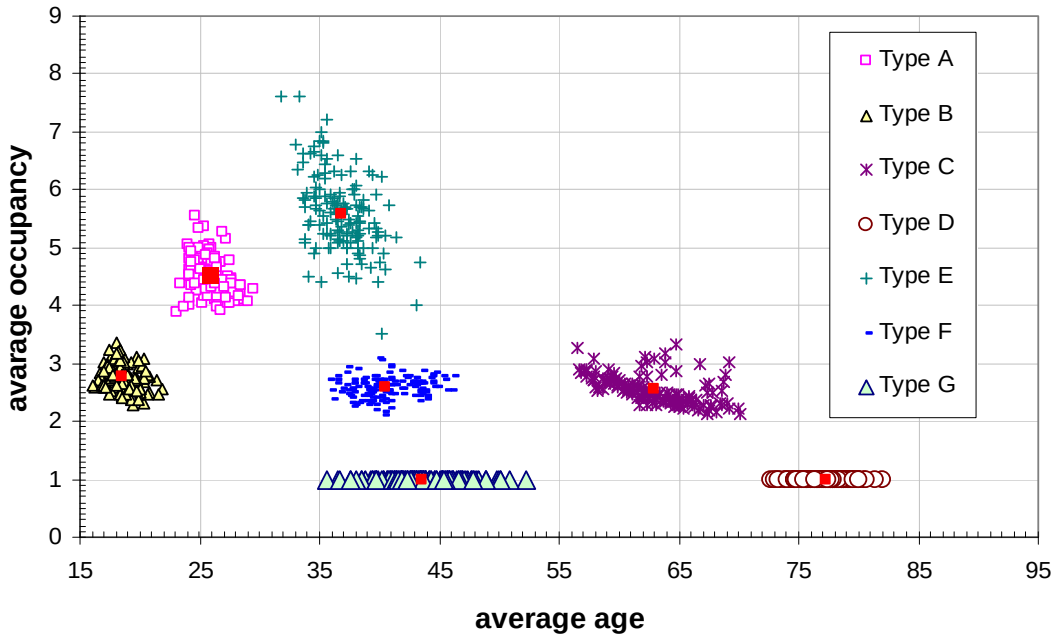

Figure 2: Plot of average household occupancy versus average age of occupants at LSOA level in Waltham Forest by household type (A-F). (A red symbol in each cluster shows mean size and occupancy for each household type.)

The highly typical and distinctive patterns obtained are indicative of the likely housing and other needs of residents. At an LSOA level for instance we observe that:

- Type A family households typically contain four or five persons, including children, with an average age of 26 years
- Type B single parent households range in size from two to three persons with an average age of 19 years
- Type C older cohabiting households range in size between two or three persons with average age of 62 years
- Type D older single person older households have an average age ranging from 70 upwards and become the dominant type of older household at the oldest ages
- Type E three generational households range in occupancy levels from four to eight people with an average age of 36 years

- Type F households are cohabiting adult households with typical average occupancy levels of between two and three persons and an average age range of 35 to 45 years

- Type G single occupancy adult households range in average age from 35 to 55 years

Type H households, not shown in Figure 2, are a small residual group of heterogeneous household that show no particular pattern.

2.8 Household level income deprivation

All six boroughs experience high levels of income deprivation compared to national levels according to the 2010 Index of Deprivation (IMD). In *nkm* there are different measures for deprivation which can be analysed on different scales - personal, household, neighbourhood, output area etc.

In *nkm* household deprivation is defined according to whether a household is currently in receipt of means tested benefits. As Table 7 shows, Hackney has the highest percentage of households of any type on benefits and Greenwich and Waltham Forest the lowest. The variation around the borough average is between +/- 6%, a 12% range of variation altogether.

There are notable differences between household types, with single parent households (B), older single person households (D), and three generational households (E) the most likely to be in receipt of means tested benefits. This is especially the case in Hackney and Tower Hamlets. Least likely to be on means tested benefits are single and cohabiting adult households.

Household type	Barking and Dagenham	Green-wich	Hackney	Newham	Tower Hamlets	Waltham Forest	total
A	29.3	24.5	50.5	41.6	**58.4**	32.5	125,856
B	59.6	46.3	**61.9**	55.4	60.0	56.1	57,209
C	34.5	31.5	57.7	50.0	**57.8**	32.4	40,596
D	56.0	48.8	**73.0**	64.5	65.4	50.2	42,114
E	35.0	37.3	64.6	54.0	**80.7**	47.2	11,893
F	21.8	17.3	**28.6**	27.0	17.5	16.5	108,798
G	**29.3**	20.4	26.3	25.1	20.0	22.6	188,610
H	47.7	27.6	39.7	**51.9**	45.2	43.0	8,797
Percentage and total	35.5	27.3	**39.7**	37.9	35	27.9	583,873

Table 7: Relative income deprivation by local authority and household type by borough - emboldened cells show which local authority has highest proportion of given household type on benefits

Hackney has the highest average level of deprivation based on the proportion of households receiving means tested benefits and Greenwich the least (highest percentages are shown in bold font for each household type).

Differences in income deprivation between household types, a measure of income inequality, is highest in Tower Hamlets and lowest in Greenwich. It is also notable that Newham, Barking and Dagenham households tend to rank higher on deprivation than income inequality relative to the other boroughs.

2.9 Pensioner income deprivation

This section is illustrative of what can be done using *nkm* 'risk ladders'. Risk ladders are used to sub-divide populations into mutually exclusive groups according to key characteristics or risk factors. These factors are often correlated with deprivation, use of services etc. and thus mark out different groups in to terms of their size and relative needs.

They may also be used as a proxy for unmet need (e.g. where a known more vulnerable group receives proportionately less support than a less vulnerable group). An appropriate example is the level of income deprivation in the older population.

There are over 120,000 people aged 65+ living in the six boroughs. Table 8 breaks them down into eight groups depending on whether they live in social housing, live alone or are age 75+. A final column shows the percentage receiving means tested benefits. Each group is then ranked from most to least income deprived.

The table shows that nearly half of the older population, 47.8%, is on benefits but this increases to 80.8% if they live alone and in social housing. Better off pensioners live in households where neither of these risk factors apply, for example those in row seven or eight of the table.

The bottom row shows that around 41% of older people (49,277) live in social housing, 35% live alone and 46% are aged 75 or more. Comparing the local authorities with each other, Tower Hamlets and Hackney have the highest levels of pensioner income poverty and Greenwich and Waltham Forest the lowest. However, the gap between the richest and poorest pensioners is greatest in Greenwich and then in Barking and Dagenham.

Further analysis shows that the odds of being on benefits increases 6.9 times if living in social housing and by 1.5 times if living alone and 1.1 times if aged 75+. This suggests that housing tenure and living status are the main predictive factors of pensioner poverty and that this affects almost half the older population. These odds are multiplicative so that an older person living alone in social housing is 6.9 x 1.5 x 1.1 = 11.4 times more likely to receive benefits.

risk group	frequency	social housing	living alone	75+	% in households on means tested benefits
1	9,551	Y	Y		80.8
2	12,773	Y	Y	Y	79.0
3	10,663	Y		Y	71.6
4	16,240	Y			70.2
5	11,548		Y	Y	36.1
6	8,242		Y		31.6
7	20,637			Y	28.7
8	30,794				26.1
total	120,448	49,227	42,114	55,621	47.8

Table 8: Risk ladder showing the number and percentage of 65+ persons living in households in the six boroughs receiving means tested benefits by risk group

3. Taking *nkm* to the next level

The *nkm* system is built on the premise that local administrative data are a largely untapped source of statistical data for planning, monitoring policies and delivering services on the ground. Administrative data offer a number of advantages over ONS and other data sources as shown by the previous analysis:

- Greater granularity of information thereby enabling more precision targeting by age group, ethnicity, household type, geography, risk group etc.

- Significantly improved timeliness – data are current rather than being up to 12 years old as in the case of the census so that information is both more relevant as well as accurate

- More accurate population denominators so that crime, unemployment, hospital admission and other ratios are more accurate and reflective of the situation on the ground leading to better decision-making and accountability

- Flexible geography in order to visualise any spatial representation down to household level in either two or three dimensions

- Users work from a common data set and reliance on external suppliers (product licences, copyright etc.) is sharply reduced.

In this section we summarise:

- The additional data sources available, and their ownership

- Linkage of administrative data to other data sources especially surveys

- Uses of administrative data at a strategic and bespoke level

Using examples from key policy areas, this section will demonstrate the adaptability, relevance and added value of local administrative data in each area. In none of these applications would it be possible to use census data as an alternative due to its inflexibility, lack of granularity and detail, and because it is always out of date.

3.1 Expansion of data coverage

Local authorities, health providers and law enforcers have specific duties and responsibilities that are reflected in their organisation and controls over data and hence information needed to run those organisations.

Figure 3 shows the core data sets used for population estimation purposes. Other data sets maintained at local level for the most part relate to local services provision and are owned by either the local authority or health providers. These are coloured differently and are not exhaustive.

Not included here are data sets owned by the police but which can also be considered and have been used in a number of studies by ourselves (e.g. youth crime). Consideration can also be given to overlaying data on businesses, utilities and labour market data but not necessarily at household level.

Data owners, especially between organisations but also within organisations, tend not to share access to person level data with each other except in specific circumstances. In *nkm* data are joined together in a secure environment and then anonymised.

The main means of linking data together is by address and NHS number. Where NHS numbers are not available, then name and date of birth are used. Permission for personal information to be used is allowed under section 33 of the Data Protection Act 1998 and sanctioned by local Caldicott Guardians in the host borough PCTs.

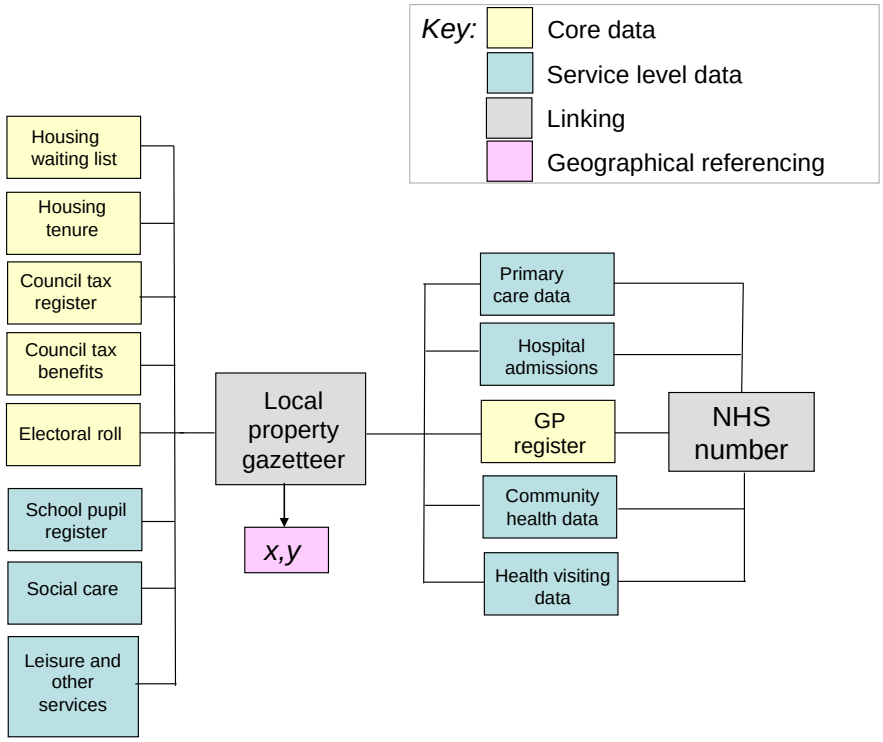

Figure 3: Some local administrative data sources and their interconnections. Core data sets are used in population estimation and non-core in bespoke applications

It is important to stress that the database is a partnership between health providers and the local authority either for joint or separate use in order to improve services, benefit the local population or identify unmet need.

The end product is a statistical database which can be used for different purposes in which personal identifiable detail is removed and to which different levels of access can be provided for different applications.

The inclusion of service level data in addition to the core data enables local authorities and health providers to:

- Understand their user populations in more detail
- Design and target services and identify unmet need
- Allocate resources and measure costs and productivity (e.g. per capita, by neighbourhood, or delivery mechanism)
- Work across organisational and geographical boundaries
- Enable services to work together more efficiently (e.g. Children's social services)
- Make prevention work more effectively

Among the six boroughs Tower Hamlets PCT has led the way in integrating other health data sets. Examples include hospital admissions, community health data, health visiting, and cancer screening. With the permission of the council, social care data has also been added.

Depending on the project, other data sets could be appended including leisure services, library membership, parking permits, blue badge holders and home insulation grants. In 2008, some of these data sets were used in Barking and Dagenham to assess the impact on current residents of the potential redevelopment of the Gascoigne Estate.

Access variables at a household level to post offices, opticians, child care, green space, dentists, GPs, and bus stops and stations have also been added in work undertaken for Tower Hamlets PCT. This provides a convenient and detailed overview of the level of access to services in each neighbourhood.

This is important since poor access to discretionary services has an attenuating effect on their take-up and may lead to welfare loss or economic disadvantage in some cases. For example, in work for Tower Hamlets on access to eye care older residents' take-up of free eye tests[16] was significantly reduced the farther they lived from an eye test provider.

In a study on youth crime in another part of London, we found that it was important deal with future potential offenders whilst they are at school. Risk factors such as Special Educational Needs, housing tenure, benefit status, being excluded from school and being 'looked after' were early markers of subsequent criminal behaviour.

Whilst these risks factors may have been identified at the outset, risk of offending was significantly accentuated where the factors occurred in combination. As a result of the study, we were able to identify numbers at risk in each risk group by neighbourhood and school of attendance.

Whilst such detail is possible to achieve this level of detail anywhere in the country, it would not be necessary or desirable for all users to have access to all variables all of the time for example in the area of crime and so access would need to be managed.

This would depend on the users of data including their roles and responsibilities within their respective organisations. A centrally managed unit would normally undertake this role on behalf of the users and stakeholders as already occurs in the participating boroughs.

[16] Eye tests help identify treatable conditions such as diabetes and early signs of conditions such as macular degeneration

Although Government hold much other data (e.g. taxes and incomes), access to these in a form that can be linked to local data sets is strictly limited. Certain administrative data are available but not at a household level and only in a few cases down to LSOA[17] level. An exception is person level public health birth and mortality files that can be accessed subject to permission first being obtained from ONS.

To some extent it is possible to mix and match with *nkm* data once *nkm* data is aggregated to LSOA levels, although linkability at the household level is lost and so there is a loss of flexibility and therefore functionality and accuracy.

Compared with ONS population data *nkm* can do all of the things that ONS data can do so adopting *nkm* does not result in any information loss. On the other hand, use of administrative data results in a significant increase in functionality compared with ONS because of the additional data sets available.

It is easier and far cheaper to integrate administrative data if all key data sources:

1. Adhere to British Standards on addressing;
2. Attach a UPRN[18] to records signifying a valid address on the Local Land and Property Gazetteer;
3. In the case of NHS data, an NHS number is attached to each record.

A useful first step, for example, would be to establish a clear link between the creation or removal of UPRNs on the Local Land and Property Gazetteer with their counterparts on the Council Tax register so there was complete consistency between tax status (active or inactive) and addresses.

Administrative data does not provide information about people's opinions, attitudes, or life styles. In Tower Hamlets, it was decided to link the locally commissioned MORI health and life style survey to the *nkm* database.

This enabled a number of cross cutting local policy issues to be evaluated such as the relationship between unhealthy life styles, housing tenure, benefits, and worklessness. As a result of this step, households could be grouped in categories that were more relevant in for example out-reach work.

3.2 Strategic applications of administrative data

Uses of administrative data can be divided into strategic and bespoke applications. Strategic applications are defined as any topic spanning the 6 host boroughs that will impact on common strands such as funding, migration, pan-area developments such as the 2012 Olympics.

[17] Lower Layer Super Output Area, an area which is smaller than a ward and typically containing around 1500 people and 600 households

[18] Unique Property Reference Number – national system used in property gazetteers to uniquely identify properties

Beside population estimation, examples of potential strategic applications include:

- Using administrative data as a basis for projecting populations and housing demand
- Work on internal and external migration and population churn within and between local authorities
- The provision and location of supra-local authority services including strategies to share services across the region e.g. regional health services
- Business growth strategies for the region especially linkages between population, housing and public transport access
- Child yield in new housing developments: i.e. to better understand the impact of new housing on the child population and hence future demand for education and other services
- Evaluation of transport demand, development of new routes and services, corridors etc.
- Pollution exposure to communities and households in the light of the introduction of the Low Emission Zone and the availability of geo-referenced air pollution data
- The location and distribution and social and economic circumstances of different population sub-groups e.g. BME groups such African or East European populations or more detailed breakdowns by individual countries e.g. Lithuania, Romania, Somalia, Uganda, Zimbabwe

3.3 Conceptualising bespoke applications

Many issues addressed locally do not fall neatly into neat organisational categories, which is why partnership and data sharing are important. Bespoke applications are generated by cross cutting issues between sectors within one organisation or between organisations.

By providing joined up data at household level the initial set up costs of intelligence gathering are avoided. Applications may include cross-sectional work such as JSNAs[19] or issues that are specific to particular service providers or directorates or commissioners such as child care.

Two policy changes at national level reinforce the necessity to improve local information and intelligence. The first are reforms to the health and social care system which will place greater emphasis on local commissioning of health and social care services plus greater accountability.

The main vehicle for this is the Health and Social Care Bill which will see the creation of Health and Wellbeing Boards and ascribing specific new functions to them including oversight of health needs of local authority residents.

Applications may focus on demographic segments of the population such as children or older people and involve a range of providers in the statutory or third sector and in some cases the private sector. They may also focus on whole sectors such as policing, the economically inactive population, leisure, the environment and so on.

[19] Joint Strategic Needs Assessment, one of the duties to be assigned to Health and Well-Being Boards

The range of applications illustrated in Figure 4 is based on around sixty past studies we have been involved with. It conveys the key idea that the real world does not dovetail neatly into organisations and instead cuts across organisational boundaries and responsibilities.

The pie chart may be thought of as the information silos that define and divide different sectors of local administration and as such are historical accidents from previous administrations and policies, which are constrained by history and cumulative inertia.

Over time each has built up separate information systems which are not harmonised in a statistically efficient way thereby making it more difficult to compare and analyse information and hence work together.

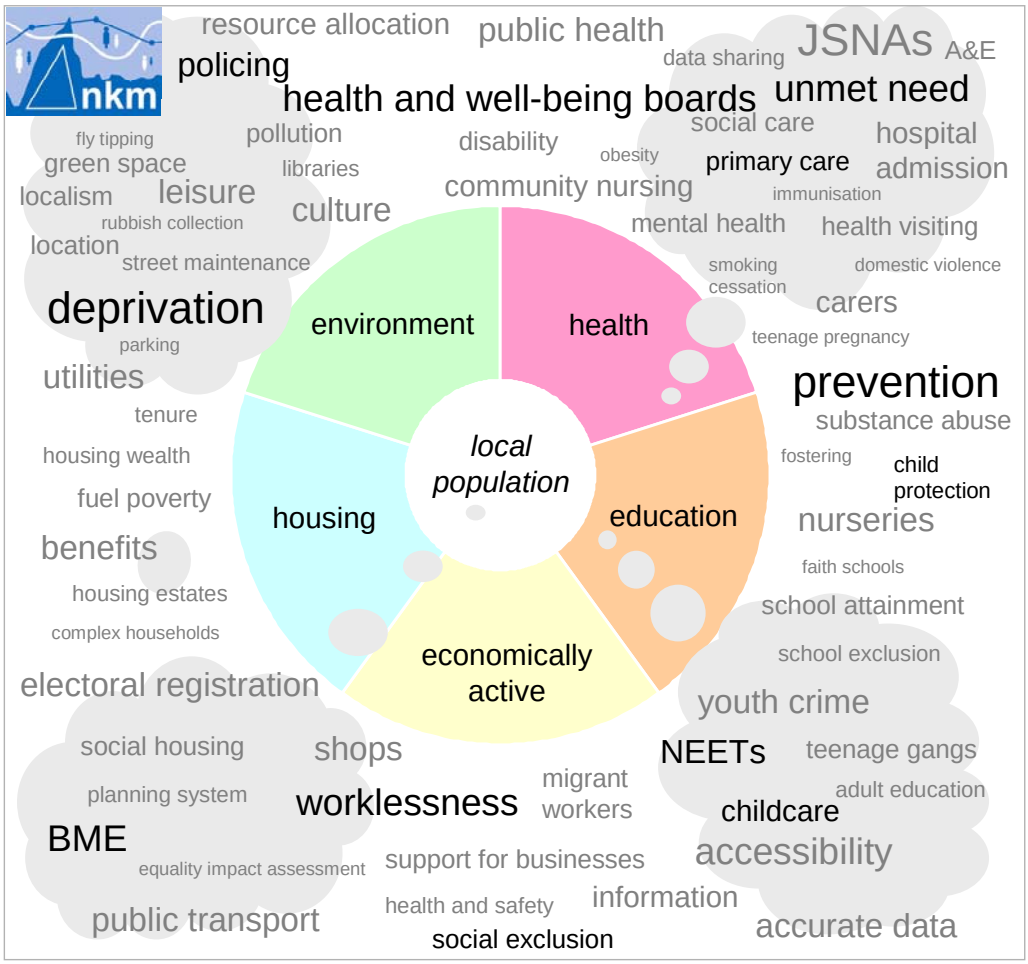

Figure 4: Examples of applications conducted for local authorities, health providers and others using nkm approach

3.3.1 Example of applications crossing organisational boundaries

In 2010, Tower Hamlets PCT wished to put a value on the costs of admissions among different risk groups within the 65+ population, depending whether they live alone, are aged 75+ and/or are on benefits. This had implications for how services would be commissioned and delivered to this group in future and to the relationship with social care.

This represented a small part of a wider piece of work to determine the impact of inequalities on health care costs and access to health care to assist in the redesign and targeting of services.

Table 10 links *nkm* population data from 2009 with admissions data for 2007 to 2009 for people living in Tower Hamlets. Secondary care costs and admission rates are ranked from highest to lowest cost per head based on the three given risk factors.

Costs are based on NHS provided HRG[20] values for each admission including the market forces factor; the denominator is based on *nkm* population data. The table segments each group and calculates usage and the average and total costs of admission for each risk group.

Column totals indicate the population in thousands who are living with each given risk factor. The table shows a more than two-fold variation in average costs between the highest risk group in row one and the lowest risk group in row 8.

Risk group	population size (000s)	A living alone	B aged 75+	C receiving benefits	admissions per 000 per year	annual cost per head of population £s
1	2.0	Y	Y	Y	573	1192
2	2.4		Y	Y	613	1101
3	1.0	Y	Y		607	1035
4	1.4		Y		590	944
5	1.5	Y		Y	483	799
6	3.6			Y	466	708
7	0.9	Y			355	642
8	2.2				405	551
Total	15.0	5.4	6.8	9.5	511	862

Table 9: Population aged 65+ of Tower Hamlets segmented into eight risk groups. Y=risk factor applies

Looking at the average annual cost of hospital admissions for each of the eight resulting groups shows that with none of these risk factors the average admission cost is £551 per person, compared to £1,192 for individuals who are in all three risk groups.

Further analysis showed that costs per person increase by £393 for those aged 75 or over, an additional £157 for those receiving benefits and by £91 for those living alone. The data can also be mapped for each risk group, allowing it to be analysed for gaps and local variations by neighbourhood or GP practice.

According to Somen Banerjee, Tower Hamlets' director of public health, "it [i.e. the new information] enables us to put a cost on local health inequalities and provides the evidence base for different and more innovative interventions and delivery structures"[21].

[20] Health Resource Groups or HRGs are used by the NHS to set standard reimbursements for care carried out. HRGs are intended to group cases of similar clinical character and similar resource use, and as such can be a valuable tool for targeting and using NHS resources.

3.3.2 Example to identify East European population by country of origin

Comprehensive data on ethnicity is very sparse. The last available data are from the 2001 census but the classifications used and the detail provided do not reflect users' needs today because the data are insufficiently detailed, out of date and do not take into account the significant influxes of people of different nationalities into London.

Migration continues to be an important policy issue across the Capital. One focus of interest is the size and distribution of the East European community which has grown since EU accession under the free movement of labour and single market.

Questions arising about this population include whether their number is growing or they are returning home, settling in this country and starting families, or if their unemployment levels differ significantly from the rest of the population and their housing needs.

There is little reliable information on this community apart from that contained in the International Passenger Survey and only partial information from the 2001 census. Other official sources on data by country of origin such as new National Insurance registrations are misleading and partial[22].

Using language, self reported ethnicity and *nkm* techniques, we used the data given to us to estimate the size of the East European Community in four of the six boroughs. Results are shown in Table 10 and were current at 27/3/11.

Similar techniques can be used to subdivide populations from, for example, the African continent into individual countries. People from African countries are not a homogenous group and may differ in language, culture and health needs.

Using these techniques, populations can be grouped into households, neighbourhoods or other geographies and analysed by tenure, benefit status etc. They can also be mapped for evidence for example of clustering or over-crowding.

[21] "How Tower Hamlets joins up social care and health data: Combining data from different parts of the state sector can produce rich results". Guardian, 9th November 2011: http://www.guardian.co.uk/social-care-network/2011/nov/09/tower-hamlets-social-care-health-data

[22] See for example *nkm* study of Luton, 'The growth and changing complexion of Luton's population: A structural analysis and decomposition' at:: http://www.luton.gov.uk/Media%20Library/Pdf/Environment%20&%20regeneration/Planning/Observatory/Growth%20of%20Luton%20Population.pdf

Country of origin	Greenwich	Hackney	Tower Hamlets	Newham	total
Poland	1,372	2,463	1,198	3,084	8,117
Lithuania	796	126	356	3,533	4,811
Albania	1,005	677	346	1,192	3,220
Romania	615	313	205	1,913	3,046
Russia	429	270	309	685	1,693
Bulgaria	305	163	204	884	1,555
Slovakia	120	70	41	237	468
Hungary	128	116	79	133	455
Serbia	88	112	82	120	403
Czech Republic	95	60	37	91	282
Latvia	62	22	28	136	248
Ukraine	54	20	23	92	188
Croatia	39	37	22	19	117
Slovenia	5	9	3	47	65
Macedonia	12	4	3	13	32
Chechnya	3	8	2	6	20
Bosnia	2	12	3	9	27
Georgia	3	2	2	6	13
Total	5,133	4,484	2,943	12,199	24,759

Table 10: The estimated East European population by local authority and country of origin in four of the six Olympic Boroughs

3.3.3 Example evaluating impact of housing renewal on income deprivation

Local authorities, alongside private developers, are investing large amounts in new infrastructure and housing in east London as part of long term growth and regeneration strategies.

To analyse how these strategies were impacting on Newham, in 2008 we compared ‘new builds’ with ‘old builds. New builds are recently completed dwellings at a number of sites around the borough which have been the subject of new investment by developers. Old builds are the predating stock of housing.

Figure 5 is a map of Newham from the time showing new and old builds. Overlaid on the map is a 0.5 x 0.5 sq km grid for ease of identification of small areas cell such as cell N15 where there is a cluster of ‘new builds’ as part of the Royal Docks development.

One question sought in the evaluation was what are the types of people moving into regenerated areas and in what respects they were different – their ages, whether economically active and so forth. We analysed the type and occupants of new households and compared them with those in ‘old-builds’.

Of the 96k properties in Newham with a UPRN (Unique Property Reference Number) at the time, 92k were designated as ‘old builds’ and 4.6k properties as ‘new builds’ (as defined by Newham Council).

Based on an analysis of all 96k properties at the time it was established that the people moving into new builds were significantly different from those living or moving into 'old builds'.

For example, new builds were:

- 2.7 times less likely to be in receipt of means tested benefits than old builds
- 1.3 times more likely to be in Council Tax Band B and above (bands are a proxy for house value)
- 1.3 times less likely to have children living in them
- 4.8 times more likely to be privately owned

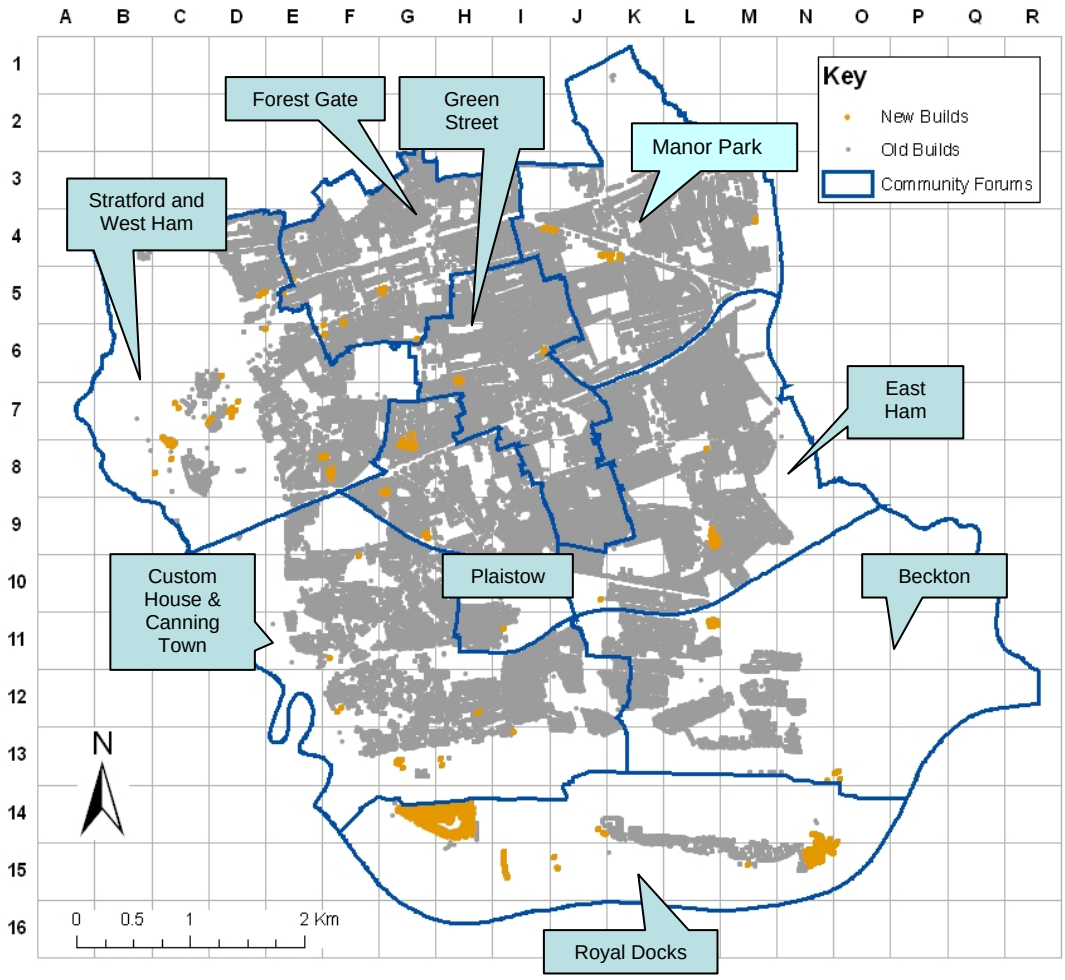

Figure 5: Map of Newham showing locations of new and old builds including community forum boundaries

(Contains Ordnance Survey data © Crown copyright and database right 2010)

3.3.4 Example identifying population turnover and change by small area

High population churn impacts on local services and areas in a number of ways. An area with high churn will generally be a greater burden on local services even though the population may be identical.

Population turnover measures the magnitude of flows into and out of an area. However, churn or turnover can only be measured once there are at least two population snapshots in place at different times.

For example, the population of an area may be unchanged, but the people that live there may be completely different from those at a previous snapshot. Suppose an area retained exactly the same people between two points in time, then the turnover is defined as zero.

Conversely, if the population is unchanged in size but the already resident population were all replaced by new people, the churn index would take a value of 100%. To take into account intermediate cases, we combine both inflow and outflow by creating an index that represents in-between cases on a scale ranging from 0% to 100%.

The results of applying this index to each LSOA are shown in the form of a map of Barking and Dagenham in Figure 6, in which the first snapshot was taken in 2008 and the second in 2011.

In the map, LSOAs are colour coded according to the amount of churn. Areas with the highest turnover are coloured dark blue and those with the least are coloured from green to yellow (least).

Turnover rates of over 35% are evident in LSOAs situated in cells A14 to D15, corresponding to Barking town centre and its environs. Elsewhere in the borough rates are typically between 16% and 20% with one LSOA in cell L9 with less than 15% churn.

In general, the level of churn in Barking and Dagenham tends to be less than that in the other London boroughs over equivalent periods of time. On the other hand high churn is frequently concentrated in favoured locations in each case.

In Greenwich high turnover is occurs in the north of the borough and in areas where former housing estates have been redeveloped; in Hackney highest turnover occurs near the border with Islington and Tower Hamlets and on the border with the City of London.

In Newham, highest turnover is in the four geographical corners – north east, north west, south east and south west - all areas of intensive regeneration; in Tower Hamlets highest levels of churn are in the Millwall area and neighbourhoods bordering the Mile End road especially to the west; in Waltham Forest highest turnover is concentrated in a small area in the south between the A12 trunk road and northern border with Newham.

It is noteworthy that where each borough borders the Olympic Park, churn tends to be highest which makes sense since these areas are likely to be temporary home to construction workers and others working on the site.

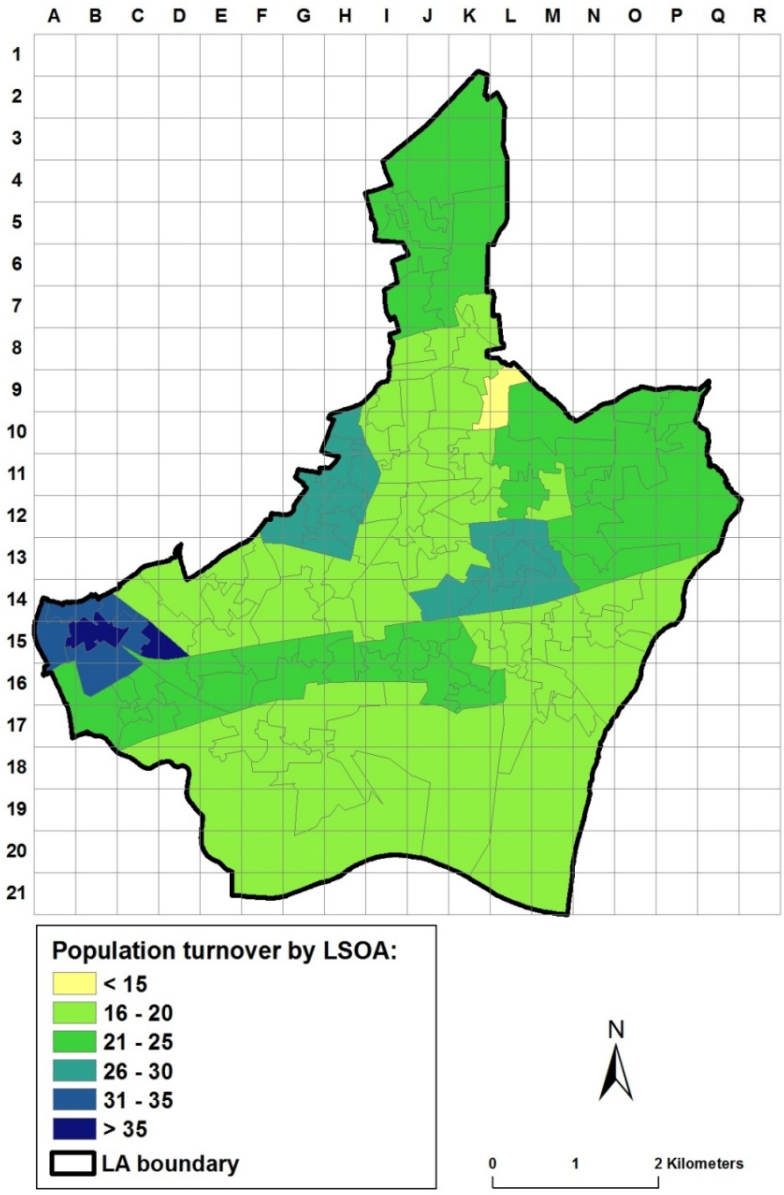

Figure 6: Population churn by LSOA in Barking and Dagenham by LSOA between 2008 and 2011 (%)

(Contains Ordnance Survey data © Crown copyright and database right 2010)

3.3.5 Example based on data visualisation

In is generally accepted that visualisation of data in the form of maps or charts helps to simplify complex issues. All data in the *nkm* database are geo-referenced at a household level or address and can therefore be mapped using GIS.

Flat maps however may not necessarily give a true impression of concentration for example the spatial incidence of high rise blocks. In the database, high rises and flats share the same x,

y co-ordinates and so stacked on top of one another they can give a 3-D impression of the built environment.

Variables such as household type, person age, gender and ethnicity are assigned to each location and so it is possible to visualise other landscapes to create impressionistic 3-D pictures of an area.

Figure 7(a) shows occupied households in Tower Hamlets at 27/3/2011 and illustrates how regeneration and new developments are transforming areas of the borough, particularly on the Isle of Dogs south of row 10.

Figure 7(b) on the other hand plots low income households that are in receipt of means tested benefits and therefore an indication of local concentrations of deprivation.

This figure tends to shows a sparser distribution of households in the south and higher concentrations of deprivation tend to occur between rows 6 and 9 in an east-west strip.

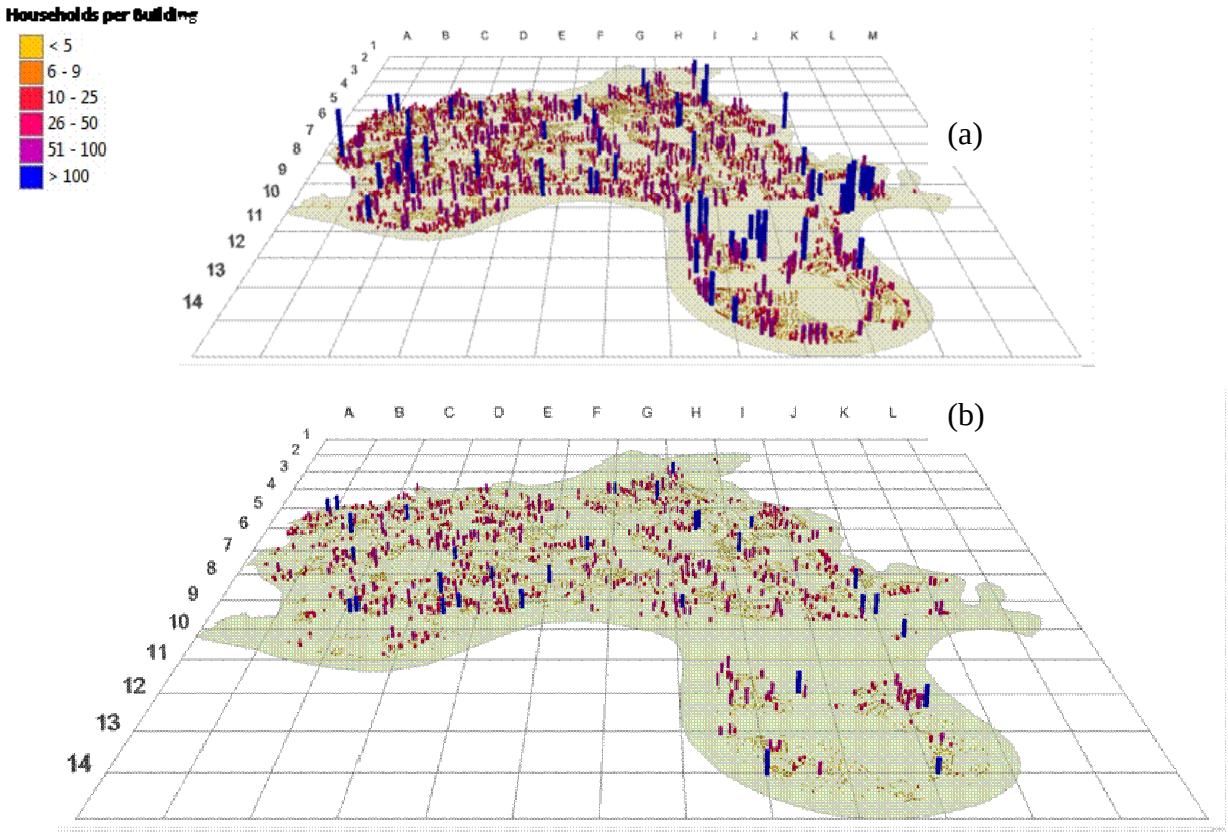

Figure 7: (a) 3-D representation of occupied properties in Tower hamlets; (b) 3-D representation of households in properties in receipt of means tested benefits at 27/3/2011

3.3.6 Example based on impact of proposed new transport infrastructure

In his Autumn Statement, Chancellor George Osborne announced that the government would explore proposals with the Mayor for three new Thames crossings. Whereas west London has numerous Thames crossings, east London has only three fixed crossing downstream of Tower Bridge.

The impact on population housing and employment will determine in large part whether these crossing come to fruition. In previous research, Hyman and Mayhew (2008)[23] evaluated the impact of a possible new Thames river crossing at Woolwich.

They calculated its geographical market share taking into account the existing crossing at Dartford linking the M25, and the congestion charge area of central London, which has the effect of diverting some journeys that would otherwise have crossed central London.

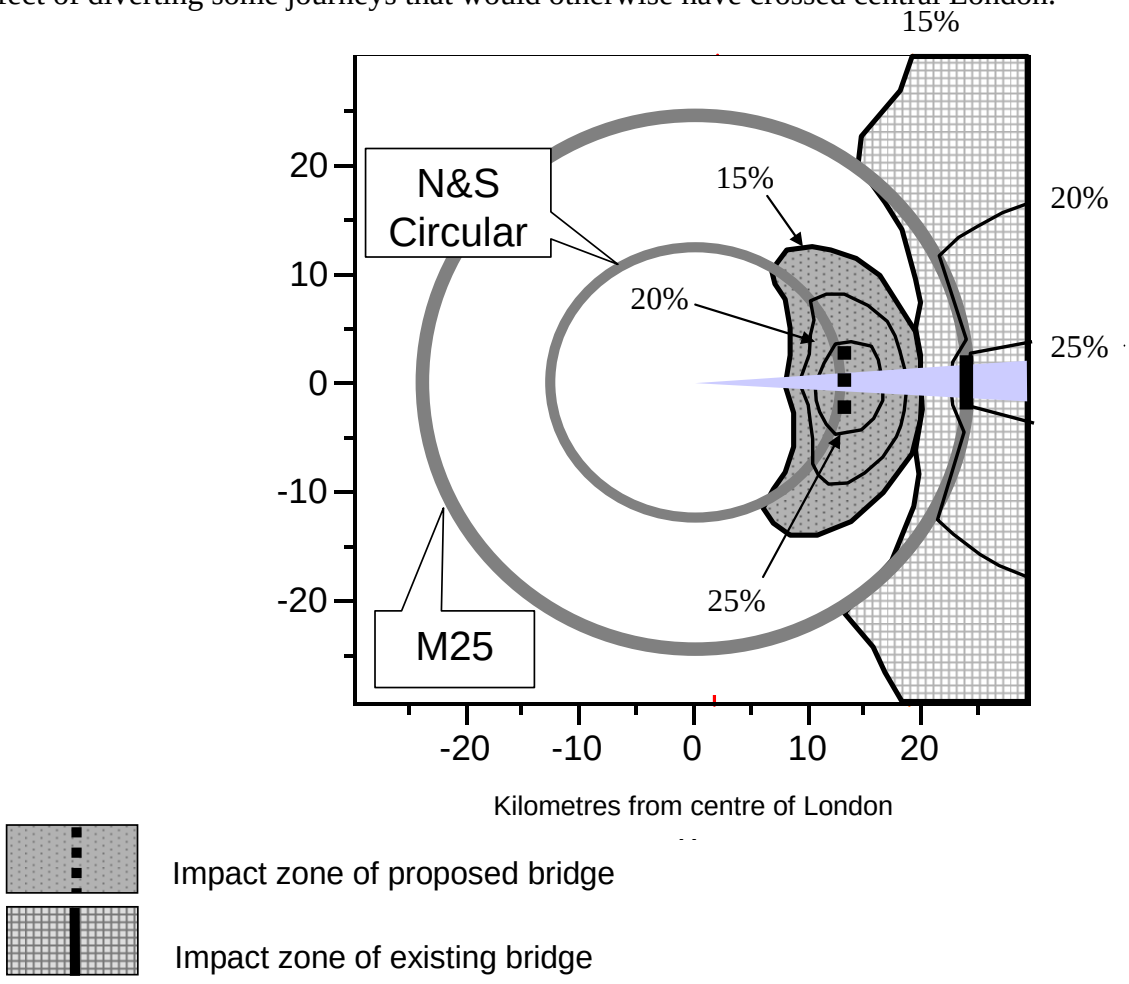

Figure 8: Schematic diagram of the estimated impact of new east London River crossing showing the market share of a new bridge at Woolwich and the existing bridge joining the M25 orbital at Dartford

[23] 'Toll optimisation on river crossings serving large cities'. G. Hyman and L. Mayhew (2008). Transportation Research Part A. http://www.sciencedirect.com/science/article/pii/S0965856407000493

A schematic diagram of the results is shown in Figure 8 which is based on a generalised map of London with its two main orbital routes: the North and South Circular road and the M25. In the model underpinning the map, there are three ways of accessing locations in London if trips that cross central London are included.

If the market share of any route from any given location is calculated to be say 25%, it means that it will be favoured on journey cost grounds over all other routes to any location in 25% of journeys from locations within the M25.

The market shares for the new and old bridges are plotted as contours. The contour values shown are 15%, 20% and 25% of all journeys inside the built up area. The dark shaded area is defined as the impact zone for the new bridge and the light shaded area as the impact zone for the existing bridge at Dartford.

A key finding is that a new bridge would be unlikely to attract much traffic into London from outside the M25 radius and thus reduce fears that it external trips would divert into East London and negatively impact on the environment[24].

Given the flexibility of the *nkm* data base it would be possible to estimate with considerable precision how many households and people would be affected and the volume of users crossing the Thames at the new crossing and hence the economic benefits and environmental impacts.

4. Conclusions

The aims of this summary report were four-fold

1. To present the results based on the six boroughs in summary form, including a comparison ONS estimates and with the GLA population estimates
2. To identify similarities and differences in population, household structures, ethnicity and deprivation
3. Using examples show how the database can be combined for general use at the six-borough level
4. Show how the databases can be maintained to enhance efficiency and facilitate joined up working within and between public sector organizations

With regard to the first two aims, the main findings are that administrative counts using the *nkm* methodology are on average 3.5% higher than GLA estimates and 9.5% higher than ONS's for the same year.

Of the 135,787 six borough difference between *nkm* and the ONS, 46.2% is accounted for by Newham; of the 49,161 difference between *nkm* and GLA, 61.2% is accounted for by Newham.

In November 2011, ONS published new indicative estimates based on their revised migration methodology but not on the latest census results (which are not due until July 2012).

[24] In the model a toll of £1 is applied at both Dartford and on the new crossing. The central London congestion charge is set at is value in 2008 when the research was conducted.

These show that the gap between *nkm* and ONS has fallen by nearly half to 67,963 or 4.9%. The next opportunity to compare *nkm* will be in July 2012 when ONS publishes headline figures for each local authority.

More detailed analysis showed the population of the six boroughs were generally young compared with the England average. There had been significant changes in the ethnic structure of local populations since 2001 with White groups taking up a smaller share. There were also distinctive patterns of deprivation among household types and also wide income inequalities between and within areas.

With regard to the third aim, examples were split into either six borough applications or bespoke individual borough applications. At the six-borough level applications including work on housing, migration and population churn and growth strategies were suggested. It was noted that, with the addition of other data sets, it would be possible to tackle economic or other dimensions such as crime or the environment at both local and regional levels.

At the borough level, examples were provided based on over 60 previous applications in sectors including health, the environment, housing, and economic activity and education. Other data sets to help facilitate these applications were identified for specific purposes.

Six examples were presented showing the adaptability, relevance and added value of local administrative data in key policy areas. In none of these applications would it be possible to use census data as an alternative due to its inflexibility, lack of granularity and detail, and because it is always out of date.

With regard to fourth aim, the anonymised database contains almost 1.5m geo-referenced records covering the entire population with around 50 variables attached to each record. These can be manipulated to any level or geography or any subset of the population by person, household, ethnicity or neighbourhood.

Details of how to maintain and extend the database by adding other administrative data sets were described and examples provided. Administrative data is more timely, accurate and flexible than external sources and can improve efficiency and reduce costs.

There is much that organisations can do to facilitate this process e.g. using common identifiers such as UPRNs and adhering to British addressing standards. The database is the product of a partnership between organisations and therefore confidential issues need to be preserved and maintained through secure processing and rigorous protocols.

This work has covered the six boroughs with a combined population of nearly 1.5m people and was completed in less than six months. Given its strategic value, we believe that given the lessons of the last six months and the levels of co-operation achieved between the six boroughs and data providing organisations, it would not be a major undertaking to extend the work to the whole of the GLA area with Local Authorities and partners maintaining ownership of the data.