

Data Management and Analysis Group

Integrating the 2001 Census into the GLA Demographic Models

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Introduction

This Briefing sets out the planned timetable of actions required to fully update the GLA suite of demographic models to account for all relevant results from the 2001 Census and associated datasets. It also sets out the main processes performed by each of the models.

Background

The annual rounds of GLA Demographic Projections are prepared on a suite of five linked models. The **main (borough population) model** projects the borough populations (single years of age and gender) based upon recent migration patterns. A closely linked **borough household model** can either be run sequentially after the population model to convert the results to households (households by type and age/gender/marital status of the household 'representative') or may be used in an iterative way with the population model to prepare dwelling stock led population and household projections. The **borough resident labour force model** converts the total population aged 16+ (by age groups and gender) to annual estimates of the resident economically active population. The **borough ethnic group model** distributes the results of a population projection to ethnic groups (single years of age and gender). The **ward population models** distribute the results of a population projection in a borough to each of the wards (single years of age and gender).

All models relate to each of the 32 London boroughs and the City of London with the exception of the ward models. The small sizes of the resident populations of the City of London's wards mean that it is not feasible to produce such projections. The borough population model is a true multi-area model that links the boroughs together through the likelihood of migration between them. Hence a migrant from borough A to borough B is subtracted from the population of A and added to that of B. The household, labour force and ward models do not require this linking feature, but a rudimentary version of it does operate within the ethnic group model.

This Briefing indicates the stepwise improvements in the models to accommodate all 2001 Census information; newly arriving annual data on vital statistics, migration, and electorates; and major new sources: the GAD 2002-based national fertility and migration forecasts, the ODPM 2002-based household representative rates and the next London Housing Capacity Study.

Data Requirements

The models each require a base year. At present that year is 1991, but as more 2001 Census data are made available the bases will be brought forward to 2001. However, the nominal start point for the projection is mid-year (June 30) rather than Census time: nine weeks earlier. The key reason for this is that ONS annually produce a population estimate for local authorities at mid-year and that the main components of change – births, deaths, migration – are therefore available on a consistent basis for consistent time periods. The government (GAD, ONS and ODPM) also work on the basis of mid-year for their population and household projections. The bases of the GLA models are now being established to be consistent with the mid-year population estimates for 2001. These estimates were released in October 2002, but have subsequently been

revised in September 2003. Further adjustments may be made in 2004 depending upon the results of ongoing research.

Several populations are required: total resident population, students living away from the parental home, residents in communal establishments and residents in private households. All these populations are specific to single years of age and gender. In addition household projections require details about marital status (married or non-married) of the private household populations by age groups and gender.

The main modules of the borough population and household models are:

- Students
- Mortality and Ageing
- Fertility
- Migration
- Private household/communal establishment population
- Marital status of private household population
- Household 'representatives'

When using the population and household models iteratively to develop projections led by forecasts of the future available dwelling supply, an additional module uses household sharing, dwelling sharing, dwelling vacancy and households in non-permanent dwellings to estimate future capacity of the dwelling supply.

Modules

Students – the population of students who are resident in each borough, but not at their parental address, are subtracted from the total resident population. It is assumed that this population will remain constant (age and gender) over time. It is added back at the end of each annual cycle. It may be amended during a year if evidence of change is available. This population is not subject to any mortality, fertility or migration.

Mortality and Ageing – the population is survived by one year using age-specific borough group life table survival rates. In each borough there is a check against the actual number of deaths in years for which this is already known. In years for which there are no preset death totals a borough level adjustment factor, based upon the latest years for which deaths were known, is applied together with the survival rates. Survival rates are annually improved in a way consistent with the Government Actuary's most recent national projection.

Fertility – at the beginning of each projection year age-specific fertility rates are applied to the resident female population aged 15-49 in single years of age. The same rates are applied at the end of each year after survival and migration have been applied. The resulting numbers of births are averaged in each borough and converted to males and females using sex ratios at birth based upon the most recent years. In years where the actual number of births are known the schedule of fertility rates is adjusted accordingly. Adjusted fertility rates for the preceding year are used as the basis for the following year's rates with an overall adjustment to enable the trends in the Government Actuary's most recent national projection of total fertility to be followed. The resulting numbers of births are survived to the end of the projection year in which they were born to become the projected population of 0-year olds.

Migration (from outside London) – is calculated annually using either actual estimated flows or a trend-based forecast of flows into each borough from the rest of the UK and Overseas. The annual totals are distributed by age and gender using the structures of the flows based upon the most recent Census.

Migration (within London) – is calculated using an initial matrix of moves between the boroughs that is based upon the latest Census and the National Health Service Central Register for the year after that Census. The flows are replicated using age and gender specific probabilities of leaving a borough group for each other group. These probabilities are based upon the last Census. These are applied to the populations of each origin borough. The probabilities are adjusted to replicate borough-to-borough moves in the initial matrix. The adjustment factors are also used in later years.

Migration (to beyond London) – is calculated in a similar way to migration within London. An initial matrix of moves from each borough to destinations in the rest of the UK and Overseas is set up. The flows are replicated using age and gender specific probabilities of leaving a borough group for each external destination. These are applied to the populations of each origin borough. The probabilities are adjusted to replicate borough-to-destination moves in the initial matrix. The adjustment factors are also used in later years.

Net Migration – is set in the initial years of the projection either when the level is known or in the first year (or years) of the projection based upon an assumption that is being examined. After calculating all gross flows the resulting net flow is compared with the target. If the projected net flow needs adjustment the total outflows from each borough are adjusted in order to match the required level. This process is iterative as an altered flow out of one borough could impact the inflows to each other borough. The final adjustment factors are able to be used in subsequent years for which no specific net migration assumptions have been made.

This completes the annual cycle in the migration led population projection.

Private Household Population – is necessary to calculate the number of households. Using the most recent Census the proportion of the total population (by age and gender) that is resident in private households in each borough is assumed to be constant. The proportions may be changed at later dates if there is evidence.

Marital Status – the private household population aged over 15 (by 5-year age groups and gender) is converted to married and non-married using borough-specific proportions. The proportions from the previous Census are adjusted in line with the latest Government Actuary's projection for England & Wales.

Household Representative Rates – ODPM calculates appropriate rates from the previous Census for each borough specific to age, gender, marital status and household type. These rates are projected forward every fifth year. There are five household types – married couples (which, in order to standardise the projection methodology, are conventionally represented only by married males), cohabiting couples (which, for the purposes of projection methodology, are conventionally represented only by males), lone parents, 2+ persons with no family and one-person living alone. There are also three types of concealed family, relating to families that do not head their own households. The rates are applied to the borough private household populations.

Household and Dwelling Factors – from the previous Census four factors are calculated for each borough: proportion of households living in non-permanent dwellings (ie caravans, etc), proportion of households that share with other households, average number of sharing households per shared dwelling and proportion of dwellings that are vacant, second homes or not otherwise used as a primary residence of at least one household. These factors may be held constant or varied through time. These factors enable the projected number of households to be converted to the likely number of required dwellings. Alternatively, if a forecast of total dwellings is available it can be converted to the likely number of households that can be accommodated. By utilising the out-migration factors for each borough (see above) this can be used to set the total population that can be housed.

This completes the annual cycle in the household projection, and, if necessary, the dwellings led population projection.

The **labour force model** uses economic activity rates by age and gender for residents of each borough based upon the previous Census. These rates are improved in line with the most recent national projection of the labour force prepared by ONS. The resulting rates are applied to the appropriate projected populations.

The **ward models** use trends in estimated future dwelling stocks and (in years where known) actual changes in the electorates at ward level to distribute the projected borough populations by age and gender. The starting ward populations are based upon the latest Census populations adjusted to match the appropriate borough mid-year population estimate. Allowance is made for the population resident in communal establishments and actual numbers of births and deaths in recent years.

The **ethnic group model** uses the most recent Census to extract the population by age and gender in each of the appropriate ethnic groups. These populations are then adjusted to match the relevant mid-year estimate. Adjusted life table survival rates and age-specific fertility rates are applied to each population. Total births and deaths are constrained to the borough population projection. Allowance is made for women from one ethnic group having a child that is assigned to another group. Census data on migration flows of each ethnic group are used to enhance the local population, redistribute the population between boroughs and move people away from London. Flows between boroughs are not specific to age and gender, but for an individual borough the gross inflows and outflows for all ethnic groups are controlled to match the results of the main borough projection model. Finally the results are constrained by age and gender to match the 'control' borough population projection.

Timetable for Updating the Models

The following timetable is dependent upon the release of specific data sets by ONS, and to a certain extent GAD and ODPM. While every effort will be made to keep to the timetable, in certain circumstances it may be necessary to choose between delay or non-inclusion of an expected new input. The basic timetable to produce borough population and household projections in September/October each year is critically dependent upon the release of new mid-year estimates. From 2004 these are expected to be made available in late August. The other projections are then dependent upon the borough population results.

Borough: Population

Base Population	2001 Revised MYE (Completed September 2003)
Students	2001 Census data on students living away from parental home aged 18-24 by SYA and gender (Commissioned Table expected in 2004)
Births and Deaths	Add in data (mid-to mid-year) from mid-2001 from ONS Vital Statistics (Completed November 2003)
2001-02 Migration	Matrix from ONS (Provisionally Completed August 2003)
Migration	Design commissioned 2001 Census migration tables (Commissioned Table expected in 2004)
Model	Minor revisions (Partly completed September 2002, more in Summer 2004)
2003 Round	To be produced after receipt from ONS of 2002 MYE and ancillary data (November 2003). This round will project from 1991 and insert 2001 MYE values at appropriate stage.
2004 Round	September/October 2004 will incorporate annual changes up to mid-2003, full 2001 Census migration data, fertility and mortality trends from GAD 2002-based national projections and will move the base to 2001 (rather than 1991).
2005 Round	September/October 2005 will incorporate annual changes up to mid-2004.
2006 Round	September/October 2006 will incorporate annual changes up to mid-2005, fertility and mortality trends from GAD 2004-based national projections and the results of the next London Housing Capacity Study. It will be possible to do dwelling stock led projections.

Borough: Households

Marital Status	2001 Census data (Available Summer 2003), but cannot fully update until GAD 2002-based projections (Summer 2004)
Private Household Population	2001 Census data (Available Summer 2003)
'Representative' Rates	2001 Census data (Available Summer 2003), but cannot update until ODPM 2002-based projections (Spring 2005)
Dwellings	2001 Census data on vacancy, sharing etc (Available Summer 2003). However, these will not be employed until Spring 2005, see below.
Model	Minor revisions (August 2003) but more significant revisions in Spring 2005
2003 Round	To be produced after receipt from ONS of 2002 MYE and ancillary data (November 2003). As this will be a hybrid projection still using 1991 Census based household representative rates it will not be distributed.
2004 Round	September/October 2004 . As this will also be a hybrid projection using 1991 Census based household representative rates it will not be distributed. It will incorporate GAD 2002-based projections of marital status.
2005 Round	September/October 2005 . This will be the first full update, as it will incorporate ODPM 2002-based projections of household representative rates.
2006 Round	September/October 2006 will incorporate the results of the next London Housing Capacity Study. It will be possible to do dwelling stock led projections.

Borough: Economic Activity

Economic Activity Rates 2001 Census data (**available Summer 2003**), but cannot fully update until new ONS national labour force projections are available (**Sometime in 2004**)

Model Minor revisions (**August 2003**)

2003 Round Provisional projections in **January 2004** but final results dependent upon the ONS national projection.

2004 Round **October 2004.**

2005 Round **October 2005.**

2006 Round **October 2006.**

Borough: Ethnic Group

Base Population	2001 Census residents by age, gender and new ethnic groups grossed to 2001 revised MYE at borough level (November 2003)
Revised Model	Design already commenced but need to confirm exact approach. Issues are: which 'basic' groups to project, whether a separate approach outside the main model is needed for 'non-basic' groups, how we handle mixed categories, ethnic group of child in relation to ethnic group of mother, updating ethnic group fertility relationships to standard ONS data, whether we pay any attention to religion. (November/December 2003) . Final redesign will await migration and child/mother/father data.
Migration	Design commissioned 2001 Census migration tables by ethnic groups (Commissioned Table expected in 2004)
Fertility	Use Health Episode Statistics to estimate age-specific fertility (Completed September 2003) . Design commissioned 2001 Census tables showing ethnic group of child and ethnic groups of mother and father (Commissioned Table expected in 2004)
2003 Round	A projection using a provisional model will be ready in March 2004 .
2004 Round	Commence in October 2004 and complete by January 2005 . This is dependent upon getting all ONS data in time.
2005 Round	January 2006 . This should include all ONS data and appropriate model developments.
2006 Round	January 2007 .

Wards

Geography	2002 Wards
Base Population	2001 Census residents by age and gender grossed to 2001 revised MYE at borough level (November 2003)
Births and Deaths	Add in data for mid-2001 to mid-2002 from ONS Vital Statistics (expected November 2003)
Electorate	October 2000, 2001 and 2002 electorate data on new ward boundaries from ONS (expected November 2003)
Development	London Housing Capacity Study data for development from mid-2001 needs to be matched to new ward boundaries. We have digital definitions of the new wards – need to run against the specified site dataset. (December 2003) Individual London borough data to enhance the LHCS if available (December 2003)
2003 Round	January to March 2004. Boroughs will be done in order depending upon whether (or not) GLA does school roll projections and whether (or not) borough provides local development data.
2004 Round	Commence in October 2004 and complete by January 2005 . This will incorporate births and deaths up to mid-2003 and the October 2003 electoral canvass. Additional borough development data if available.
2005 Round	Commence in October 2005 and complete by January 2006 . This will incorporate births and deaths up to mid-2004 and the October 2004 electoral canvass. Additional borough development data if available.
2006 Round	Commence in October 2006 and complete by January 2007 . This will incorporate births and deaths up to mid-2005 and the October 2005 electoral canvass and the results of the next London Housing Capacity Study. It will be possible to do both borough migration trend projections as well as borough dwelling stock led projections

Regular Briefings from the GLA Data Management and Analysis Group

In 2002 DMAG instituted a new series of publications, covering all aspects of DMAG work.

DMAG Briefings now incorporate the *Census Information Notes (CIN)* and *Population Advice Notes (PAN)*. The traditional content of both series will still appear regularly. Some *Briefings* continue to be dual-labelled as *CINs*.

The latest *DMAG Briefings* are:

DMAG 2003/1	Disabled people and the labour market	Lorna Spence
DMAG 2003/2	2001 Borough Demographic Profiles	Baljit Bains/ Iryna Pylypchuk
DMAG 2003/3	2002 Round of Demographic Projections	John Hollis Baljit Bains
DMAG 2003/4	Greater London Demographic Review: 2001	Baljit Bains/ Iryna Pylypchuk
DMAG 2003/5	Census Information Note CIN 2003-1	Eileen Howes
DMAG 2003/6	Third country nationals living in London 2000/01	Lorna Spence
DMAG 2003/7	2001 Census Key Statistics: Initial summary of results	Eileen Howes
DMAG 2003/8	2001 Census Key Statistics: Household variables	John Hollis
DMAG 2003/9	2001 Census Key Statistics: Ethnicity, religion and country of birth	Eileen Howes
DMAG 2003/10	Household Forecasts based on 2001 Census Key Statistics	John Hollis
DMAG 2003/11	2001 Census: Copyright and Licensing for Census users	Rachel Leeser/ Hywel Davies
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DMAG 2003/14	2001 Census Key Statistics: People, Families and Households	Rachel Leeser
DMAG 2003/15	Census Information Note CIN 2003-2	Eileen Howes
DMAG 2003/16	2001 Census Key Statistics: Health Indicators	Gareth Piggott
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DMAG 2003/19	Fertility of Ethnic Groups in London	Ed Klodawski
DMAG 2003/20	ONS 2001 (revised) and 2002 Mid-year Population Estimates	John Hollis/ Baljit Bains
DMAG 2003/21	Workless Households with dependent children in London: Output area maps	Declan Gaffney/ Bill Armstrong
DMAG 2003/23	2001 Census: Ethnic Groups in London and other metropolitan districts	Eileen Howes/ Giorgio Finella

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