

Update 2017-13

GLA small area population projection methodology

2016-based projections

November 2017

Introduction

The GLA produces a range of annually updated demographic projections for London. Among its outputs are projections of the population at small area level. These projections are used by a range of bodies to help plan services and infrastructure in the city. This document outlines the methodology used to produce these projections. The model implementation and methodology for the 2016-based round of projections is the same as the 2015-based projection.

The GLA has previously produced projections for electoral wards. For this latest round, outputs are available for both 2011 census wards and Middle Layer Super Output Areas (MSOA) within London. The decision to produce outputs at MSOA-level was made for two principle reasons: to facilitate the use of the outputs in other models which use geographies aligned to MSOA boundaries; and to provide better utility in those boroughs that have undergone ward boundary changes since the 2011 Census¹. Key data inputs to the model are not available for the revised wards and so all outputs are on the basis of the old ward boundaries, limiting their use in the affected authorities.

Overview of methodology

The projections are produced using a standard cohort component approach which has been adapted to account for limitations in the migration data available at small geographies.

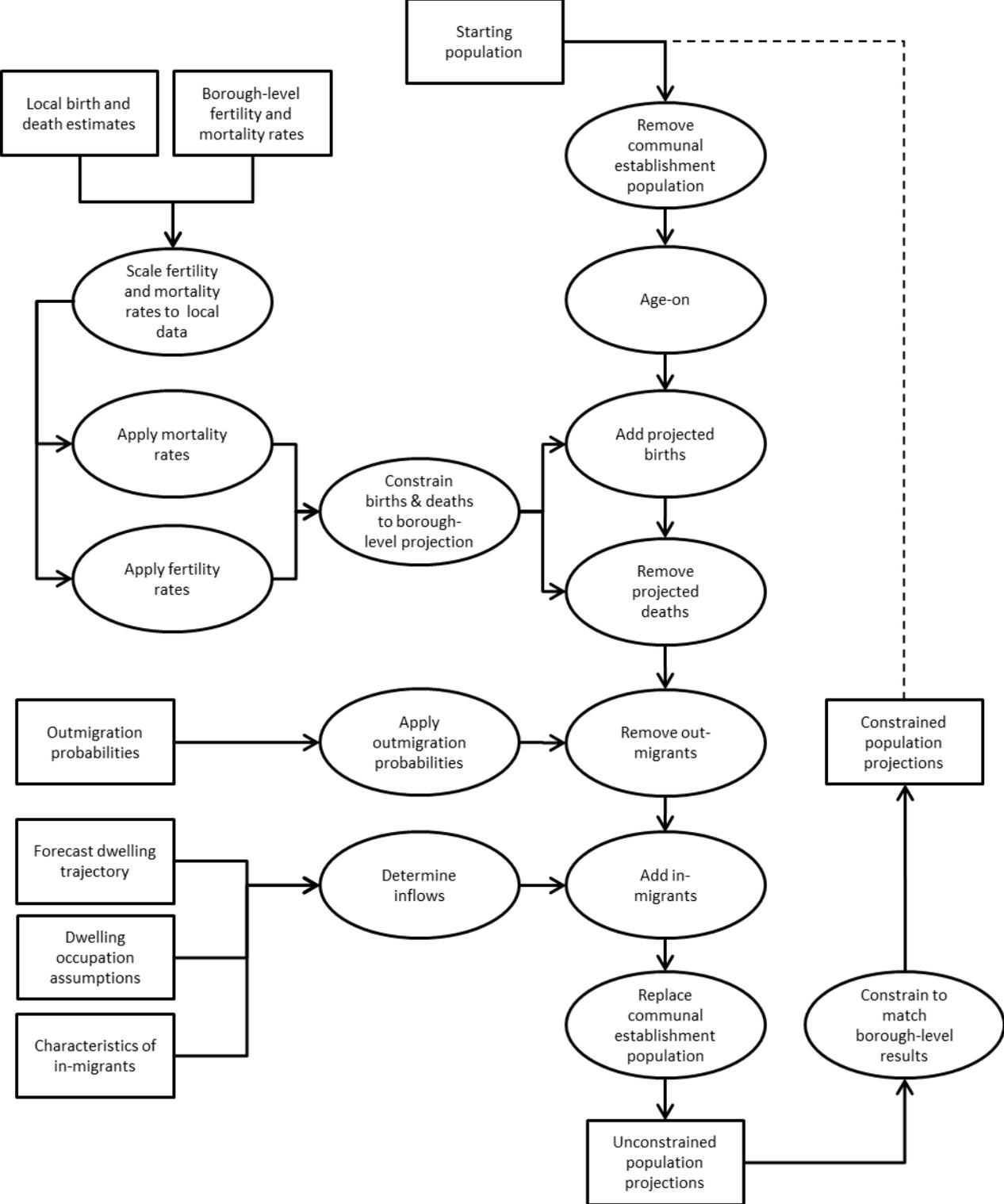
Projections are produced from the starting point of the 2011 census population estimates. These census estimates are scaled to be consistent with the mid-2011 local authority population estimate used in the GLA's borough projections.

Each subsequent year's population is generated by ageing-on the private household population by one year and applying components of population change: births, deaths, and migration. The population living in communal establishments is assumed to be static. The projected components and populations are constrained to match the results of a corresponding set of the GLA's local authority-level projections.

Annual migration flow data is not available below local authority level. The model generates proxy migration flows for each area, primarily using a combination of dwelling occupation assumptions and origin-destination data from the 2011 census, as well as estimated and forecast changes to the available dwelling stock.

¹ Kensington and Chelsea, Hackney, and Tower Hamlets underwent changes to their ward boundaries in 2014

Figure 1: Overview of the small area projection methodology



Communal establishment population

At the start of each projection cycle, the population living in communal establishments (e.g. prisons, boarding schools, and nursing homes) is separated from the total population, leaving only those who are resident in private households. The communal establishment population is assumed to be static, is not aged-on and does not contribute to any of the components of change. The populations are combined again before the small area populations are constrained to match the borough-level projections.

Births

For years with available birth data, these are used within the model as actuals. For projection years, the model generates births by applying a set of age specific fertility rates (ASFR) to the population. For each ward these age-specific rates are based on the rates for the borough as a whole taken from the local authority-level projections. These rates are then rescaled to be consistent with the observed births and estimated population for each area. Several years of birth and population data are used in this process to smooth out fluctuations in the data.

Deaths

This process is similar to that used for births, with age specific mortality rates (ASMR) being taken from the local authority level projection and rescaled to be consistent with observed total deaths for each ward. ASMRs rescaled to each year with death estimates are used to generate deaths by single year of age from the total ward/MSOA deaths which are input to the model. Projected ASMRs are based on several years of death and population estimate data.

Outmigration

Outflows from each ward are projected by applying age and sex specific outmigration probabilities to the population. These probabilities remain fixed throughout the projection period. Increasing populations in an area will therefore tend to lead to increased outflows.

Outmigration probabilities are derived from estimates of moves out of each area. Estimates of domestic moves are based on census origin-destination tables. As the census does not capture international outflows, a separate modelling exercise is undertaken to apportion international outflow from the components of the ONS mid-year estimates to individual areas.

In-migration

The characteristics of moves to each area are taken from census origin-destination tables. The volumes of inflows are determined by the assumed number of dwellings in each area. The inflow to each area is scaled such that the ratio of adults per dwelling in each area remains constant. Assuming a high level of development in an area therefore gives rise to an increased inflow.

Dwelling trajectories for the published projections are based on the following data: dwelling estimates from the 2011 census, completions recorded in the London Development Database, and assumed future changes in dwelling numbers derived from the 2013 Strategic Housing Land Availability Assessment (SHLAA).

Constraint to local authority results

At the end of each year of the projection cycle, the results for all areas within a borough are constrained to match the results of a corresponding set of local authority level projections. For each individual year of age and sex, the outputs for all areas within an authority are scaled by a common factor such that the sum of the populations matches those in the local authority outputs.

Births and deaths are adjusted using a similar process. Total births are scaled to match the borough total. For deaths, a single scaling factor is calculated based on total deaths and this is applied uniformly to all deaths by age and sex.

The gross migration flows cannot be directly scaled in the same way as the other components as the small area flows include moves between areas within the local authority, whereas the flows from the borough outputs only include those moves which cross the local authority boundary. The act of constraining the population and deaths effectively acts to constrain the net migration for constituent areas to match that from the borough projection.

Summary of data sources

2011 census population estimate
DC1117EW, QS103EW

Number of live births and deaths by sex for each Census merged ward and MSOA
Data requested from and published by ONS.

Census communal establishment population
MSOA - DC1104

Migrants in to London by age by sex
Ward - CT0409
MSOA – CT0498, CT0499, CT0496, CT0497

Origin and destination of migrants out of London by age by sex
Ward - CT0356
MSOA - CT0543, CT0544,

International outflows by single year of age and sex
ONS local authority mid-year estimates, detailed components of change

Census dwelling and household estimates
KS401EW

Dwelling completions by ward and MSOA from 2011 onwards
London Development Database

Assumed future net change in dwellings by ward and MSOA
2013 London Strategic housing Land Availability Assessment

Model outputs

The model produces estimated and projected population by single year of age and sex for each area. Component data in the form of births, deaths and net migration are also output by the model.

Due to the large amount of data output from the models, the GLA has produced automatically generated reports giving a summary of the results for each ward. A link to these reports can be found on the London Datastore. If there proves to be sufficient demand, equivalent reports will be issued for the MSOA results.

Model limitations

While, the GLA endeavours to use the best available data and methodologies, users should be aware of the limitations of small area projections when interpreting the results.

Significant uncertainty exists in all demographic projections and this tends to increase as the size of the geography being considered decreases. The principal causes for greater uncertainty in small area projections are:

- Randomness and noise have a greater significance as populations and sample sizes become smaller;
- The characteristics of small areas and populations tend to change more rapidly than for larger regions. As such model assumptions based on past patterns are outdated;
- Data availability is typically worse at lower geographies (especially for migration flows). Many data sets that are available at local authority or national level are available at reduced detail or not at all for lower geographies.

Accuracy of projections is not uniform; varying by age, location, and how far into the future is being projected. Quantifying the uncertainty in projections is challenging and no attempt has been made to do so. Users must make their own judgement about the validity of projecting forward past patterns and trends, and set their expectations accordingly.

The results are published by single year of age and sex to 2050. Providing this level of detail allows users to choose their own aggregations and facilitates onward use in other models. However, the high level of precision with which the outputs are presented should not be taken as an indication of the expected accuracy of the results.

The GLA recommends aggregating the results of the projections wherever possible. The results can be considered more robust for larger age groups and collections of geographic areas.