

# Guide to GLA Population Projection Variants

June 2014

## Introduction

The GLA Intelligence Unit produces annually updated population, household, and school roll projections for London local authorities. In past years the GLA typically issued only one or two different projections in a given year. However, in recent years, the number of projection variants available has increased greatly, with approximately ten sets of population projections being produced for the 2013 round. Among users, this proliferation has led to uncertainty as to the differences between the variants and confusion as to which set of projections to use for a given purpose.

The aim of this note is to give an overview of the population projection variants that the GLA produces and to help users make more informed decisions about which to use. In the following sections, the key differences in the projection models and assumptions are discussed and some general guidance about using the projections is offered.

## Overview of projections

### Housing-linked and trend-based

The borough population projections fall into two categories: those that do and do not include housing development data. Here we will refer to those that include development data as 'development-led' or 'housing-linked' projections and those that do not as 'trend-based' projections.

### Trend-based projections

This category includes the GLA's 'trend-based' borough projections<sup>1</sup> and ONS's subnational projections<sup>2,3</sup>. These are produced by models which project forward on the basis of recent trends in fertility, migration and mortality. These models also include assumptions about how these trends will change in future, e.g. life expectancy will continue to rise.

While no development data is used in the model, past development influences the previous migration trends that are used to project forward. As such, these models implicitly assume that recent development trends will continue in the future.

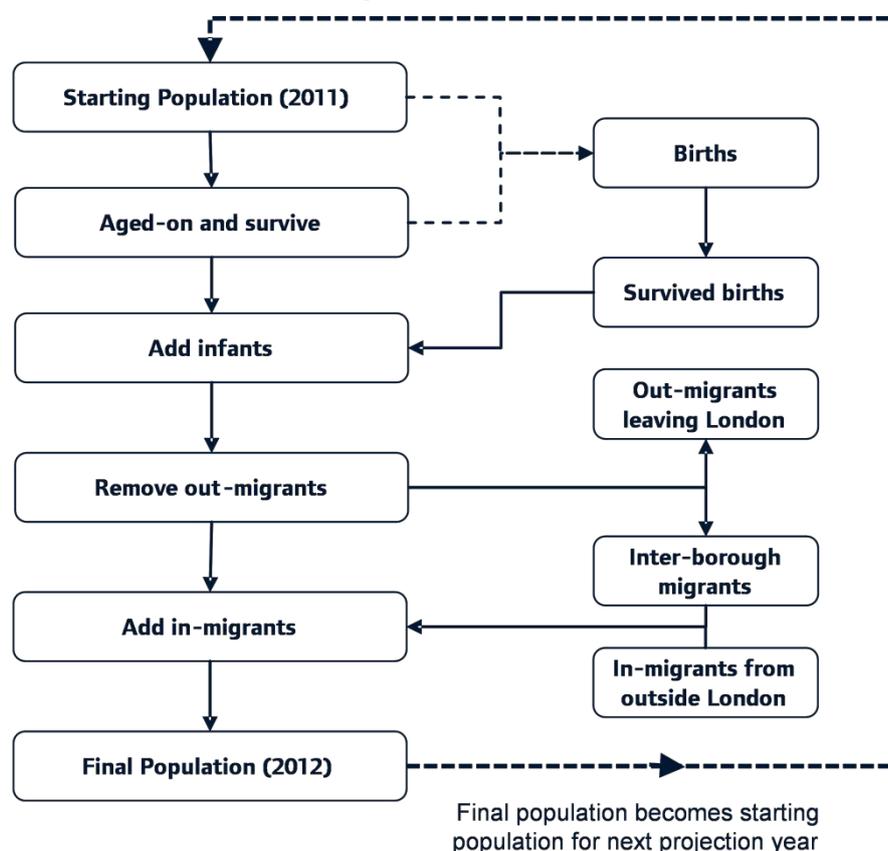
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<sup>1</sup> <http://data.london.gov.uk/datastore/package/gla-2013-round-population-and-household-projections>

<sup>2</sup> <http://www.ons.gov.uk/ons/rel/snpp/sub-national-population-projections/2012-based-projections/index.html>

<sup>3</sup> <http://data.london.gov.uk/datastorefiles/documents/update-08-2014-2012-based-snpp.pdf>

Figure 1: Flow chart of the GLA cohort-component model



Both the GLA and ONS’s trend-based projections use cohort-component models. This is the most popular form of model used for both national and subnational population projections. Many other modelling approaches exist and it is recommended that those interested in the subject read the review of sub-regional population methods produced by Tom Wilson at the Queensland Centre for Population Research<sup>4</sup>.

The GLA produces several variants of trend-based projections. The *Central*, *High*, and *Low* variants differ in their migration assumptions after 2017. The differences in these assumptions and the impact on the projections are covered in a GLA Update<sup>5</sup>

### Housing-linked projections

Housing-linked projections incorporate information about future development with the aim of arriving at a more realistic picture of the future population. The GLA uses two different models to generate housing-linked projections; these are referred to as the *DCLG-based* and the *capped household size* models.

### Development data used

The GLA produces publicly available projections based on the trajectories from the latest Strategic Housing Land Availability Assessment (SHLAA)<sup>6</sup>. The GLA also provides local authorities with projections based on

<sup>4</sup> [Wilson, T. \(2011\) A Review of Sub-Regional Population Methods](http://www.qcpr.org.au/wp-content/uploads/2011/07/Wilson-2011-A-Review-of-Sub-Regional-Population-Methods.pdf)

<sup>5</sup> <http://data.london.gov.uk/datastorefiles/documents/update-04-2014-2013rnd-trend-proj-results.pdf>

<sup>6</sup> <http://www.london.gov.uk/sites/default/files/FALP%20SHLAA%202013.pdf>

the development trajectory of their choice. These projections are designated “BPO” or Borough Preferred Option, and are not made public due to the potential sensitivity of the underlying development assumptions provided by the local authority.

The GLA borough-level models incorporate forecast annual net change in dwellings. No information is currently included about the breakdown of units by bedrooms, type or tenure. For the BPO trajectories, boroughs are encouraged to split development into standard residential and non-self-contained units and these are treated differently in the ward projection model.

### **Linking to housing data**

A number of methodological approaches exist (refer to Tom Wilson’s *Review* to see a range of them), but they all make use of some relationship between dwellings and population. For the 2013 round, the GLA has used two different models to produce its housing-linked projections. These models have been referred to as the “DCLG-based” and “capped household size” models.

### **DCLG-based model**

This method has been employed by the GLA in recent years and is so-called because it incorporates the results of the Department of Communities and Local Government’s (DCLG) household projections to establish the link between population and households.

The methodology makes use of the same cohort-component model employed for the trend-based projections, but now adds an additional stage where migration is adjusted according to the number of available dwelling spaces (in Wilson’s *Review*, this type of model is covered in *Chapter 15 Integrated projection models*). Implicit in this methodology is the assumption that additional dwellings have the same typical occupation characteristics as the local authority’s existing dwelling stock.

1. An initial “candidate” projection is produced using the cohort-component model
2. The population is converted into households by applying household formation rates<sup>7</sup> taken from the DCLG household projections to the population
3. The number of households generated is compared to the available dwelling spaces implied by the housing trajectory
4. If the number of households is greater than the number of available dwelling spaces, then net migration to the local authority is reduced  
If the number of households is lower than the number of available dwelling spaces, then net migration to the local authority is increased
5. The final projection is arrived at when a population is found that yields a matching number of households to available dwelling spaces for each projection year

The model setup determines which migration flows are adjusted in the iteration process. For the GLA’s 2013 round of projections, this adjustment is to migration flows between each London borough and UK regions outside of London. The choice of migration flows to adjust is significant because different flows have different characteristics. For example, outflows from London typically have a higher proportion of children and persons over thirty than inflows to London.

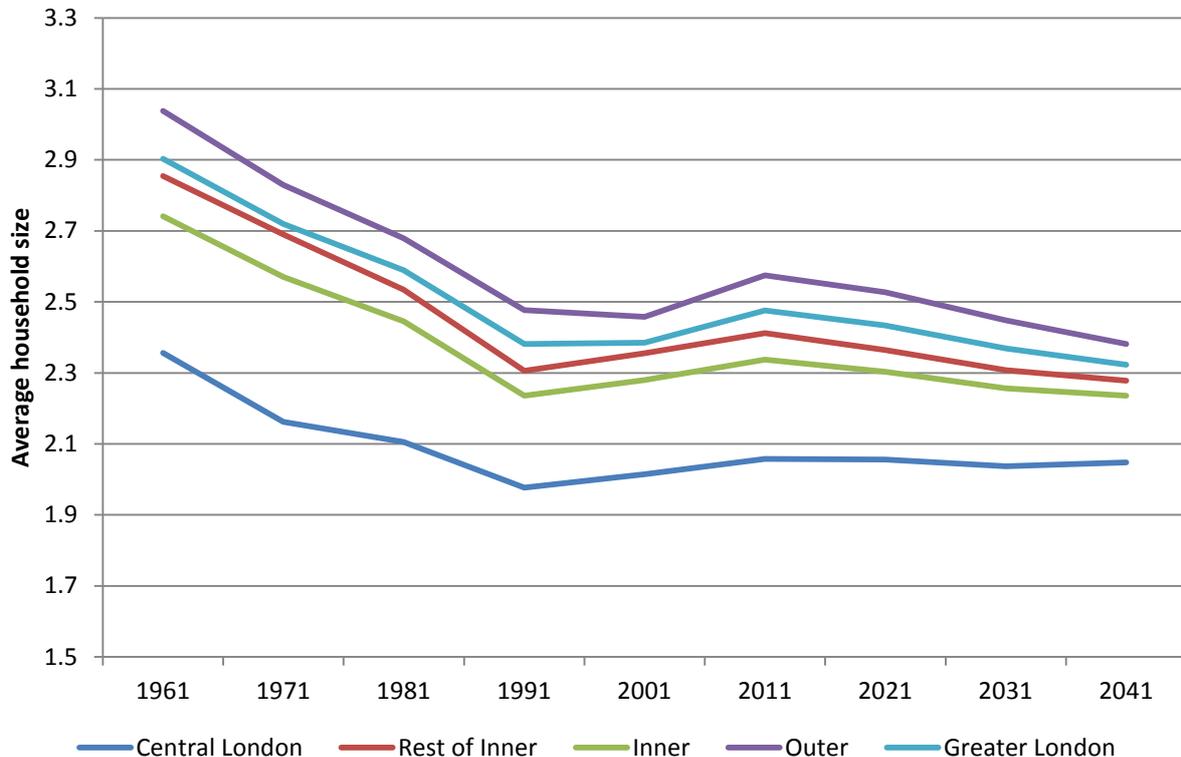
The household formation rates taken from DCLG’s work are based on an extrapolation of trends from 1971 to 2011, a period which saw an overall fall in household sizes. Over the final part of that period, 2001 to

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<sup>7</sup> A full explanation of the steps taken to convert population by age, sex and local authority of residence into households can be found in the methodology notes accompanying the [DCLG](#) and GLA household projections. For simplicity, the series of relationships linking population and households taken from the DCLG projections will be referred to as “household formation rates” in this document.

2011, household sizes saw a reversal of the long term trend with rises across London. The DCLG-based model projects the fall in household size to resume immediately and to continue for the duration of the projection period. This fall arises from a combination of the household formation rates used and the increasing numbers of elderly people in the population (who form small households).

**Figure 2: Past and projected average household size**

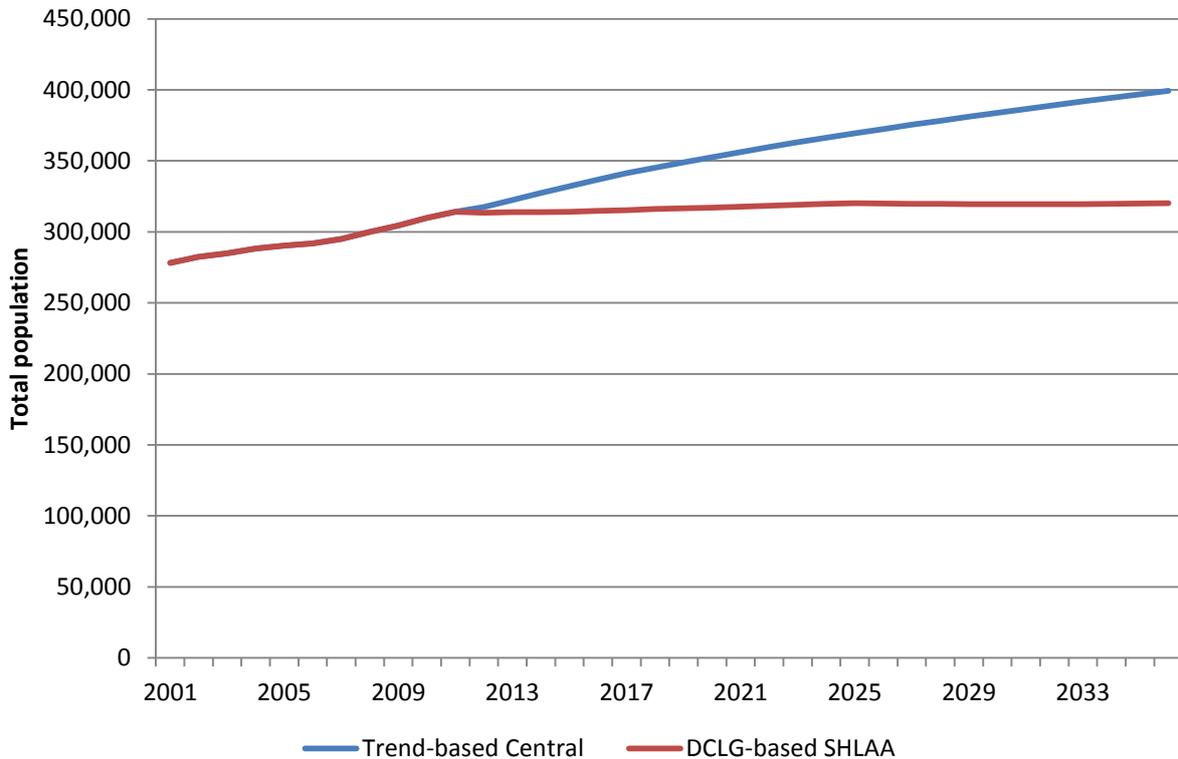


Source: GLA 2013 round of trend-based population projections, Central variant

This approach has clear advantages over trend-based models in situations where large quantities of development are planned in the future. In such cases the model will generally yield far higher projections than the trend-based model.

Issues can arise if the projected household formation rates used do not accurately reflect the changing situation in the local authority. In some (particularly Outer) boroughs it seems likely that household sizes will not fall at the rate suggested by this methodology. The current high cost of accommodation in London will tend to put upwards pressure on household sizes. There is therefore a risk of significant under-projection for some boroughs when using this model. Those areas seemingly at highest risk of under-projection are those that have seen strong recent growth in population through increasing household size and which have relatively small amounts of future development planned. For such local authorities, illustrated here with the example of Enfield, trend-based models can yield significantly higher projections than those constraining to forecast housing trajectories and the DCLG's projected household formation rates.

**Figure 3: Total population, Enfield: trend-based and DCLG-based, 2001-2036**



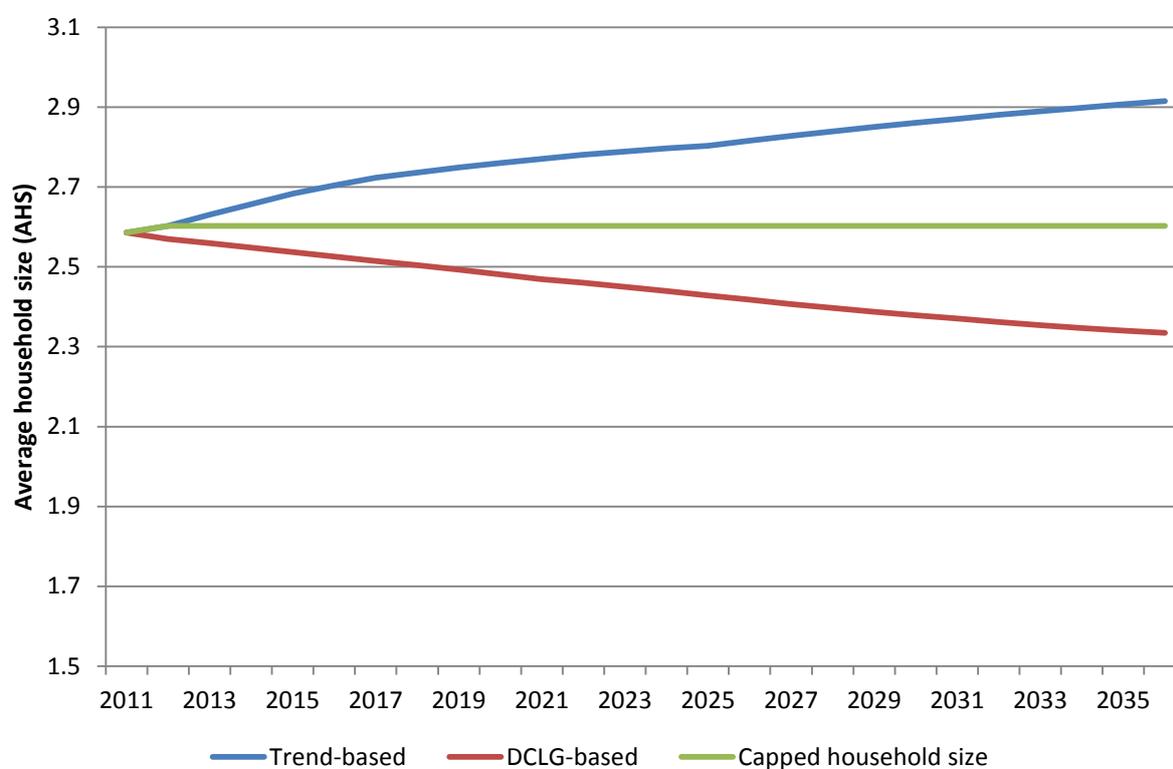
Source: GLA 2013 round of trend-based population projections, Central variant; GLA 2013 round of SHLAA-based population projections

### Capped household size model

The issues outlined above regarding the results of the GLA’s DCLG-based model for some local authorities has led the GLA to develop an additional methodology for linking to development assumptions.

In the short-term, where recent growth has been strong but levels of new housing are low, the population may well continue to rise at a rate nearer to that indicated by the trend than that projected by the DCLG-based model. However, for such trends to continue in the long term would require unprecedented rises in household size. While possible, given the expected downwards pressure on household sizes arising from the ageing population, it seems more likely that increases in household size will slow or reverse at some point in the future.

**Figure 4: Average household size, Enfield: trend-based, DCLG-based and capped household size, 2001-2036**



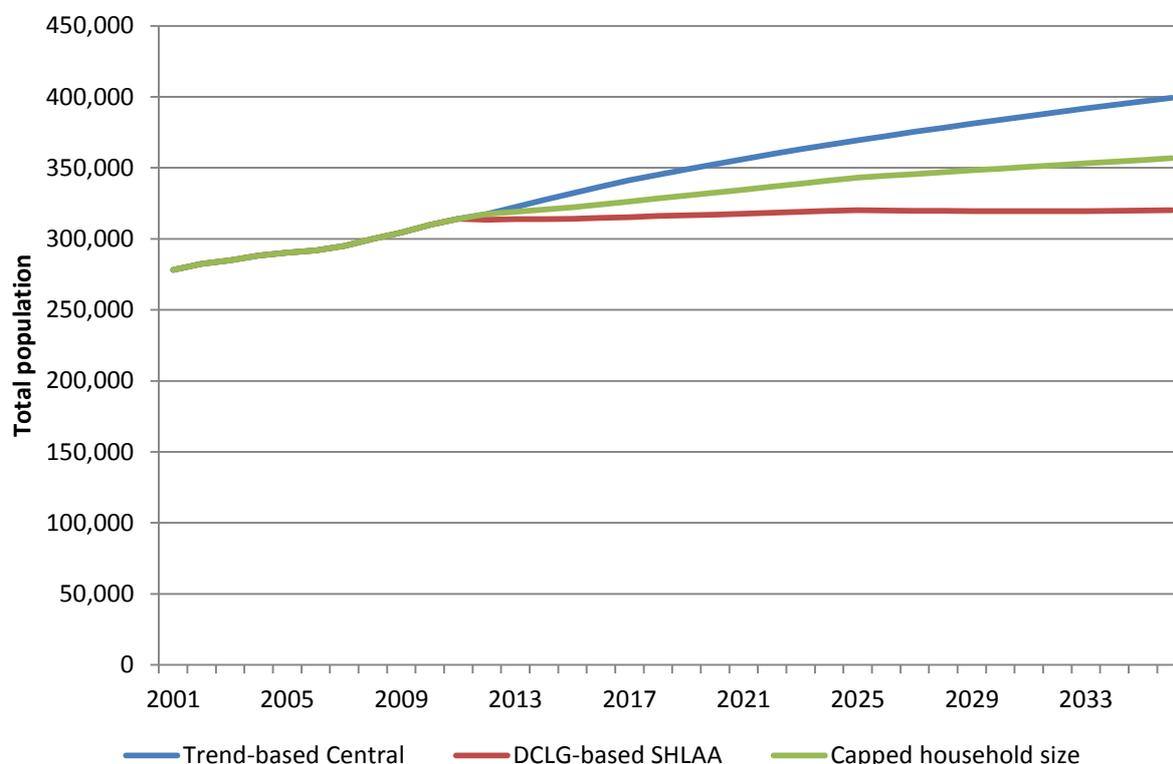
Source: GLA 2013 round of trend-based population projections, Central variant; GLA 2013 round of SHLAA-based population projections; GLA 2013 round of capped household size population projections

The capped household size model makes use of the results of both the trend-based and DCLG-based projections and operates on the following principles:

1. If the DCLG-based housing-linked projection is higher than the trend-based:  
It is assumed that development has driven the population growth and the housing-linked projection is used unchanged
2. If the trend-based projection is higher than the housing-linked projection and implies increasing household size:  
It is assumed that demand will prevent household size falling, but it is not allowed to rise above a certain limit, e.g. the estimated 2012 household size. This “maximum household size” is used together with the development trajectory to determine a total population target. Migration flows are then adjusted accordingly to arrive at the final projection.
3. If the trend-based projection is higher than the housing-linked projection but still implies falling household size:  
It is assumed that sufficient housing capacity exists to allow recent population trends to continue unimpeded. As such, the trend-based projection is used unchanged.

This methodology is intended to be pragmatic and to yield sensible results across all local authorities. The choice of household size limit is admittedly arbitrary, and development of a more sophisticated methodology will be considered for future rounds.

**Figure 5: Total population, Enfield: trend-based, DCLG-based, capped household size, 2001-2036**



Source: GLA 2013 round of trend-based population projections, Central variant; GLA 2013 round of SHLAA-based population projections; GLA 2013 round of capped household size population projections

### Zero-development projections

As well as producing projections using SHLAA and BPO development trajectories, the GLA produces variants that assume dwelling stocks will not increase. The models (DCLG-based and capped household size) used to generate these projections are the same as those detailed above. The resulting projection has several uses:

1. It adds a level of transparency by allowing users to compare the results with those from the models including the full development trajectory. In this way the user can observe the modelled impact of development on the population and compare this with other sources of information to help determine whether the results are plausible.
2. It can be used for further modelling work, e.g. as a baseline population in conjunction with a population yield calculator.
3. It forms one of the inputs to the GLA's school roll projection model.

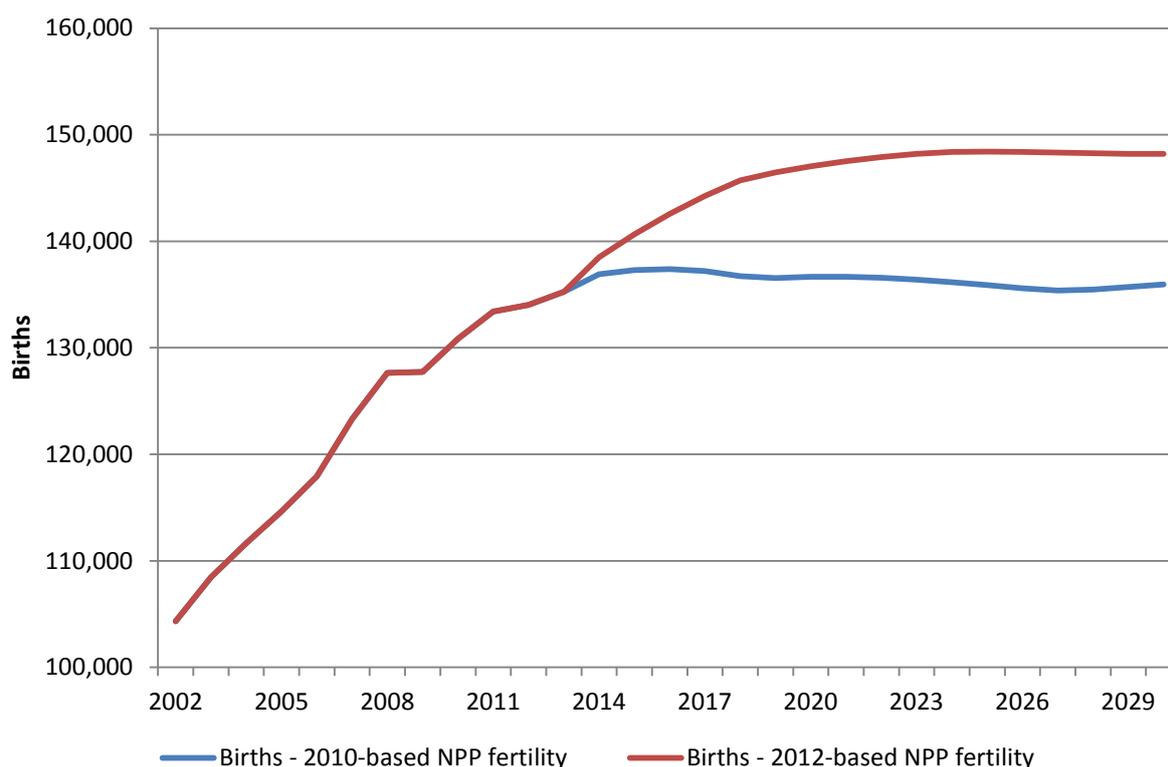
### Fertility assumptions

Currently available GLA projections use one of two sets of assumptions about future fertility rates. The GLA bases future changes in fertility for each local authority on assumptions taken from the most recent round of ONS's national projections for England.

The publicly-available variants of the 2013 round projections published took fertility assumptions from the 2010-based National Population Projections (NPP). In these projections, fertility is assumed to fall from 2013 onwards, reaching a level approximately ten per cent below 2013 levels.

Projections produced later and provided directly to local authorities (including those underpinning school roll projection work) have included trends taken from the 2012-based NPP. These assume that fertility will remain near-constant for the duration of the projection. Projections produced with the 2012-based NPP assumptions have annual birth rates approximately ten per cent higher than those produced using the 2010-NPP data.

**Figure 6: Projected annual births using 2010-based and 2012-based NPP assumptions, Greater London**



Source: GLA 2013 round of trend-based population projections, Central variant; GLA 2013 round of capped household size population projections

## Ward projections

Like its borough-level model, the GLA’s ward projection model is based around the cohort component concept. However at this level of geography, annual migration flow data is not available. Housing information is used together with census origin-destination data to generate proxy migration components.

The GLA’s ward-level projections are produced subsequent to the borough projections. Regardless of the ward projection variant being produced, the same ward model is used. When producing a ward projection, the results from a borough projection are used as a constraint – that is, the population of all wards in a borough have to add up to the borough population. The only difference between, e.g., the *trend-based BPO ward projection* and the *DCLG-based BPO ward projection* is the borough population projection that has been used as a constraint in the ward model.

One source of possible confusion among users is that the “trend-based” ward projections do still include development data. For such projections, the borough constraint is produced using a trend-based model and does not include development data. The development data is used solely to allocate the borough population at ward level. Housing development inputs are always required in the ward model to allocate the borough population between the wards.

## Household projections

The GLA produces consistent sets of household projections, for both the trend-based and DCLG-based population projections. DCLG produce subnational household projections for England and Wales based upon ONS’s subnational population projections. The 2012-based DCLG household projections are scheduled for release in autumn 2014. Users of the capped household size projections should be aware that at this time no consistent set of household projections exist. The methodology employed effectively builds in the assumption that there will be a deviation away from the DCLG household formation rates that underpin the GLA’s household model. Without valid household formation rates it is not possible to produce detailed household projections.

## GLA school roll projections

The GLA maintains a roll projection service that the majority of local authorities choose to subscribe to. The roll projection model that the GLA uses takes ward-level population projections as inputs together with school level roll data. Two projections are produced from the model and these are labelled in the output file as “Standard” and “Alternate”, respectively. These labels are historical curiosities rather than useful descriptors. For the 2013 round of roll projections, the Standard projection was based on the DCLG-based BPO population and the Alternate used the trend-based population. For the 2014 round, the Standard label referred to the capped household size BPO projection. The GLA provides guidance as to which of the variants to use on a borough-by-borough basis.

## Choosing a projection to use

Figure 7 shows the ten current projections available from the GLA and ONS at the time of writing along with a list of their key characteristics.

**Figure 7: Overview of current projections available for London authorities**

Type	Borough development data used	Model used	Fertility assumption	Publicly available	Ward projection available	Ward development data used
Housing-linked	SHLAA	DCLG-based	2010-NPP	Y	Y	SHLAA
		Capped AHS	2010-NPP	Y	Y	SHLAA
	BPO	DCLG-based	2012-NPP	N	Y	BPO
		Capped AHS	2012-NPP	N	Y	BPO

Type	Origin	Variant	Fertility assumption	Publicly available	Ward projection available	Ward development used
Trend-based	GLA	Central	2010-NPP	Y	Y	SHLAA
			2012-NPP	Y	N	-
			2012-NPP	N	Y	BPO
		High	2010-NPP	Y	Y	SHLAA
		Low	2010-NPP	Y	Y	SHLAA
	ONS	2012-based SNPP	2012-NPP	Y	N	-

The GLA has designed its capped household size model projections to give sensible results for all local authorities and, as such, recommends these as the default projection to use for the majority of applications.

Users within local authorities have access to projections produced using their chosen development trajectory. BPO projections should generally be preferable to using the SHLAA-based projections; however, it is recommended that users confirm with their primary demography contact that the development data submitted matches their expectations before use. If the intended use of the projections involves comparison between local authorities, then users might consider using the publicly available SHLAA-based projections.

### **Considering multiple projections**

It is good practice for users to consider a range of projections in their work. Results for some local authorities can diverge greatly between variants and this often indicates that there is significant uncertainty in projecting future patterns. However, trying to take account of ten different projection variants would be excessively burdensome. Instead, it is often better to consider a primary projection alongside one or two others that give a reflection of realistic alternative scenarios.

Example 1: An authority with strong recent population growth, but relatively low levels of planned development, might use the capped household model as their primary projection. However, due to the risk that population growth will continue at recent rates they should also consider the results of a trend-based projection that reflects this.

Example 2: Another authority may feel that the capped household size model is at risk of over-projecting for their area, and so choose to use it only as a 'high scenario' alongside the DCLG-based projection.

### **Projections for determining future housing need**

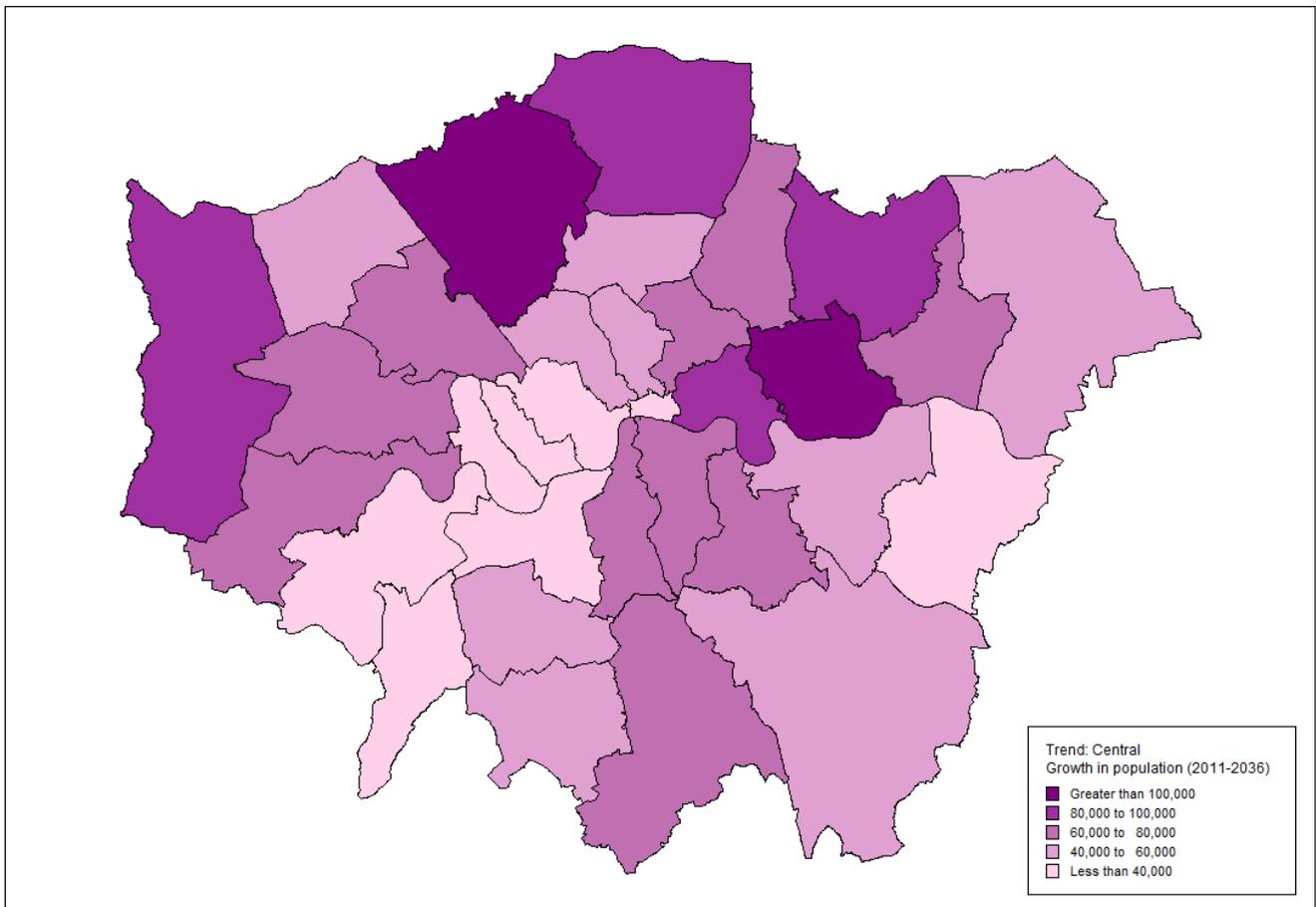
If the purpose is related to projecting future housing need, e.g. for a Strategic Housing Market Assessment (SHMA), then a trend-based projection should be used. Housing-linked projections are not suitable for such applications as they are projections of the outcome of following a specified housing trajectory and cannot be considered indicators of future need. The GLA recommends that the GLA's *central trend-based projection* is used together with ONS's 2012-based subnational projections. The GLA *high* and *low* trend-variants can be used for additional sensitivity testing.

### **Pan-London uses**

As well as differences in total population, housing linked and trend-based projections tend to give very different results in terms of the spatial development of future growth. Users selecting a projection for use at pan-London level should be aware of how the distribution of population growth varies between projection variants.

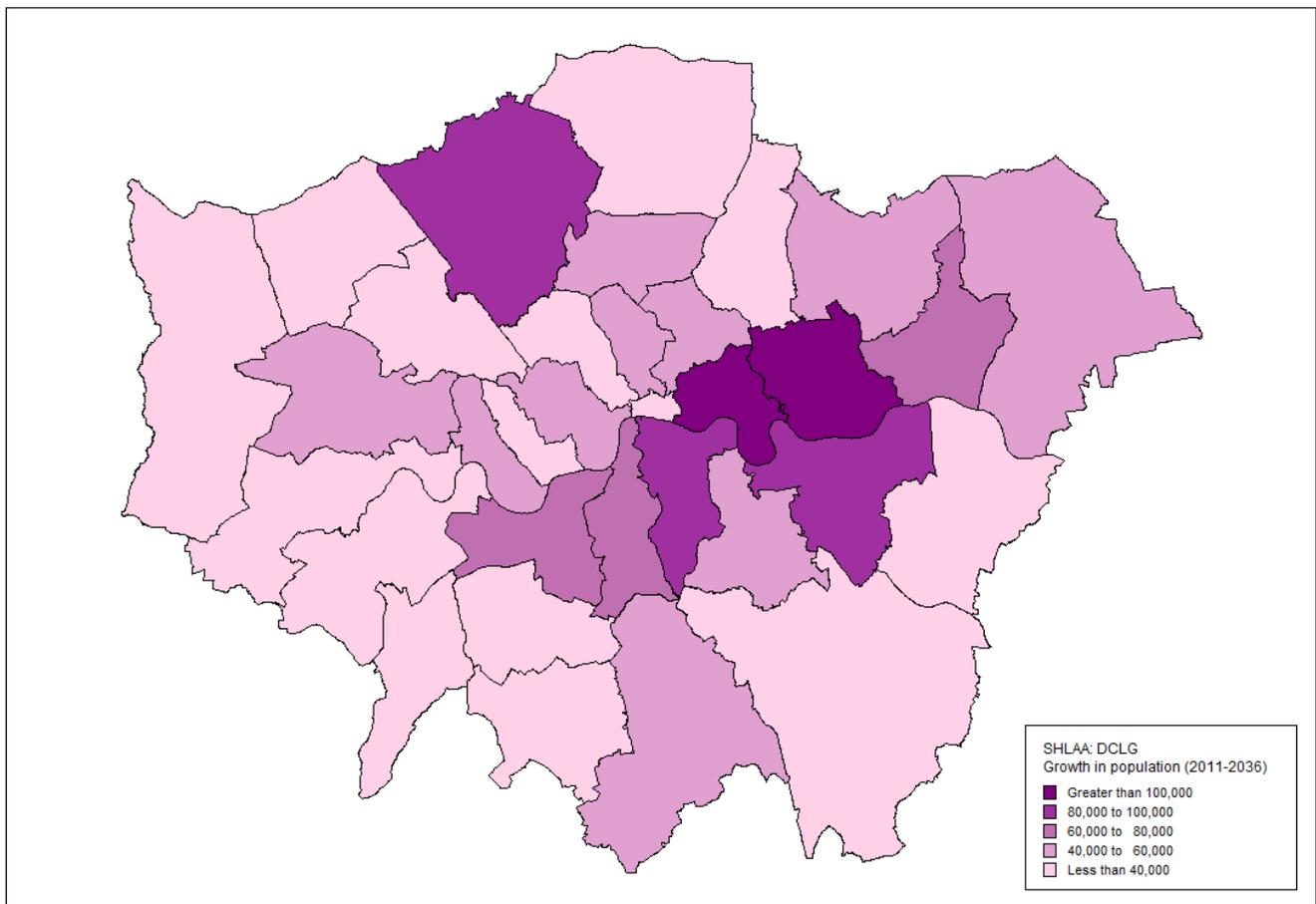
Current trend-based projections reflect where recent growth has taken place, but not where future development will take place (Figure 8). DCLG-based projections are almost the opposite, with past growth having relatively little influence, and future development driving population change (Figure 9). The results of the capped household size model sit somewhere in between, reflecting future development, but also making allowance for recent patterns of migration (Figure 10).

Figure 8: Population growth, borough, trend-based variant, 2011-2036



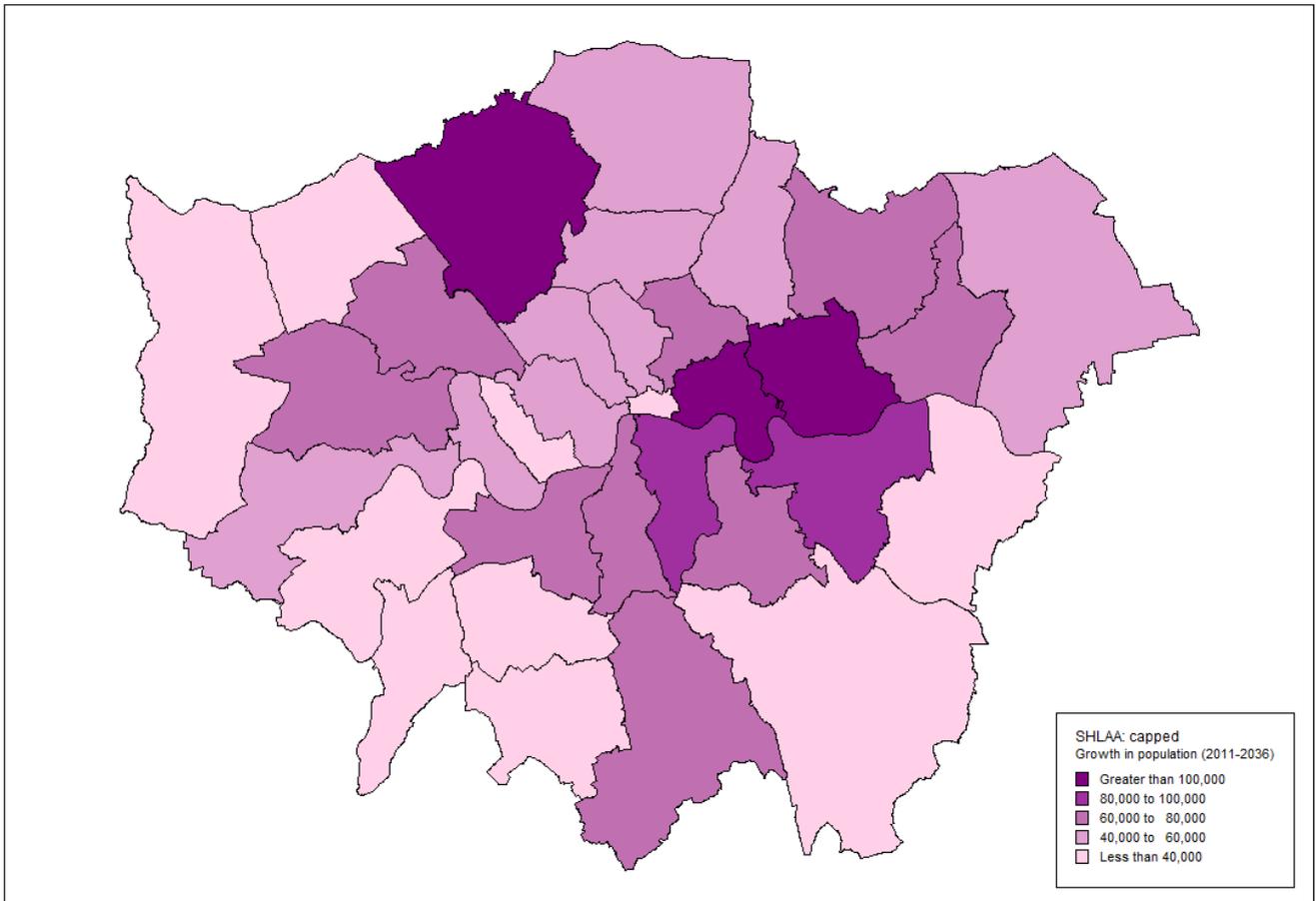
Source: GLA 2013 round of projections, Central variant

Figure 9: Population growth, borough, SHLAA: DCLG variant, 2011-2036



Source: GLA 2013 round of projections, SHLAA: DCLG variant

Figure 10: Population growth, borough, SHLAA: Capped variant, 2011-2036



Source: GLA 2013 round of projections, SHLAA: Capped variant

## Glossary

### Average Household Size (AHS)

This is defined as the number of persons in the population living in private households divided by the number of households.

### Capped household size model

Title given by the GLA to one of its models for creating population projections linked to housing development. It is so-called because for areas where recent trends in growth outstrip the estimated capacity for additional population (as determined by the DCLG-based model), population growth is allowed to follow past trends so long as average household size does not exceed a predetermined limit.

### Cohort-component model

A common population projection method - they are so-called because they separate the population into a series of cohorts and model the demographic components acting upon them. These are referred to as *components of change* and consist of fertility, mortality and migration.

### DCLG-based model

Title given by the GLA to one of its models for creating population projections linked to housing development. It is so-called because it uses data from the Department of Communities and Local Government's household projections to estimate the number of households that would form from a given population. The model operates by adjusting net migration for each area until the population yields the same number of households as available household spaces implied by the housing trajectory.

### Dwellings

A dwelling is a unit of accommodation which may comprise one or more household spaces.

### Household space

A household space is the accommodation used or available for use by an individual household. Household spaces are identified separately in census results as those with at least one usual resident, and those that do not have any usual residents.

### Household

A household is defined as:

- one person living alone, or
- a group of people (not necessarily related) living at the same address who share cooking facilities and share a living room or sitting room or dining area.

### National population projections (NPP)

These are population projections released by ONS every two years that use past trends to project forward the population to give an indication of the future population for the UK and constituent counties. The most recent NPP are the 2012-based NPP released by ONS in November 2013.

### Non-self-contained development

This includes communal establishments such as residential care homes, communal halls of residence, and hostels.

### Strategic Housing Land Availability Assessment (SHLAA)

The SHLAA helps inform the Local Plan by identifying and assessing possible land that could be used to provide new homes. It is an audit of land at a point in time and does not decide where new homes will be built.

### **Strategic Housing Market Assessment (SHMA)**

The SHMA sets out estimates of current and future housing requirements to inform the development of the Local Plans and housing strategy.

### **Subnational population projections (SNPP)**

These are population projections released by ONS that use past trends to project forward the population to give an indication of the future population for 25 years from the base year at local authority level. The most recent SNPP are the 2012-based SNPP released by ONS in May 2014.

### **Trend-based population projection**

Used here to refer to a population projection based on past trends of fertility, mortality and migration, but which does not make explicit use of housing development data.