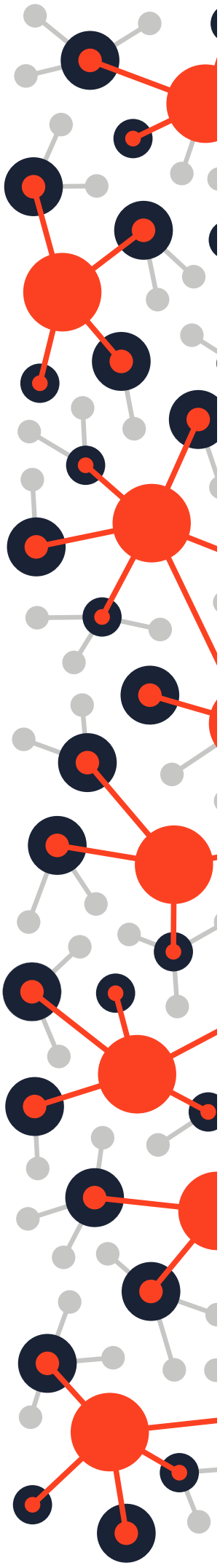
Bradford

Updating the Demographic Evidence

July 2019



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Acknowledgements

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Contents

1 Introduction

Context

1.1 In 2013, Bradford Metropolitan District Council (BMDC) commissioned Edge Analytics to provide demographic evidence to inform the Bradford Housing Requirements Study (HRS). This evidence was underpinned by the Office for National Statistics (ONS) 2010-based sub-national population projection (SNPP), together with employment-led scenarios informed by the Yorkshire & The Humber (YH) Regional Econometric Model (REM). The initial HRS evidence estimated household growth using assumptions from the Ministry of Housing, Communities and Local Government's (MHCLG) 2008-based household projection model, with a subsequent addendum including evidence from the 2011-based interim household model.

1.2 Following the release of the 2012-based SNPP, 2011 Census, revised mid-year population estimates (MYEs), and new economic data, BMDC requested an update to the demographic evidence. A revised demographic report was published in September 2014, informing an updated HRS.

1.3 Since 2014, a range of new demographic evidence has been published including:

- MYEs to 2018 (including ONS revisions 2012–2016)
- ONS 2014-based and 2016-based national and sub-national population projections
- 2014-based and 2016-based sub-national household projections (SNHP)
- Labour force participation forecasts from the Office for Budget Responsibility (OBR)
- Unemployment rate time series to 2018

1.4 In addition, there have been significant changes to planning policy, with the revised National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG)[1] published in early 2019. The latest PPG outlines a 'standard method' for calculating the minimum housing need figure (HNF) for authorities in England, with the intention of *'…significantly boosting the supply of homes."* [2]. The standard method is underpinned by the 2014-based SNHP, taking account of each planning authority's affordability ratio and current Local Plan adoption status, to calculate housing need for a ten-year horizon.

[1] https://www.gov.uk/guidance/housing-and-economic-development-needs-assessments

[2] PPG (2019).Paragraph 005, Reference ID: 2a-005-20190220

Requirements

1.5 In light of the new demographic evidence and changes to the PPG, BMDC is updating its Core Strategy, drawing upon a range of demographic and economic evidence to inform its Strategic Housing Market Assessment (SHMA) and planning process.

1.6 As part of this, BMDC has commissioned an update to its demographic evidence, taking account of population and housing change since 2001. In forming a key part of the evidence base, BMDC has also requested that demographic forecasts are developed to inform housing need analysis in the SHMA and the wider Core Strategy.

Approach

1.7 POPGROUP technology has been used to develop a range of scenarios for Bradford's 2019–2037 plan period.

1.8 The scenario analysis is prefaced with a demographic profile of Bradford (**Section 2**), illustrating its geographical context, components of population change, and its historical patterns of international and domestic migration.

1.9 **Section 3** examines Bradford's current population estimates in conjunction with a range of alternative datasets, to consider the potential for under-estimation post-2011.

1.10 The official ONS population projections for Bradford are presented in **Section 4**, together with a range of alternative trend scenarios using variant migration assumptions. Household and dwelling growth under each of the scenarios is considered for Bradford's plan period, using assumptions from the 2014-based and 2016-based household projection models.

1.11 **Section 5** summarises the evidence, providing BMDC with a suite of population and housing growth outcomes to consider in the formulation of its updated Core Strategy and SHMA.

2 Demographic Profile

Geography

2.1 With an estimated population of 537,173 in 2018, Bradford is home to approximately 10% of the YH's population, making it the third largest planning authority in the region behind Leeds (14%) and Sheffield (11%). Bradford is bordered by six districts (Leeds, Kirklees, Calderdale, Pendle, Craven and Harrogate) and touches the Yorkshire Dales National Park at its most northerly point (Figure 1).

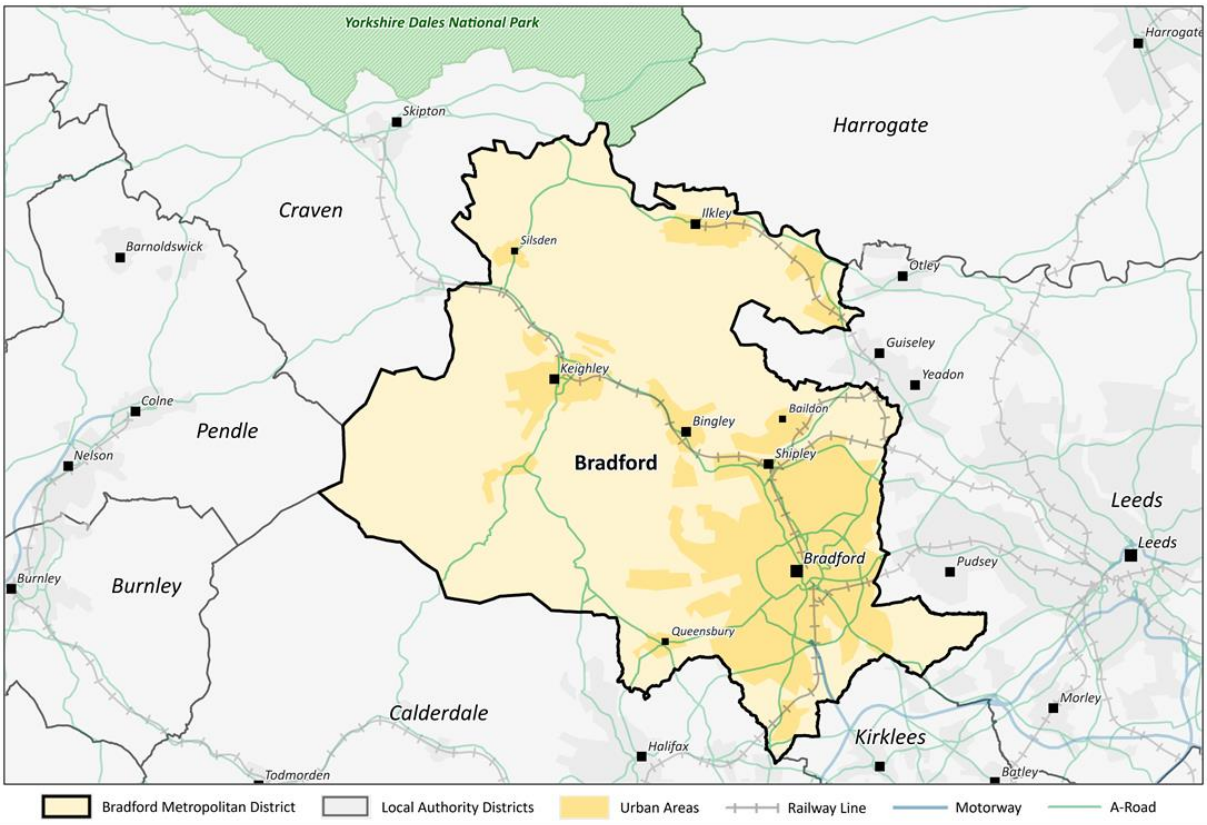

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Figure 1: Bradford context

Population Growth Profile

2.2 Since 2001, Bradford's population has increased by approximately +66,400, a 14.1% growth in seventeen years. Whilst population change has continued to be positive, lower growth has been estimated since 2011, averaging +2,008 pa compared to +5,236 pa over the 2001–2011 period (Figure 2).

2.3 Higher population growth pre-2011 aligns with a period of higher numbers of housing completions. A fall in population growth post-2011 would appear to correspond to a lower completion rate, although the housing market has recovered since 2014, with only a limited recovery in the rate of estimated population change.

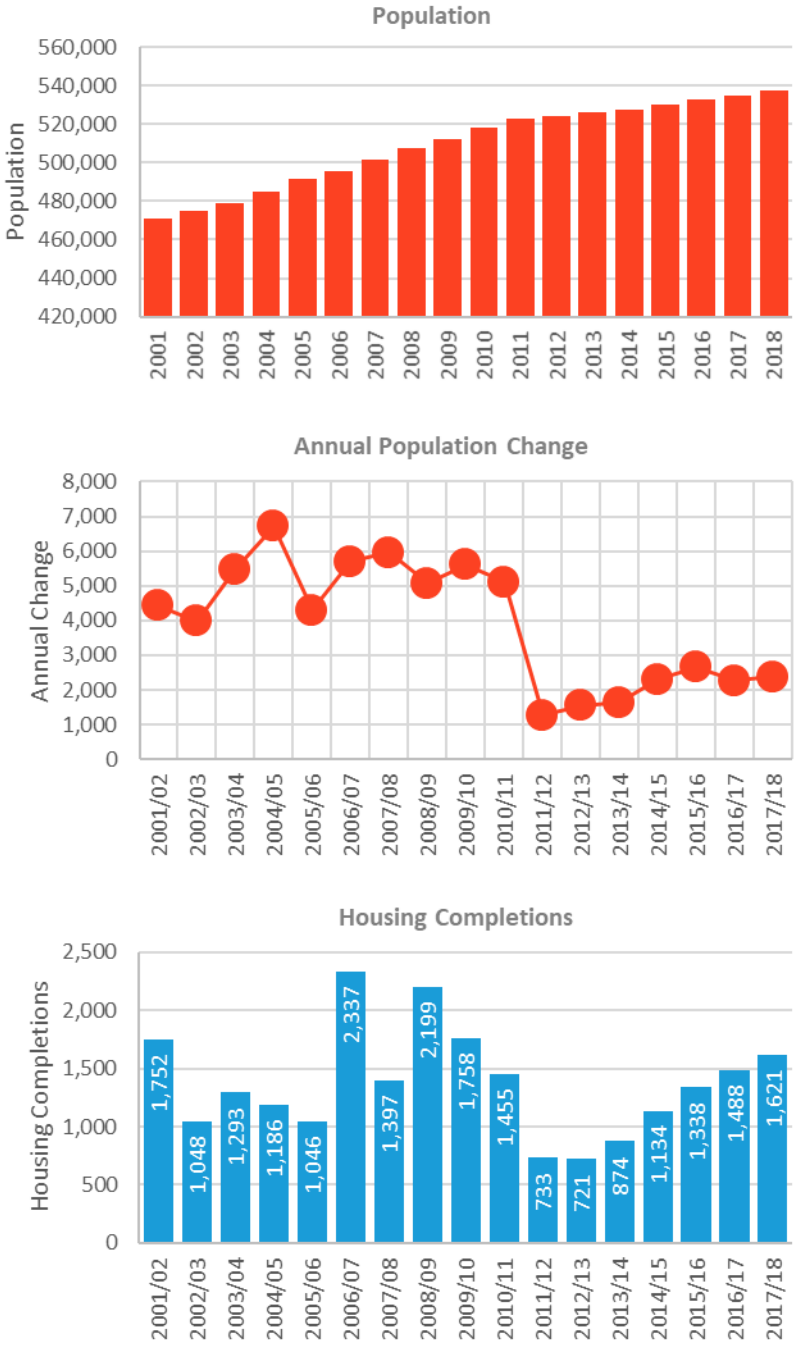


Figure 2: Bradford mid-year estimate population, annual population change and housing completions (Source: ONS, MHCLG[3])

[3] Net Additional Dwellings (Live Table 122). Note that 907 net completions are recorded in the Live Table for 2015/16, however this is reported as incorrect by the Council. The 5yr Supply (March 2019) states that the net completions figure in 2015/16 should be 1,338.

2.4 Since 2001, Bradford has recorded a higher population growth rate (+14.1%) than the YH region (+10.1%) and for England in total (+13.2%) (Figure 3). Since 2011, the estimated population growth rates for Bradford and the region have dampened, compared to England in total.

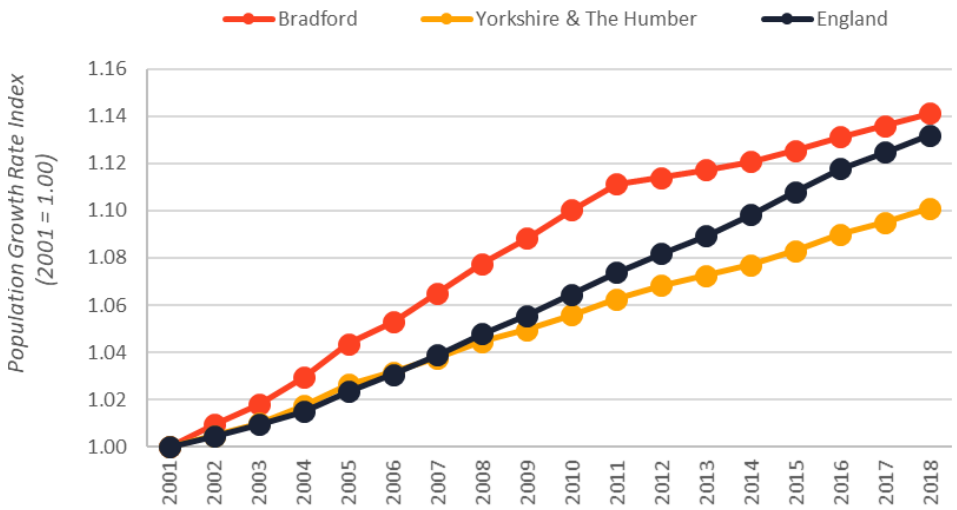


Figure 3: Population growth rate index (2001 = 1.00) (Source: ONS)

2.5 Population change is driven by a combination of births, deaths, internal and international migration. Following the 2011 Census, the 2002–2010 MYEs were 'rebased' for alignment with the 2011 MYE and to ensure the correct transition of the age profile over the 2001–2011 decade. The rebasing of the MYEs involved the recalibration of the components of change, with differences between the 2011 MYE and 2011 Census-based MYEs referred to as 'unattributable population change' (UPC). The UPC adjustment for Bradford over the 2001–2011 period was +11,555 (averaging +1,156 pa) (Figure 4a).

2.6 Given the robustness of birth and death registers, it is most likely that the UPC adjustment was associated with migration estimation, particularly international migration (Figure 4b).

2.7 Population growth in Bradford has been driven by a combination of positive natural change (the balance between births and deaths) and net international migration (i.e. a higher level of immigration than emigration) (Figure 4a).

2.8 Since 2001, growth through natural change has averaged +3,489 pa, with a sharp fall in birth numbers in 2017/18 resulting in the lowest natural change contribution to population growth since 2002/03. Net international migration (including the UPC adjustments) has averaged +3,210 pa. However, there has been a noticeable fall in net international migration estimates for Bradford following the 2011 Census, from an average annual net inflow of +4,367 pa (2001/02–2010/11) to +1,559 pa (2011/12–2017/18).

2.9 At the same time, net internal migration (i.e. the balance of migration flows between Bradford and the rest of the UK) has had a negative impact on population change since 2001; with more people leaving Bradford than moving into the district from the rest of the UK. Over the 2001/02–2017/18 period, net internal migration has averaged -2,792 pa.

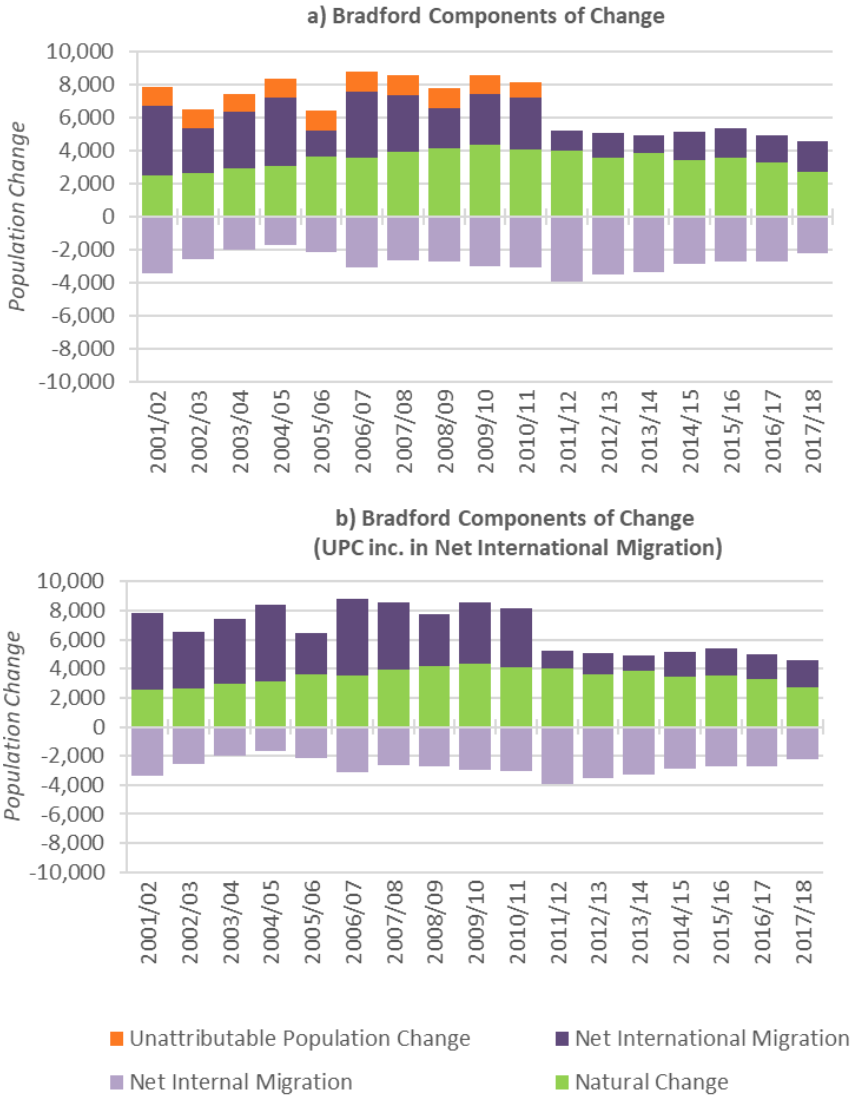


Figure 4: Components of population change 2001/02–2017/18 (Source: ONS)

2.10 Further detail on Bradford's internal and international migration profiles, together with its underpinning age-structure changes are provided below.

Internal Migration

2.11 Internal migration statistics record the inflow and outflow of population to and from Bradford, from and to elsewhere in the UK. Net internal migration has had a negative impact on population change since 2001, with inflows and outflows tracking each other over the historical period (Figure 5a). A rise in both inflows and outflows to and from Bradford was recorded in 2016/17, likely associated with a change in the ONS methodology estimating student migration, post-graduation. The net outflow has reduced from a high point in 2011/12, with 2017/18 recording the smallest net loss since 2005/06.

2.12 The age profile of internal migration reveals that whilst Bradford has experienced an average annual net outflow in all age groups, it is the 'student' (15–19) age group that has recorded the largest net out-migration from the district (Figure 5b). The young adult and 'family' age groups (25–39 and 0–9) have also recorded relatively large net outflows from Bradford to other districts.

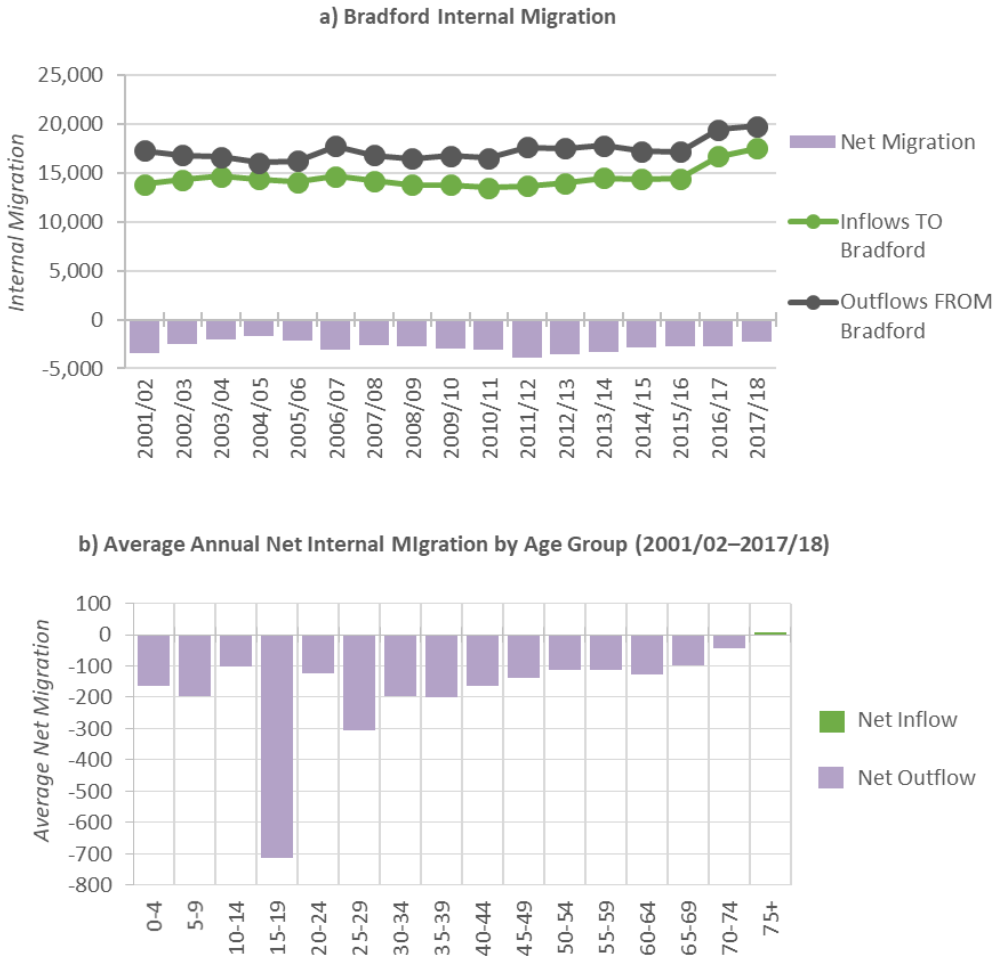


Figure 5: Bradford internal migration flows and average annual net flow by age group (2001/02–2017/18)

2.13 In terms of migration linkages between Bradford and its surrounding areas, the largest positive net exchange (i.e. higher inflow than outflow) has been with Leeds (+77 pa), with smaller net inflows with a dispersed group of local authorities (Figure 6). The largest net outflow exchanges have been with neighbouring Calderdale (-356 pa), Craven (-246 pa), East Riding of Yorkshire (-241 pa) and Kirklees (-223 pa) (Figure 6).

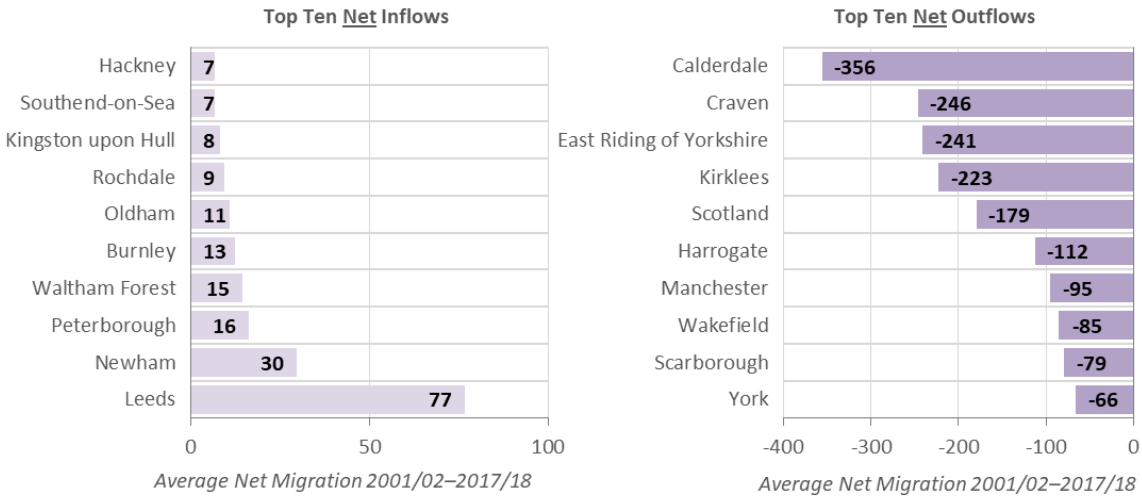


Figure 6: Bradford top net average annual inflows and outflows (2001/02–2017/18)

International Migration

2.14 International migration has been a key contributor to population change in Bradford, but there has been a notable fall in the estimate of net international migration post 2011 Census. Whilst emigration has remained relatively stable, it is the immigration estimate that has recorded a notable fall since 2011 (Figure 7). Home Office policy changes in 2012 [4] had an immediate impact upon New Commonwealth immigration, but it is likely that changes to ONS' methodology for estimating local area immigration have also altered the profile of international migration pre- and post-2011.

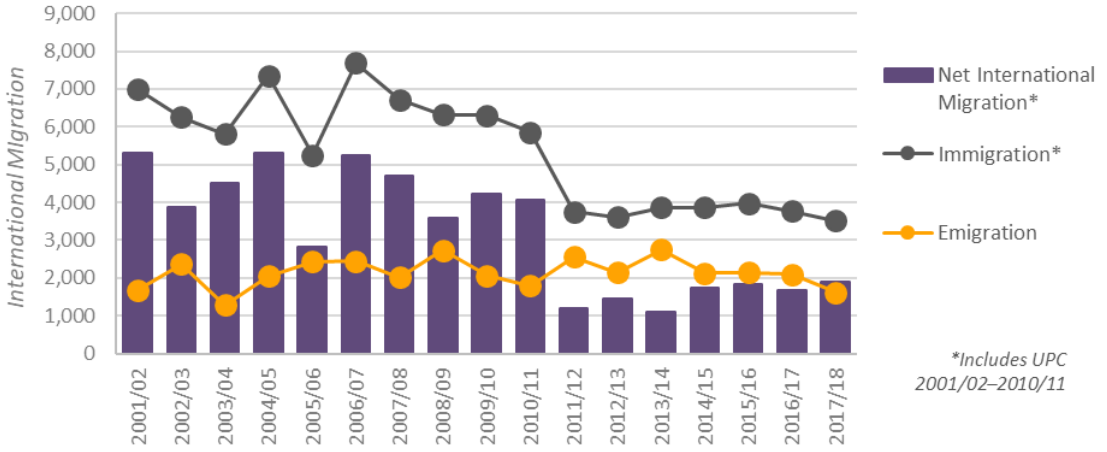


Figure 7: Bradford international migration 2001/02–2017/18 (Source: ONS)

[4] In 2012, the Home Office introduced a number of changes to immigration policy relating to the movement of family members and spouses/partners to the UK. These included increasing the probationary period to 5-years, with new tests of relationship to inform the decision making; setting a new minimum income threshold for sponsors; and tests of basic English.

2.15 National Insurance Number (NINo) statistics provide an alternative but complementary view of *immigration* linked to migrant worker populations (Figure 8) (refer to Appendix A for a definition of country of origin group).

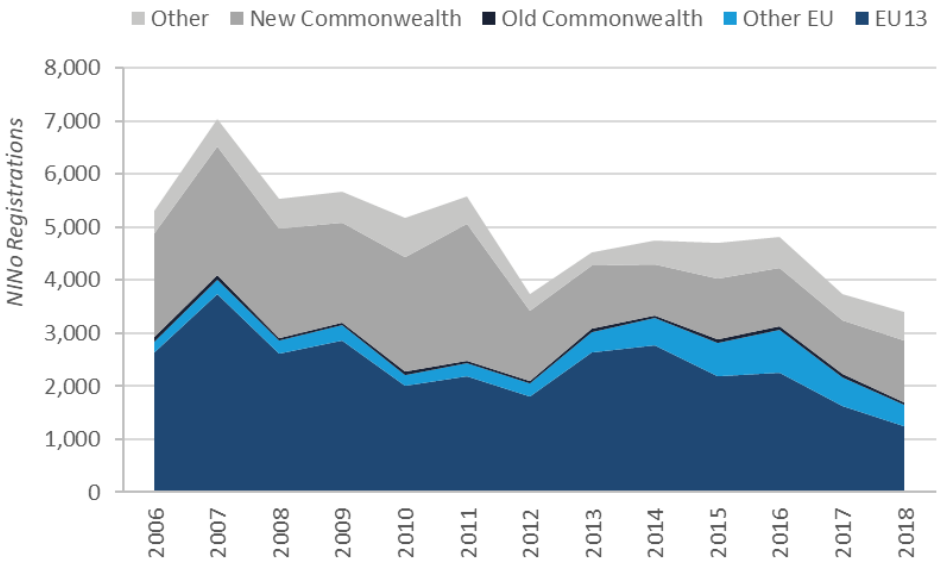


Figure 8: Bradford NINo registrations by country of origin 2002–2018 (Source: DWP)

2.16 NINo statistics are a useful but imperfect measure of international migration, providing an indication of those registering to work in the UK but do not include a record of accompanying dependents. NINo registrations record workers regardless of their length of stay, whilst ONS population statistics only include migration totals for international moves of more than twelve months duration.

2.17 Since 2006, NINo registrations have predominantly been from New Commonwealth and EU13 countries, comprising 48% and 33% of total registrations respectively. A sharp fall in New Commonwealth NINo worker registrations was recorded in 2012, following the Home Office change in immigration policy.

2.18 In terms of country-of-origin, worker registrations since 2006 have predominantly been from Pakistan (+13,595), Poland (+12,701) and Slovakia (+6,808). Whilst registrations from Pakistan nationals continue to contribute a large proportion of total NINo registration in Bradford, only 35% of the 13,595 total relates to the period post-2011. Since 2014, with freedom of movement for Romanian and Bulgarian workers, the number of Romanian worker registrations has notably increased, from +383 (2006–2013) to +2,530 (2014–2018).

Population Age Profile

2.19 In considering future housing, labour force and service demands, the changing size and age structure of Bradford's population is a key factor. Figure 9 illustrates population change by age group over the 2001–2011 and 2011–2018 period.

2.20 All age groups have recorded a lower rate of population change post 2011, notwithstanding the 65–74 age group which has seen a notable increase as the larger post-war birth cohorts reach retirement age (Figure 9). The 15–44 age groups have experienced population decline over the 2011–2018 period, contrasting to the population growth recorded 2001–2011.

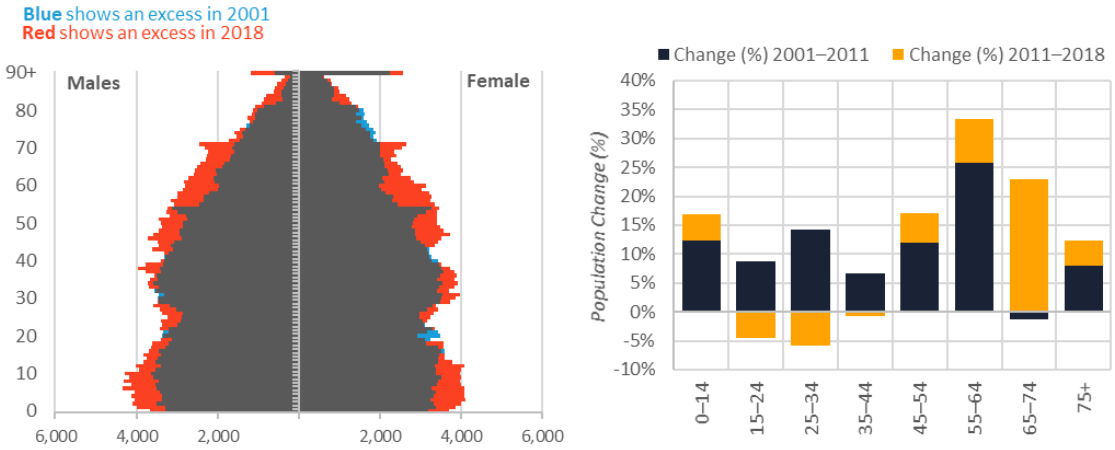


Figure 9: Population age profile and change (%) 2001–2011 and 2011–2018 by age group (Source: ONS)

2.21 Table 1 presents Bradford, YH and England's population age profile in 2001 and 2018, providing an indication of the share of older age groups relative to the rest of the population. Between 2001 and 2018, the proportion of Bradford's population aged 65+ and 80+ has remained relatively stable (14-15% and 4% respectively), with growth in the younger age groups counteracting the relative growth in the older groups. Conversely, the region and England have experienced growth in the 65+ and 80+ age group share over the seventeen-year period, from 16% to 19% (aged 65+) and 4% to 5% (aged 80+).

Table 1: Bradford, Yorkshire & The Humber and England's age profile (2001 & 2018)

	Bradford		Yorkshire & The Humber		England	
	2001	2018	2001	2018	2001	2018
Percentage 65+	14%	15%	16%	19%	16%	18%
Percentage 80+	4%	4%	4%	5%	4%	5%
OAD	23%	24%	25%	30%	25%	29%

2.22 The Old Age Dependency (OAD) ratio expresses the 65+ population as a percentage of the 'working age' (16–64) population. Over the 2001–2018 period, Bradford's OAD has experienced a percentage point increase, whilst YH and England have an estimated increase from 25% in 2001 to 30% and 29% in 2018 (+5 and +4 percentage points respectively).

3 Population Estimation

Macro and Micro Perspective

3.1 Deciding what could be a potential undercount of Bradford's population and what is a genuine population growth trend is challenging. The 2018 mid-year estimate provides a seventh year of MYEs since 2011, enabling robust consideration of how pre-2011 and post-2011 growth rates compare, and how the demographic components of population change have influenced these growth rates.

3.2 Population growth rates for local authorities that experienced a +5,000 UPC adjustment are compared pre- and post-2011, with England included for comparison (Figure 10). This indicates that the large majority of these areas are experiencing lower growth estimates post-2011, a potential indication of continued mis-estimation of population change.

3.3 At national level, annual population growth rates pre-2011 and post-2011 have remained relatively stable (0.7% and 0.8% respectively). For Bradford, an average annual growth rate of 1.1% was recorded over the 2001–2011 period; this has since fallen to 0.4% per year, post-2011.

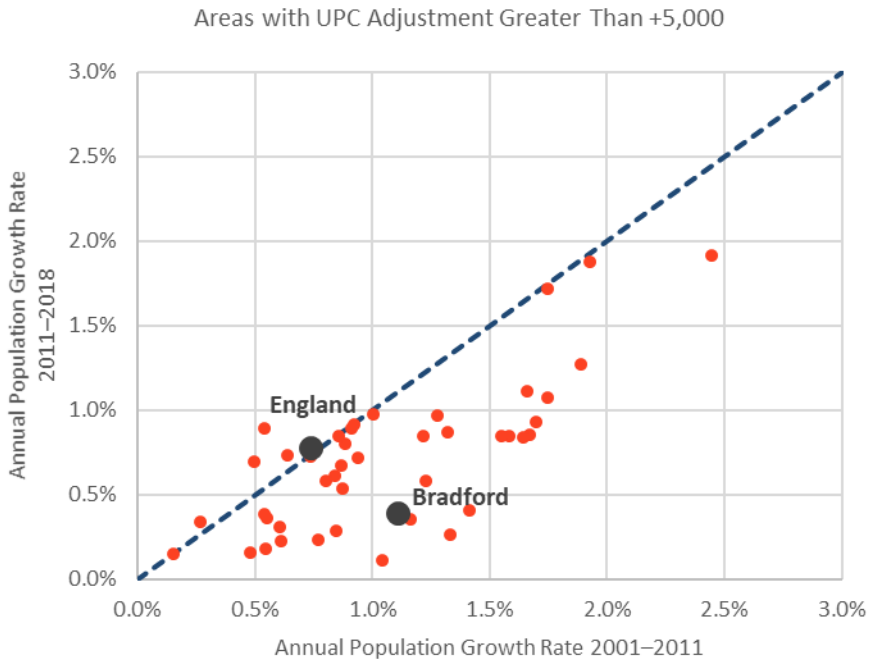


Figure 10: Annual population growth rate comparison for areas with a UPC adjustment greater than +5,000 & England

3.4 At micro-level, a comparison of the annual population growth rate for wards in Bradford indicates lower growth in the majority of the wards post-2011, compared to 2001–2011, with Eccleshill a

notable exception to this trend (Figure 11). The deviation in growth rates is most noticeable in a number of wards; City, Little Horton, Heaton, Queensbury, Idle and Thackley and Keighley East. It is likely that any under-estimation of population will be centred on these wards in particular.

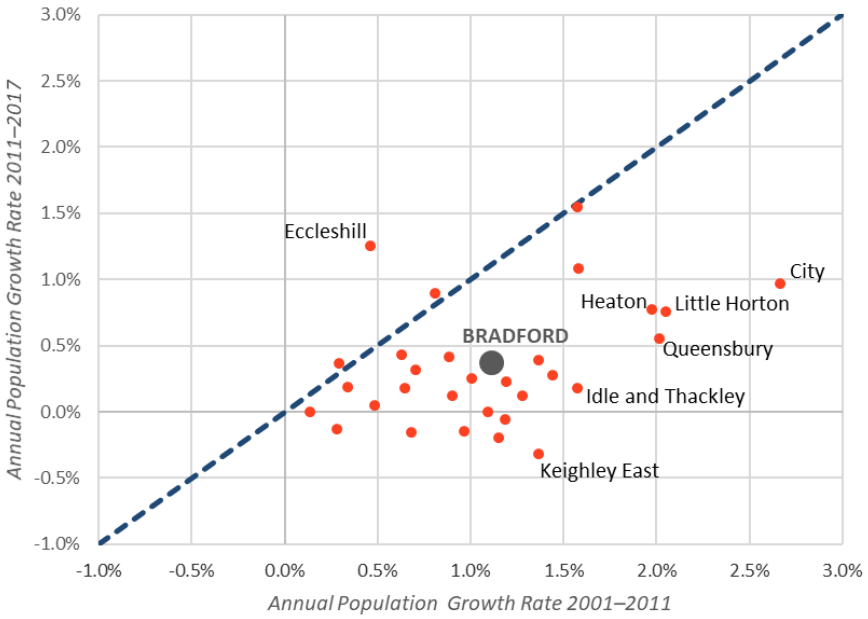


Figure 11: Annual population growth rate comparison for wards in Bradford

Administrative Statistics

3.5 ONS uses NINo statistics in combination with GP registration (flag 4) statistics and Higher Education Statistics Agency (HESA) international student data, to inform the estimation of international migration at a local level. The trend in Bradford's NINo, GP registration and HESA data is presented alongside its ONS immigration totals (including UPC adjustment) (Figure 12).

3.6 Pre-2011, GP registration statistics were reasonably consistent with the immigration total, whilst NINo totals were generally below the immigration total. HESA counts reflect the decline in international student numbers after 2007/08. Since 2011, ONS immigration totals have deviated markedly from GP registration numbers. NINo registration totals exceeded the annual immigration figure until 2016/17, since when they have become more consistent. These differences point toward potential issues regarding the robustness of the post-2011 immigration estimates for Bradford.

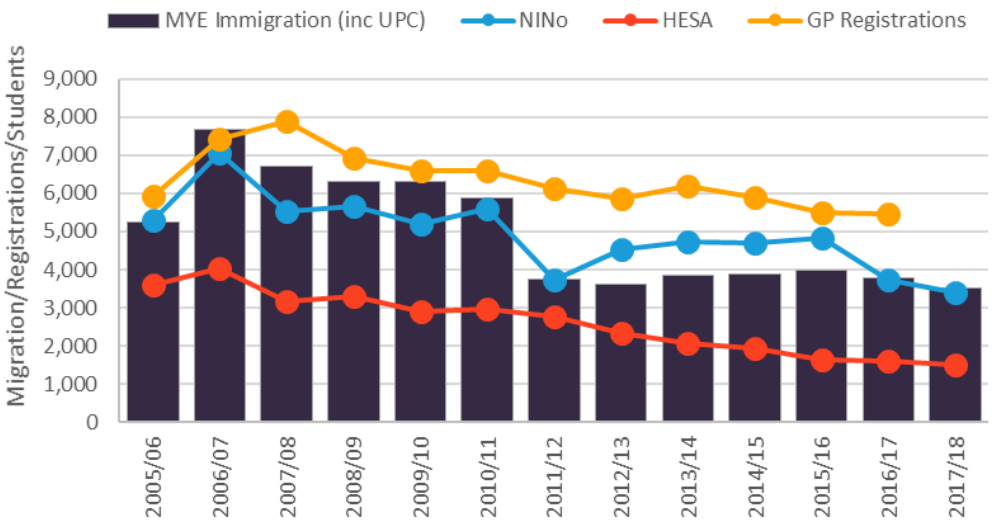


Figure 12: Bradford international migration statistics

3.7 As part of its post 2011 Census quality assurance of its MYEs and part of the development of an 'administrative' alternative to the Census, ONS has published evidence from its Statistical Population Dataset (SPD). The SPD draws on a number of administrative data sources to provide an alternative estimation of population. Whilst the administrative data are research outputs and do not have 'National Statistics' status, the SPD does provide a useful perspective on potential issues with the robustness of the MYEs.

3.8 The latest SPD has used record-matching from a combination of data sources. These include NHS Patient Register, School Census, Department for Work and Pensions (DWP), Her Majesty's Revenue and Customs (HMRC) statistics and HESA student data, to derive an alternative population estimate for each local authority, by age and sex.

3.9 The latest SPD is for 2016, which when compared to the 2016 MYE for Bradford, provides an illustration of the potential under- and over-count issues associated with the two sources. The 2016 SPD for Bradford estimates a population total of 547,831, compared to 532,539 in the ONS MYEs (-15,292, -3% difference).

3.10 The dominant feature is a notably lower population of young adults (20–40) in the MYE, with smaller differences in the 44–54 and child age groups. These are key migrant and family age groups and may be a reflection of the difficulties associated with the robust estimation of migration to Bradford.

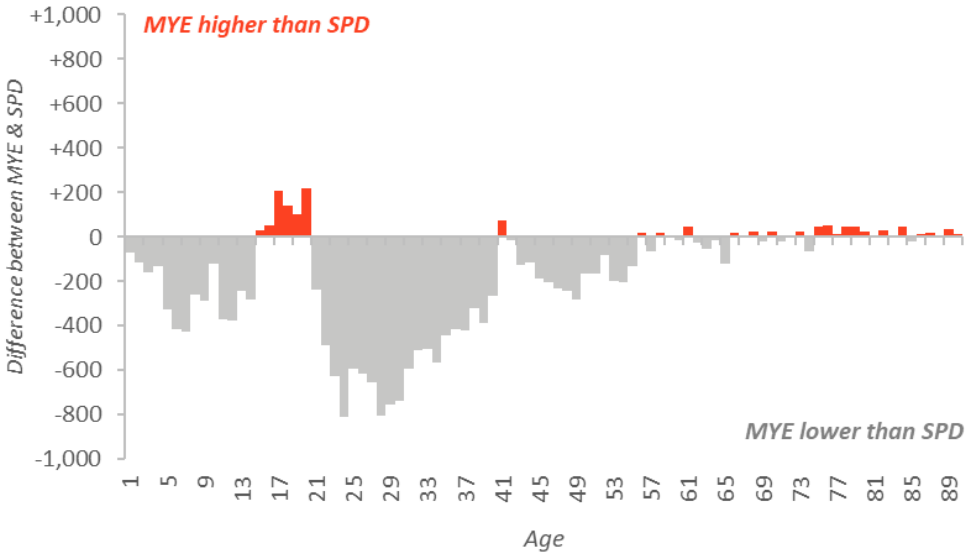


Figure 13: Bradford 2016 ONS MYE vs SPD

Alternative Population Estimate

3.11 The latest demographic evidence suggests that whilst there is likely to have been a genuine trend of lower international migration to Bradford, a population undercount is a distinct possibility. Quantifying the extent of this potential undercount presents a particular challenge.

3.12 In an attempt to quantify the impact of the potential under-estimation of Bradford's population, a *prudent* UPC equivalent has been calculated for 2011/12–2017/18 (Figure 14). This has been achieved using the relationship between UPC and immigration totals that was evident for the 2001/02–2010/11 period to quantify a post-2011 figure. This results in a UPC estimate of approximately **+5,743** for the seven-years, 2011/12–2017/18.

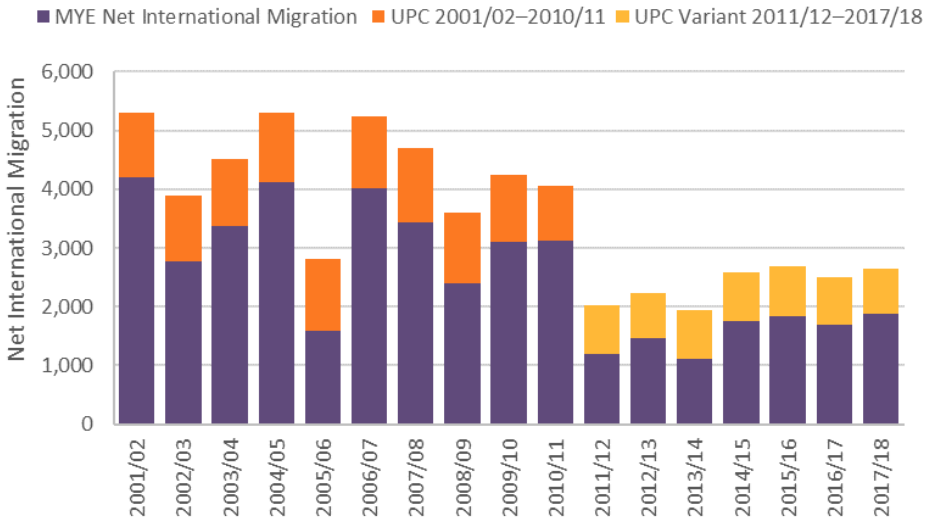


Figure 14: Bradford net international migration and variant UPC estimation (2001/02–2017/18)

3.13 The impact of the UPC equivalent estimate upon Bradford's population is presented in Figure 15, indicating the extent to which the population growth trajectory would change with an assumed UPC adjustment for 2011/12–2017/18. The population estimated for Bradford in 2018 increases from **537,173** recorded in the ONS MYE, to approximately **542,900** with the estimated adjustment.

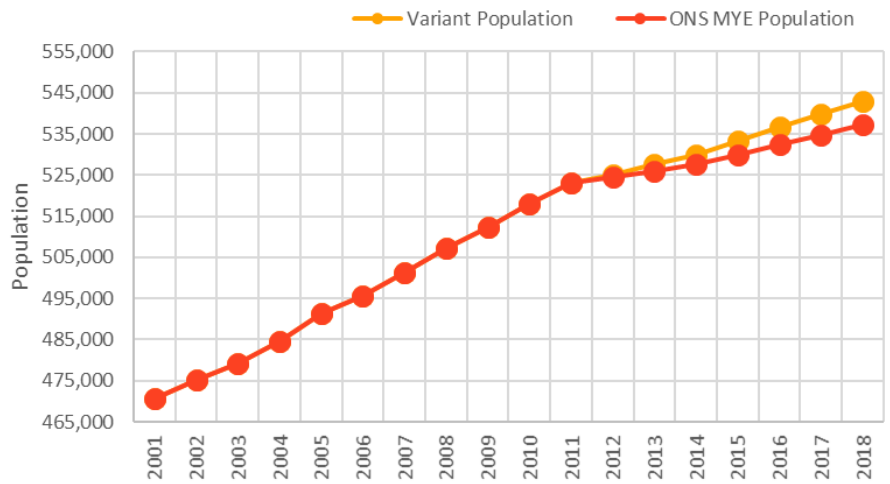


Figure 15: Bradford population ONS MYE and variant UPC 2001–2018

3.14 It is evident that net international migration in Bradford has fallen since 2011, driving lower population change in the district. The potential undercount estimated for Bradford's population provides a modest uplift but has an important bearing on estimating future population change based on past migration trends.

4 Demographic Forecasts

Policy & Guidance

4.1 Every two years, ONS publishes its national and subnational populations (SNPP), setting key assumptions on the long-term effects of fertility, mortality and migration to estimate population growth outcomes. The 2016-based SNPP is the latest projection released by ONS, using demographic assumptions derived from a pre-2016, 5–6 year historical period and incorporating national assumptions on fertility, mortality and international migration to formulate a 25-year (2016–2041) projection for each local authority area.

4.2 In addition, the ONS has published international migration 'variant' projections for local authorities in England; considering the impact of a 10-year international migration trend (as opposed to 5-years under the 'Principal' projection), and national levels of 'High' and 'Low' international migration at a local level. The 2016-based Principal and variant projections provide an updated population growth outlook to the 2014-based population projection, which covered the 2014–2039 time-period and based its assumptions on the 5/6-year period pre-2014.

4.3 ONS population projections underpin its household projections, providing key assumptions on the future number of households, average household size and household formation by age group and sex. The ONS 2016-based household projections are underpinned by their respective population projections and incorporate a number of methodological changes, compared to previous household projections published by the MHCLG.

4.4 However, whilst the 2016-based projections reflect more recent trends, the 2014-based household projections remain the starting point in the assessment of future housing need; estimating an overall higher level of household growth over the projection period. The latest PPG and NPPF, provide a standard methodology to calculate the minimum housing need for Local Authorities in England. The standard methodology is underpinned by the 2014-based household projections and seeks to aid in achieving the *"Government's objective of significantly boosting the supply of homes"* [5].

4.5 The standard methodology (summarised in Figure 20, Appendix B), uses the average annual household growth under the 2014-based household projections for a ten-year period, together with the latest affordability ratio as its starting point. Under the standard methodology, the minimum housing need figure for Bradford for 2019–2029 is +1,703 per year (1,584 average annual household growth under the 2014-based household projections, plus an 8% uplift to account for affordability).

[5] NPPF (February 2019). Paragraph: 004. ID: 2a-004-20190220

Demographic Scenario Development

4.6 The official population and household projections provide the starting point in determining future housing need in Bradford. However, given Bradford's dynamic demographic change profile and potential under-estimation post-2011 Census, it is important to consider alternative demographic trend trajectories based on variant migration assumptions.

4.7 In conjunction with the ONS 2014-based SNPP and 2016-based Principal and variant SNPPs, four alternative trend-based scenarios have been developed which take account of (i) different migration histories (i.e. a six-year and seventeen-year historical period) and, (ii) an uplift to international migration post-2011 to take account of the potential underestimation of Bradford's population (refer to Figure 14, page 14).

- **SNPP-2014**: Replicates the ONS 2014-based SNPP for Bradford.
- **SNPP-2016 (Principal):** Replicates the latest ONS 2016-based SNPP for Bradford.
- **SNPP-2016 (High Mig):** Replicates the ONS 2016-based High International Migration Variant for Bradford.
- **SNPP-2016 (Low Mig):** Replicates the ONS 2016-based Low International Migration Variant for Bradford.
- **SNPP-2016 (10yr Mig):** Replicates the ONS 2016-based 10-year Migration Variant for Bradford.
- **PG[6] Long Term:** Internal migration rates and international migration flow assumptions are based on a seventeen-year history (2001/02–2017/18). UPC for 2001/02–2010/11 is included in international migration assumptions.
- **PG Long Term (UPC Variant):** Internal migration rates and international migration flow assumptions are based on a seventeen-year history (2001/02–2017/18). UPC for 2001/02–2010/11 and estimated UPC for 2011/12–2017/18 is included in international migration assumptions.
- **PG Short Term:** Internal migration rates and international migration flow assumptions are based on a six-year history (2012/13–2017/18). UPC for 2001/02–2010/11 is included in international migration assumptions.
- **PG Short Term (UPC Variant):** Internal migration rates and international migration flow assumptions are based on a six-year history (2012/13–2017/18). The estimated UPC for 2012/13–2017/18 is included in international migration assumptions.

4.8 The demographic trend scenarios (PG) incorporate mid-year population estimates, migration, births and deaths statistics for 2001–2018 (i.e. an additional two years of data to the SNPP-2016 scenarios and an additional four years to the SNPP-2014 scenario).

[6] PG refers to POPGROUP, the cohort component model used to develop the forecasts.

4.9 The household growth impact of alternative population growth trajectories is considered later in this section alongside the PPG housing need figure. Refer to Appendix C for detail on data inputs and assumptions under each scenario.

Population Growth Outcomes

4.10 The 2001–2037 population growth trajectories for all scenarios are presented in Figure 16. In Table 2, each of the scenarios is summarised in terms of population growth and components of change over the 2019–2037 plan period.

4.11 Over the 2019–2037 plan period, population change in Bradford ranges from 0.3% (+1,462) under the **SNPP-2016 (Low Migration)** variant scenario to 11.2% (+60,530) under the **PG Long Term (UPC Variant)** scenario. Under each of the scenarios, net internal migration is estimated to continue to have a negative impact on population change; with net international migration and natural change driving population growth in Bradford.

4.12 Under the **SNPP-2014** scenario (which underpins the current PPG Standard Method for calculating the minimum housing need figure), population change is estimated at +6.9%, driven by net international migration (averaging +1,796 pa) and a continued positive impact of natural change (averaging +3,448 pa).

4.13 The 2016-based SNPPs provide a lower population growth outlook than previously estimated under the 2014-based SNPP, driven by (i) lower fertility rates, (ii) dampened improvements in life expectancy and, (iii) a lower long-term international migration outlook. The 2016-based growth outcomes are further dampened by the potential underestimation of Bradford's population, post-2011.

4.14 Population change under the **SNPP-2016 (Principal)** and variant scenarios is notably lower than previously estimated under the **SNPP-2014** for Bradford. The **SNPP-2016 (Principal)** scenario and **SNPP-2014** both base their assumptions on the 5–6-year period preceding their respective base dates. Under the **SNPP-2016 (Principal)** scenario, lower population change of 2.4% (+12,756) is predominantly driven by lower net international migration (averaging +875 pa), and lower natural change (2,612 pa). The impact of natural change on population growth is also reduced by assumptions on lower fertility and life expectancy, reflecting forecast national trends.

4.15 Under the 2016-based international migration variants (10-year, High and Low), differences in population change are driven by net international migration and subsequent impact on natural change. Under the **SNPP-2016 (High Migration)** and **(10-year Migration)** variants, net international migration increases to +1,353 pa and +1,642 pa (respectively), with the annual impact of natural change also increasing as a result of higher birth numbers. Over the 2019–2037 plan period, population growth under the **SNPP-2016 (High Migration)** and **(10-year Migration)** variants ranges from 4.5% to 5.3% respectively.

4.16 The **SNPP-2016 (Low Migration)** variant illustrates the extent to which population growth in Bradford is driven by net international migration (and subsequently natural change). Notably lower net

international migration (+397 pa) would be insufficient to counteract the annual net outflow to the rest of the UK, resulting in a near-zero population growth outcome (0.3%).

4.17 The PG scenarios base their fertility and mortality assumptions on the ONS 2016-based SNPP but include the latest mid-year estimates in its migration assumptions. The **PG Short Term** and **PG Short Term (UPC Variant)** scenarios base their migration assumptions on a similar period to the SNPP scenario (i.e. 5-6 years) but incorporate the latest mid-year estimates. The **PG Short Term (UPC Variant)** scenario includes an adjustment to account for a potential population undercount since 2011. Under the **PG Short Term (UPC Variant)** scenario, population change of +7.1% is estimated over the 2019–2037 plan period; higher than that estimated under each of the SNPP-2016 variants and slightly higher than the **SNPP-2014**. The **PG Short Term** alternative estimates lower growth, 5.3% by 2037.

4.18 The **PG Long Term** and **PG Long Term (UPC Variant)** scenarios base their migration assumptions on a longer-term migration history (seventeen-years), capturing the higher net international migration evidenced pre-2011 in their assumptions. As a result, higher population change is estimated under the **PG Long Term** and **PG Long Term (UPC Variant)** scenarios (10.4% and 11.2% respectively), with the latter including adjustments to international migration post-2011, to reflect potential underestimation.

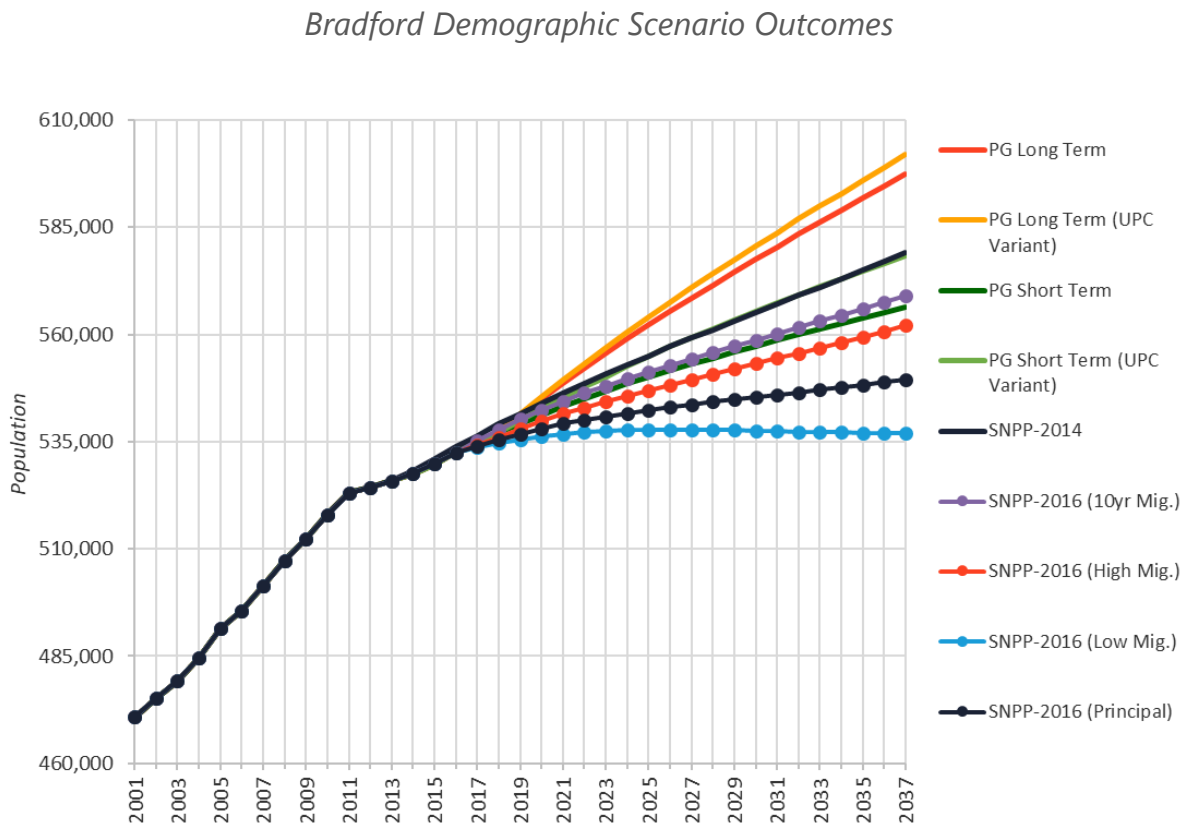


Figure 16: Bradford population growth trajectory 2001–2037

Table 2: Bradford demographic scenario outcomes 2019–2037

Scenario	Change 2019–2037		Average Annual			
	Population Change	Population Change %	Natural Change	Net Internal Migration	Net International Migration	Net Migration
PG Long Term (UPC Variant)	60,530	11.2%	3,394	-3,489	3,458	-32
PG Long Term	56,343	10.4%	3,377	-3,457	3,210	-247
PG Short Term (UPC Variant)	38,437	7.1%	2,845	-2,989	2,279	-710
SNPP-2014	37,480	6.9%	3,448	-3,162	1,796	-1,366
SNPP-2016 (10yr Mig.)	28,786	5.3%	2,927	-2,969	1,642	-1,327
PG Short Term	27,186	5.0%	2,768	-2,876	1,618	-1,258
SNPP-2016 (High Mig.)	24,046	4.5%	2,763	-2,780	1,353	-1,427
SNPP-2016 (Principal)	12,756	2.4%	2,612	-2,778	875	-1,903
SNPP-2016 (Low Mig.)	1,462	0.3%	2,461	-2,776	397	-2,379

Note: Scenarios ranked in order of population change.

Population Age Profile

4.19 Fluctuations in the level of in- and out-migration have influenced Bradford's annual population change. Future international migration flows and their influence upon the age structure are a key factor when considering future housing requirements and employment growth.

4.20 Migration profiles will drive changes to Bradford's population age structure (Figure 17). Over the 2019–2037 plan period, there is substantial population growth estimated in the 65+ age groups under all scenarios, driven by the gradual ageing of the birth cohorts from the 1940s, 50s and 60s.

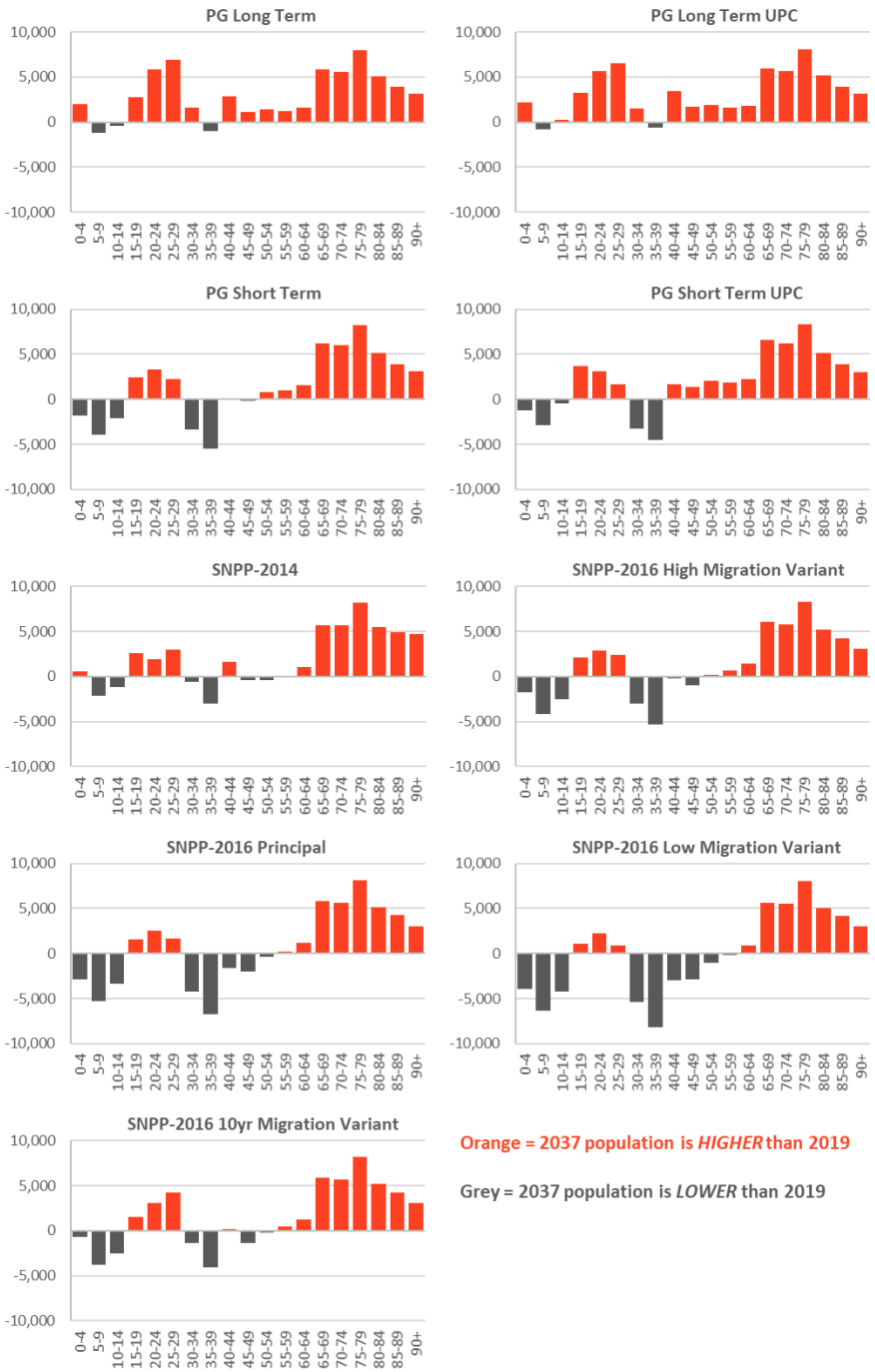


Figure 17: Population change by 5-year age group (2019–2037)

4.21 Under the **SNPP-2016 (Principal**) and variant scenarios, population decline is estimated in the 30–49 and associated 0–14 migrant and family age groups, driven by fewer people moving into Bradford coupled with out-migration in the 'family' age groups.

4.22 The **PG Long Term** and **PG Long Term (UPC Variant)** scenarios result in a different profile of population change, with growth estimated in the majority of age groups. Higher net international migration estimated under the **PG Long Term** and **UPC Variant** scenarios, results in more growth to the key labour force age groups and the maintenance of a more youthful population age profile. Under the **PG Long Term** scenarios, the OAD increases from 24% in 2019 to 31% by the end of the plan period, compared to approximately 34% under the **SNPP-2014** and **SNPP-2016** scenarios.

Household & Dwelling Growth Outcomes

4.23 The household and dwelling growth associated with a given population growth trajectory, size and age profile, can be estimated using assumptions from official household projection models (2014-based and 2016-based). Under the 2016-based Principal household projection, household representative rates are forecast to 2021, fixed thereafter.

4.24 Under the 2014-based household projection, household formation rates coupled with a greater decline in average household size, results in higher household growth than estimated under the latest 2016-based household projection. However, both projections estimate a decline in household formation in the 25–44 young adult age groups; reflecting recent trends linked to affordability.

4.25 In May 2019, ONS also published a number of variant 2016-based household projections which considered: (i) the impact of a continuing headship rate projection post 2021 and, (ii) the impact of variant underpinning *population* projections (i.e. 10-year, High and Low SNPP) but using household formation rates in line with the Principal projection.

4.26 In light of the available evidence, household and subsequent dwelling growth is estimated using assumptions from the 2014-based and 2016-based (Principal) household projection models, together with an additional 2014-based 'Return' variant considering the potential impact of a return to higher household formation in the young adult age groups[7]. The relationship between household and dwelling growth is estimated using a 2011 Census vacancy rate of 3.8% for Bradford.

4.27 Over the 2019–2037 plan period, the population growth range of 0.3% to 11.2% is estimated to support an average annual dwelling growth range of 742–2,004 dpa (2014-based household model assumptions). A return to higher household formation in the young adult age groups is estimated to increase the dwelling growth range to 945–2,251 dpa (2019–2037).

4.28 Lower household formation under the 2016-based projections results in lower dwelling growth supported by the same population growth trajectory. Over the 2019–2037 plan period, the average

[7] Over the 2019–2037 plan period, the male 25–44 age groups return to their respective 2001 values. No adjustments have been made to female age groups which forecast a small increase in headship rates over the plan period.

annual dwelling growth range reduces to 597–1,793 dpa, an average of c.185 fewer dwellings per year compared to the 2014-based equivalent.

Table 3: Bradford population change and average annual dwelling growth (2019–2037)

Scenario	2019–2037				
	Population Change	Population Change %	Average Annual Dwelling Growth		
			2014-based	2014-based Return	2016-based
PG Long Term (UPC Variant)	60,530	11.2%	2,004	2,251	1,793
PG Long Term	56,343	10.4%	1,907	2,156	1,698
Minimum HNF (2019–2029)*			**1,703**		
SNPP-2014	37,480	6.9%	1,585	1,825	1,372
PG Short Term (UPC Variant)	38,437	7.1%	1,568	1,778	1,392
SNPP-2016 (10yr Mig.)	28,786	5.3%	1,374	1,607	1,182
PG Short Term	27,186	5.0%	1,325	1,541	1,154
SNPP-2016 (High Mig.)	24,046	4.5%	1,258	1,475	1,085
SNPP-2016 (Principal)	12,756	2.4%	1,000	1,210	841
SNPP-2016 (Low Mig.)	1,462	0.3%	742	945	597

*Minimum housing need figure (HNF) calculated using the PPG (2019) standard method for the 2019–2029 ten-year period. This is underpinned by the 2014-based household projection model and includes an affordability uplift.
All other scenarios include a 2011 Census dwelling vacancy rate of 3.8% for Bradford. 2016-based refers to assumptions from the ONS 2016-based *Principal* household projection model.

4.29 Whilst the 2016-based household projection model provides an updated outlook on household formation, it has been disregarded in the standard methodology. As a result, the starting point in the assessment of future housing need is estimated using assumptions from the 2014-based household projection model.

4.30 The standard methodology minimum housing need figure for Bradford is 1,703 pa for the ten-year 2019–2029 period, calculated using assumptions from the 2014-based household projection and an 8% affordability uplift[8]. Over the full eighteen-year (2019–2037) plan period, a continuation of longer-term migration patterns under the PG Long Term and UPC Variant scenarios points to a higher annual dwelling growth need than currently estimated by the standard methodology, whilst the SNPP-2016 scenarios indicate lower growth levels.

Linking Population and Employment

4.31 It is evident that in the face of a net outflow of domestic migrants, net international migration has maintained Bradford's relatively youthful population age profile. However, an estimated fall in long-term international migration, coupled with the continuation of the domestic migration outflow, could

[8] Note that this does not apply a vacancy rate adjustment.

have an important impact on labour force age groups. Bradford needs to retain its working age population to support future economic growth.

4.32 Quantifying the relationship between demographic change and employment growth presents a particular methodological challenge. However, three key economic assumptions can be used to link population change to an estimate of workplace-based employment (a person-based, rather than job-based, employment count).

4.33 **Economic activity rates** determine the proportion of the population that is actively engaged in the labour force; either employed or unemployed, with future rates typically adjusted in line with the OBR's forecast of long-term changes to age-specific rates of labour force participation. The **unemployment rate** determines the proportion of the labour force that is unemployed (and as a result, the proportion that is employed).

4.34 The **commuting ratio** is the balance between local employment and the size of the resident workforce. A commuting ratio greater than 1.00 indicates a net out-commute (i.e. the number of resident workers in an area is greater than the level of employment). A commuting ratio less than 1.00 indicates a net in-commute (i.e. the employment total is greater than the number of resident workers). At the 2011 Census, Bradford's commuting ratio was 1.02, indicating a net out-commuting balance.

4.35 In considering the alignment of demographic forecasts (population and housing) with the economic outlook, it is imperative that employment/job definitions are correctly identified and acknowledged. The demographic model would typically consider a 'person-based' measure of 'workplace-based employment', whereas economic forecasts will consider both person-based employment and an accompanying 'jobs' count. A measure of 'jobs' growth will incorporate both full-time and part-time jobs, which contrasts to the person-based measure of employment. Jobs totals and annual growth in jobs will typically be higher than equivalent workplace-based employment statistics.

4.36 The population and employment analysis is not extended further in this report, with a forthcoming Employment Land Review (ELR) providing the key evidence on Bradford's economic outlook and aspirations.

5 Summary

Approach

5.1 Bradford Metropolitan District Council is in the process of formulating evidence to inform its Core Strategy and SHMA. Taking account of the latest PPG and demographic evidence, this document has presented a range of population and dwelling growth forecasts for the Council to consider.

5.2 The analysis has presented Bradford's demographic profile, identifying migration as a key driver of change since 2001. Over the 2001–2011 period, Bradford's population increased by an average of 1.1% per year. Since 2011, a notable fall in population growth has been estimated (an average of 0.4% per year), driven by a significant fall in the estimate of net international migration, coupled with a continued net domestic out-migration from Bradford to the rest of the UK.

5.3 Following the 2011 Census, Bradford experienced a substantial UPC adjustment (+11,555) to account for its population undercount 2001–2011. The analysis presented in this report has considered whether there is a continued undercount of Bradford's population post-2011. The evidence suggests that whilst lower net international migration into Bradford is a genuine trend, under-estimation of the population is likely. A prudent estimate of this undercount has been made, equating to approximately 5,700 over the 2011–2018 period.

5.4 The 2014-based SNPP and 2016-based (Principal and variant) SNPP for Bradford have been presented, with the latter estimating lower growth as a result of: (i) lower fertility rates, (ii) dampened improvements in life expectancy and, (iii) lower long-term international migration outlook. The lower growth has been accelerated by the population estimation issues, post-2011.

5.5 For comparison with the SNPP scenarios and to take account of the potential undercount post-2011, a range of demographic trend scenarios have been formulated which take account of alternative migration histories; short-term (six-year migration history 2012/13–2017/18) and long-term (seventeen-year history 2001/02–2017/18). The 'UPC variant' scenarios include adjustments to international migration to account for a potential mis-estimation since 2011.

5.6 The dwelling growth impact of population growth, forecast under the demographic scenarios, has been estimated using assumptions from the 2014-based and 2016-based household projection models, including the potential impact of a 'return' to higher household formation in the young adult age groups. Dwelling growth outcomes have been presented alongside Bradford's PPG minimum housing need figure of +1,703 pa (2019–2029).

Growth Outcomes

5.7 Over the 2019–2037 plan period, the population growth range of 0.3% to 11.2% under the demographic scenarios is estimated to support an average annual dwelling growth range of **742–2,004** dpa under the 2014-based household model assumptions (Figure 18). Assuming a 'return' to higher household formation in the young adult age groups, increases the average annual dwelling growth range to **945–2,251** dpa.

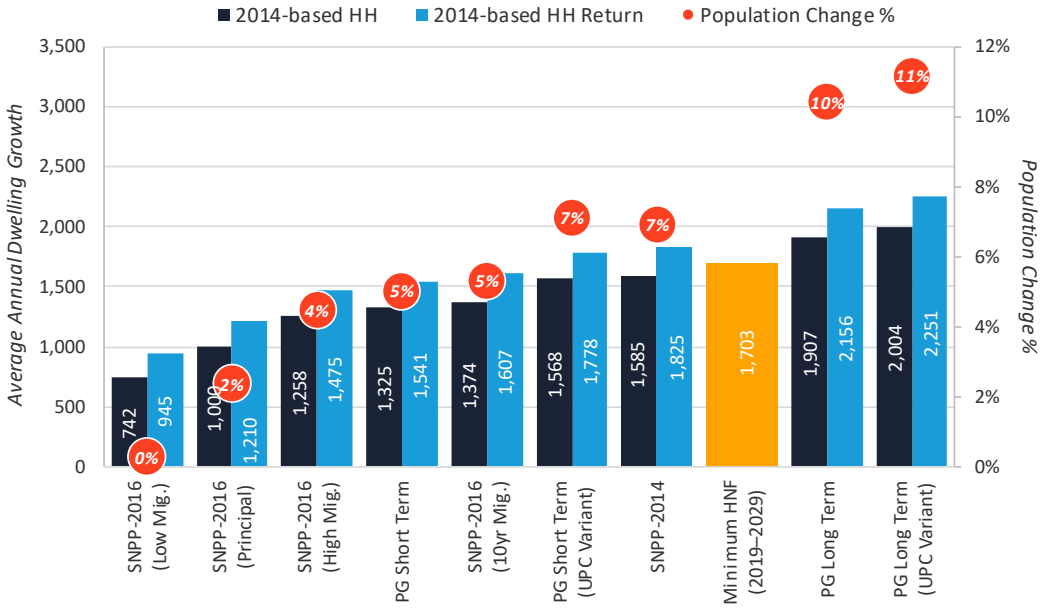


Figure 18: Average annual dwelling growth and population change (%) 2019–2037

5.8 The minimum housing need figure (HNF) calculated for the 2019–2029 plan period (+1,703 pa) sits toward the upper end of the dwelling growth range. The **PG Long Term** and **PG Long Term (UPC Variant)** scenarios point to higher dwelling growth than the minimum HNF, whilst the **SNPP-2016 (Principal)** and international migration variants suggest lower growth.

5.9 The PG scenarios capture the latest demographic evidence in their migration assumptions, with the 'UPC Variants' also incorporating an adjustment for a potential undercount of population post-2011. Under the **PG Short Term (UPC Variant)** scenario, a continuation of migration trends over the last six-years (including an uplift to international migration flows) results in population growth of 7.1% over the plan period; reflecting lower migration since 2011, but a more positive outlook on international migration than estimated under the SNPP-2016 scenarios. The **PG Short Term** alternative estimates lower growth, 5.0% by 2037.

5.10 The **PG Long Term** scenario captures higher net in-migration recorded pre-2011 in its migration assumptions, resulting in a more substantial dwelling growth requirement (1,907–2,156 dpa). Including a moderate adjustment to net international migration post-2011 to account for potential

underestimation in population, increases the estimated population growth to 11.2% under the **PG Long Term (UPC Variant)** scenario, with an associated dwelling growth range of 2,004–2,251 dpa.

ONS 2018-based Projections

5.11 The ONS official projections presented in this analysis include both 2014-based and 2016-based population and household growth projections. Whilst the 2016-based statistics provide the most recent suite of projections, it is the 2014-based output that has been retained as the underpinning evidence for MHCLG's standard methodology for estimating minimum housing need.

5.12 ONS will publish its 2018-based sub-national population and household projections during 2020. For Bradford, the 2018-based growth outcomes will be determined from a combination of evidence on: (i) local migration impacts from the last 5/6 years; (ii) national assumptions on international migration, fertility and mortality.

5.13 The latest mid-year estimates for 2017 and 2018 have indicated a continued improvement (reducing net outflow) in the migration balance for Bradford, resulting from a narrowing of the gap between domestic in and out-migration flows. This will have a positive impact upon Bradford's 2018-based migration assumptions in the forthcoming ONS evidence.

5.14 However, any positive impact that this recent domestic migration evidence will have upon growth outcomes, may be countered by further downward adjustments to ONS' long-term assumptions on UK international migration. Given the likelihood of stricter immigration controls following the UK's exit from the European Union, these assumptions will either be held at current (2016-based) levels or will be reduced. Further reductions will have a dampening impact upon Bradford's 25-year growth projection, 2018-2043.

5.15 In terms of fertility and mortality, the ONS' 2016-based projections applied dampened fertility rates and constraints on life expectancy improvements. These assumptions were a deviation from the 2014-based evidence and are therefore likely to vary little in the 2018-based evidence.

5.16 The 2016-based *household* model was also a departure from its 2014-based predecessor, resulting in lower estimates of household growth across all local authorities. With little new evidence available on household representative rates, it is very unlikely that 2018-based household model assumptions will alter from those evident in the 2016-based model.

5.17 On this evidence it is likely that the 2018-based ONS population projections for Bradford will result in a more positive outlook for domestic migration, a gradual reduction in the impact of natural change, plus a similar or dampened impact from international migration. Compared to the 2016-based projections, a slightly higher population growth (and therefore household growth) outcome would be expected, depending upon the extent of the ONS' long-term international migration assumptions.

5.18 MHCLG has indicated that its standard methodology will continue to be subject to review but it remains uncertain as to whether it will replace ONS' 2014-based projections as the basis for its minimum housing need calculations when the 2018-based evidence becomes available.

Recommendation

5.19 To inform the SHMA analysis and its estimation of Bradford's future housing needs, it is recommended that a condensed range of growth scenarios is considered.

5.20 The **PG Long-Term** scenario assumptions have included historical evidence on relatively high levels of international migration that are unlikely to be replicated in the future, even with potential issues relating to population mis-estimation.

5.21 The suite of **ONS 2016-based** scenarios are lower-growth outcomes, underpinned by a relatively high net outflow from domestic migration. This net outflow balance has improved considerably since the 2016-based evidence was formulated.

5.22 The **PG Short-Term** scenarios incorporate the latest evidence on domestic and international migration, exclude the higher international migration totals pre-2011 and consider the potential impact of population mis-estimation. Together with **SNPP-2014**, which underpins the MHCLG standard method, these scenarios provide an appropriate range for SHMA consideration.

5.23 In this condensed range, all dwelling-growth outcomes include a '**return**' to higher household formation in the young adult age groups, an important aspiration in seeking to redress housing affordability issues (Figure 19).

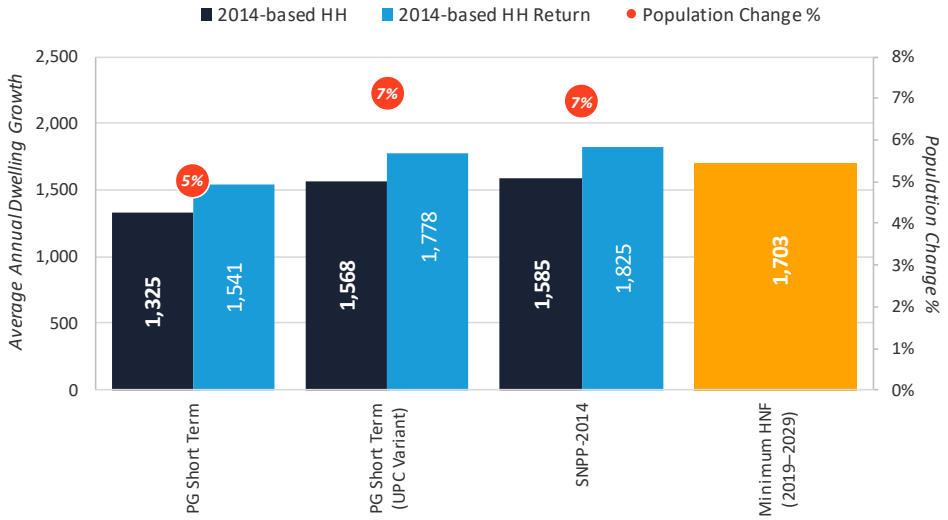


Figure 19: Dwelling growth range for SHMA consideration, 2019-2037

5.24 On balance, notwithstanding the forthcoming ELR evidence on economic outlook and aspiration, the MHCLG's standard method would appear to provide an appropriate baseline for the examination of Bradford's future housing need.

Appendix A NINo Country of Origin Definition

EU13	
EU8	Cyprus
	Malta
	Czech Rep
	Czechoslovakia
	Hungary
	Poland
	Rep of Estonia
	Rep of Latvia
	Rep of Lithuania
	Rep of Slovenia
	Slovak Rep
EU2	Bulgaria
	Romania
	Croatia

Other EU
Austria
Belgium
Denmark
E Germany
Finland
France
Germany
Greece
Italy
Luxembourg
Netherlands
Portugal
Rep of Ireland
Spain
Sweden

Old Commonwealth
Australia
Canada
New Zealand
South Africa

New Commonwealth
Antigua
Bahamas
Bangladesh
Barbados
Belize
Botswana
Brunei
Cameroon
Fiji
Ghana
Grenada
Guyana
India
Jamaica
Kenya
Kiribati
Lesotho
Malawi
Malaysia
Maldive Islands
Mauritius
Mozambique
Namibia
Nauru
Nevis, St Kitts-Nevis
Nigeria
Pakistan
Papua New Guinea
Seychelles
Sierra Leone
Singapore
Solomon Islands
Sri Lanka
St Lucia
St Martins
St Vincent & Grenadines
Swaziland
Tanzania
Tonga
Trinidad & Tobago
Tristan da Cunha
Tuvalu
Uganda
Vanuatu
Samoa
Zambia
Rwanda

Appendix B
PPG Standard Methodology Housing Need

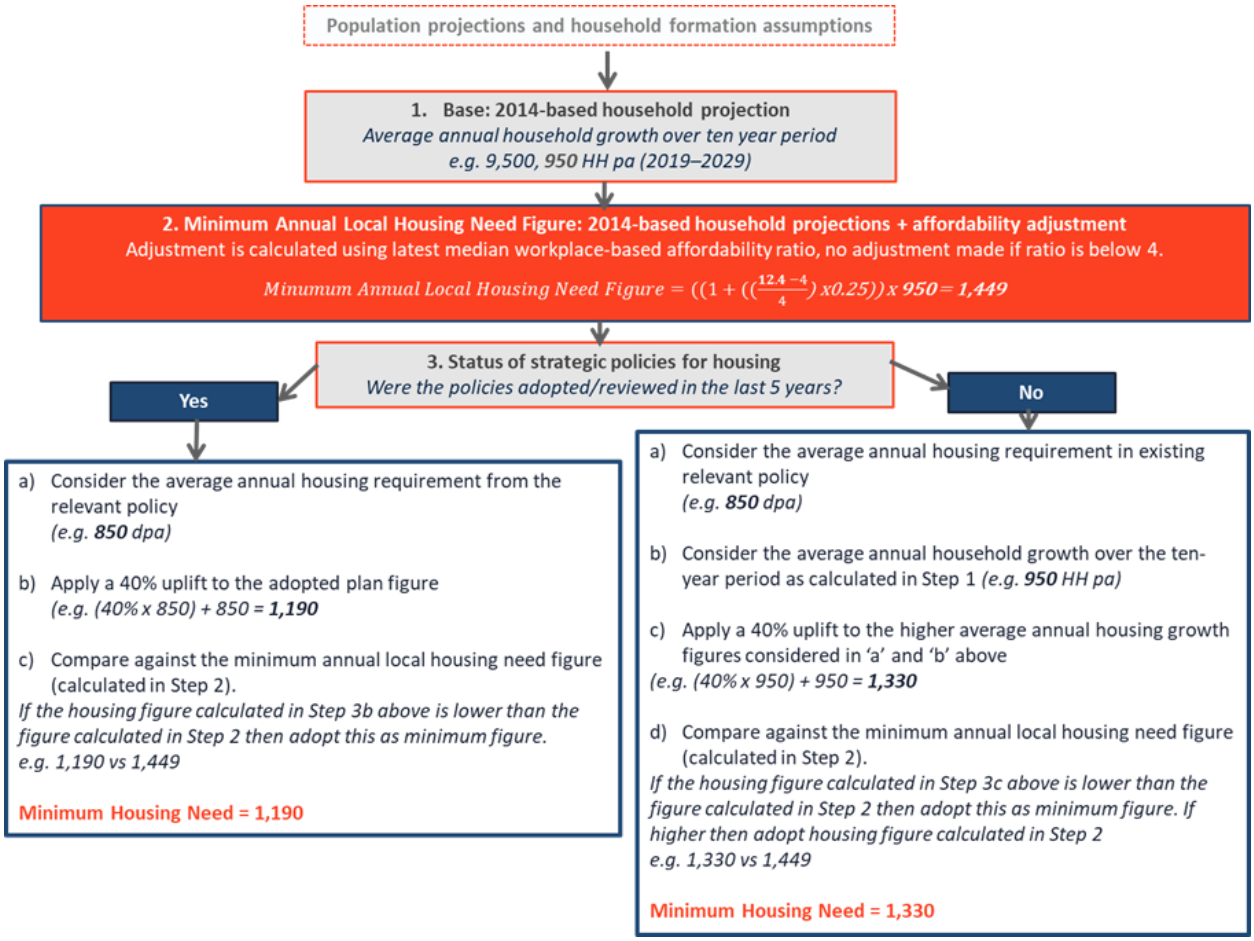


Figure 20: PPG Standard Methodology Example

Appendix C
POPGROUP Methodology & Assumptions

Forecasting Methodology

C.1 Evidence is often challenged on the basis of the appropriateness of the methodology that has been employed to develop growth forecasts. The use of a recognised forecasting product which incorporates an industry-standard methodology (a cohort component model) removes this obstacle and enables a focus on assumptions and output, rather than method.

C.2 Demographic forecasts have been developed using the POPGROUP suite of products. POPGROUP is a family of demographic models that enables forecasts to be derived for population, households and labour force, for areas and social groups. The main POPGROUP model (Figure 21) is a cohort component model, which enables the development of population forecasts based on birth, death and migration inputs and assumptions.

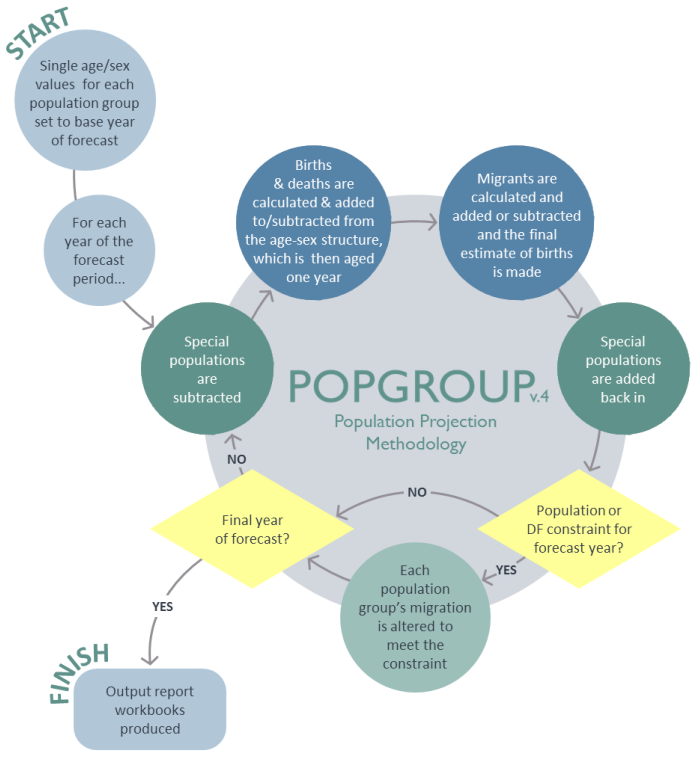
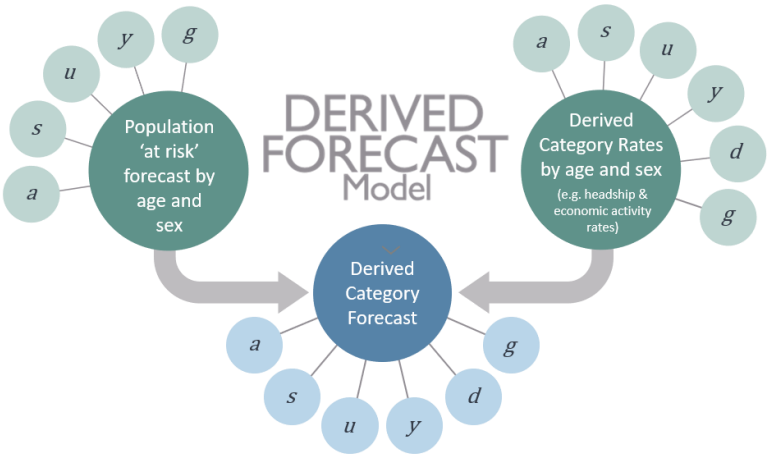


Figure 21: POPGROUP population projection methodology

C.3 The Derived Forecast (DF) model (Figure 22) sits alongside the population model, providing a headship rate model for household projections, and an economic activity rate model for labour force projections.



$$D_{a,s,u,y,d,g} = \frac{P_{a,s,u,y,g}\ R_{a,s,u,y,d,g}}{100}$$

D	Derived Category Forecast	y	Year
P	Population 'at risk' Forecast	d	Derived category
R	Derived Category Rates	g	Group (usually an area, but can be an ethnic group or social group)
a	Age-group		
s	Sex		
u	Sub-population		

Figure 22: Derived Forecast (DF) model

C.4 For further information on POPGROUP, please refer to the Edge Analytics website: https://www.edgeanalytics.co.uk/

Data Inputs & Assumptions

C.5 Edge Analytics has developed a suite of demographic scenarios for Bradford using POPGROUP and the Derived Forecast (DF) model. The POPGROUP suite of demographic models draw data from a number of sources, building an historical picture of population, households, fertility, mortality and migration on which to base its scenario forecasts.

C.6 Using historical evidence for 2001–2018, in conjunction with information from the Office for National Statistics (ONS) and Ministry of Housing, Communities and Local Government (MHCLG) population and household projections, a series of assumptions have been derived which drive scenario forecasts.

C.7 Population change is driven by assumptions on births, deaths, internal and international migration components of population change. In the following sections, a narrative on the data inputs and assumptions underpinning the scenarios is presented.

Population & Components of Change

C.8 In each scenario, historical population statistics are provided by the mid-year population estimates (MYEs), with all data recorded by single-year of age and sex. These data include the revised MYEs for

2002–2010 (which were rebased by the ONS in May 2013), providing consistency in the measurement of the components of change (i.e. births, deaths, internal and international migration) between the 2001 and 2011 Censuses. In addition, the ONS revisions made to 2012–2016 MYEs in March 2018 are also included, these provided a revised estimated of international migration at district level.

C.9 In the SNPP-2014 scenario, historical MYEs are used to 2014. From 2014, future population counts are provided by single-year of age and sex to ensure consistency with the trajectory of the ONS 2014-based sub-national population projection (SNPP).

C.10 In the SNPP-2016 (Principal) and variant scenarios, historical MYEs are used to 2016. From 2016, future population counts are provided by single-year of age and sex to ensure consistency with the trajectory of the ONS 2016-based (Principal) and respective variant SNPPs for Bradford.

C.11 In the **PG Short Term (UPC Variant), PG Long Term**, and **PG Long Term (UPC Variant)** scenarios, historical MYEs are used to 2018.

Fertility & Births

C.12 In each scenario, historical mid-year to mid-year counts of births by sex have been sourced from the ONS MYEs for Bradford.

C.13 In the **SNPP-2014** scenario, historical births are used from 2001/02–2013/14. From 2014, future counts of births are specified to ensure consistency with the ONS 2014-based SNPP for Bradford.

C.14 In the **SNPP-2016 (Principal)** and **variant** scenarios, historical births are used from 2001/02–2015/16. From 2016, future counts of births are specified to ensure consistency with the ONS 2016-based SNPP (Principal) and respective variants for Bradford.

C.15 Under the **PG Short Term (UPC Variant), PG Long Term** and **PG Long Term (UPC Variant)** scenarios, historical births are used from 2001/02 to 2017/18. From 2018/19, area-specific age-specific fertility rate (ASFR) schedule, derived from the ONS 2016-based (Principal) projection, is included in the POPGROUP model assumptions. Long-term assumptions on changes in age-specific fertility rates are taken from the ONS 2016-based (Principal) projection.

C.16 In combination with the 'population-at-risk' (i.e. all women between the ages of 15–49), the area-specific ASFR and future fertility rate assumptions provide the basis for the calculation of births in each year of the forecast period (i.e. from 2018/19 onward).

Mortality & Deaths

C.17 In each scenario, historical mid-year to mid-year counts of deaths by five-year age group and sex have been sourced from the ONS MYEs for Bradford.

C.18 In the **SNPP-2014** scenario, historical deaths are used from 2001/02–2013/14. From 2014, future counts of deaths are specified to ensure consistency with the ONS 2014-based SNPP for Bradford.

C.19 In the **SNPP-2016 (Principal)** and **variant** scenarios, historical deaths are used from 2001/02–2015/16. From 2016, future counts of deaths are specified to ensure consistency with the ONS 2016-based SNPP (Principal) and respective variants for Bradford.

C.20 Under the **PG Short Term (UPC Variant), PG Long Term** and **PG Long Term (UPC Variant)** scenarios, historical deaths are used from 2001/02 to 2017/18. From 2018/19, area-specific age-specific mortality rate (ASMR) schedule, derived from the ONS 2016-based (Principal) projection, is included in the POPGROUP model assumptions. Long-term assumptions on changes in age-specific mortality rates are taken from the ONS 2016-based (Principal) projection.

C.21 In combination with the 'population-at-risk' (i.e. the whole population), the area-specific ASMR and future mortality rate assumptions provide the basis for the calculation of deaths in each year of the forecast period (i.e. from 2018/19 onward).

Internal Migration

C.22 In each scenario, historical mid-year to mid-year estimates of internal in- and out-migration by five-year age group and sex have been sourced from the 'components of change' files that underpin the ONS MYEs.

C.23 In the SNPP-2014 scenario, historical counts of in- and out-migrants are used from 2001/02–2013/14. From 2014/15, future counts of migrants are specified, to ensure consistency with the ONS 2014-based SNPP for Bradford.

C.24 In the SNPP-2016 (Principal) and variant scenarios, historical counts of internal and in- and out-migrants are used from 2001/02 to 2015/16. From 2016, future counts of migrants are specified to ensure consistency with the ONS 2016-based (Principal) and respective variant SNPPs for Bradford.

C.25 Under the **PG Short Term**, **PG Short Term (UPC Variant), PG Long Term** and **PG Long Term (UPC Variant)** scenarios, historical counts of internal in- and out-migrants are used from 2001/02 to 2017/18. In the PG scenarios, the relevant historical time period is used to derive the area-specific age-specific migration rate (ASMigR) schedule, which then determines the future number of internal in- and out-migrants. In the **PG Short Term** and **PG Short Term (UPC Variant)** scenario, a six-year internal migration history is used (2012/13–2017/18). In the **PG Long Term** and **PG Long Term (UPC Variant)** scenarios, a seventeen-year history is used (2001/02–2017/18).

C.26 In the case of internal migration, the ASMigR schedules are applied to an external 'reference' population (i.e. the population 'at risk' of migrating to Bradford). This is different to the other components (i.e. births, deaths, internal out-migration), where the schedule of rates is applied to the area-specific population (i.e. the population 'at risk' of migrating out of the area). The reference population is defined by considering the areas which have historically contributed the majority of migrants into the area. In the case of Bradford, the Leeds City Region Local Enterprise Partnership (LEP) population has been used.

International Migration

C.27 Historical mid-year to mid-year counts of immigration and emigration by five-year age groups and sex have been sourced from the 'components of population change' files that underpin the ONS MYEs. Any 'adjustments' made to the MYEs to accounts for asylum cases are included in the international migration balance. In all scenarios, future international migrant counts are specified.

C.28 In the **SNPP-2014** scenario, historical counts of migrants are used from 2001/02–2013/14. From 2014/15, the international in- and out-migration counts are drawn directly from the ONS 2014-based SNPP.

C.29 In the **SNPP-2016** scenario, historical counts of migrants are used from 2001/02–2015/16. From 2016/17, the international in- and out-migration counts are drawn directly from the ONS 2016-based (Principal) and variant SNPPs for Bradford.

C.30 In the PG scenarios, historical counts of immigration and emigration are used from 2001/02 to 2017/18. From 2018/19, future international migration counts are based on the area-specific historical migration data. In the **PG Long Term** scenario, a seventeen-year international migration history is used (2001/02–2017/18), including the 'unattributable population change' (UPC) figure (2001/02–2010/11). Under the **PG Long Term (UPC Variant)** scenario, a seventeen-year international migration history is used, but an uplift is applied to recorded international migration 2011/12–2017/18 to take account of potential underestimation. The **PG Short Term** scenario uses a six-year international migration history (2012/13–2017/18). The **PG Short Term (UPC Variant)** scenario also uses a six-year international migration history (2012/13–2017/18), with an uplift applied to take account of potential underestimation. In all PG scenarios, an ASMigR schedule of rates is derived from the relevant migration history and is used to distribute future counts by single-year-of-age and sex.

Household & Dwellings

C.31 The 2011 Census defines a household 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."*

C.32 In POPGROUP, a dwelling is defined as a unit of accommodation which can either be occupied by one household or vacant.

C.33 The household and dwelling implications of the population growth trajectory have been evaluated through the application of household representative rates, communal population statistics and a dwelling vacancy rate. These data assumptions have been sourced from the MHCLG 2014-based and 2016-based household projection models and 2011 Census.

Household Representative Rates

C.34 A household headship rate (also known as household representative rate) is the: *"probability of anyone in a particular demographic group being classified as being a household representative"*[9] .

C.35 The household headship rates used in the POPGROUP modelling have been taken from the MHCLG 2014-based and ONS 2016-based household projection models. The household projections are derived through the application of projected headship rates to a projection of the private household

[9] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/536705/Household_Projections_2014-based_Methdology_Report.pdf

population. The methodology used by MHCLG and ONS in its household projection models consists of two stages:

- **Stage One** produces the national and local authority projections for the total number of households by sex and age-group over the projection period.
- **Stage Two** provides the detailed 'household-type' projection by age-group, controlled by the previous Stage One totals.

C.36 Under all scenarios, the Stage One headship rates have been applied by age group and sex. Three sets of headship rates have been applied to all scenarios:

- **2014-based:** MHCLG 2014-based household representative rates for Bradford.
- **2014-based Return:** MHCLG 2014-based household representative rates for Bradford, with rates in the young adult (25–44) male age groups returning to their respective 2001 values over the 2019–2037 plan period (Figure 23). No adjustments have been made to females which indicate an improvement over the plan period.
- **2016-based:** ONS 2016-based household representative rates for Bradford.

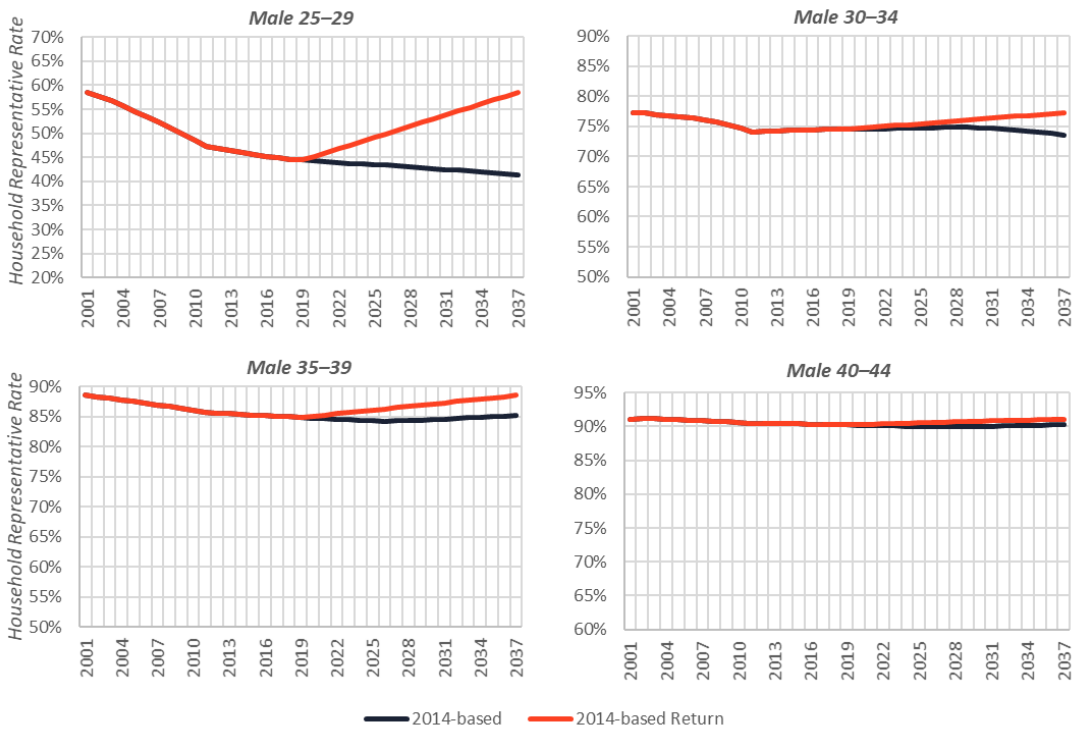


Figure 23: Bradford 2014-based and 2014-based Return Household representative rates

Communal Population Statistics

C.37 Household projections in POPGROUP exclude the population 'not-in-households' (i.e. the communal/institutional population). These data are drawn from the MHCLG 2014-based and ONS

2016-based household projections, which use statistics from the 2011 Census. Examples of communal establishments include prisons, residential care homes and student halls of residence.

C.38 For ages 0–74, the number of people in each age group not-in-households is fixed throughout the forecast period. For ages 75–85+, the proportion of the population not-in-households is recorded. Therefore, the population not-in-households for ages 75–85+ varies across the forecast period depending on the size of the population.

Vacancy Rate

C.39 The relationship between households and dwellings is modelled using a 'vacancy rate', derived from the 2011 Census using statistics on households (occupied household spaces) and dwellings (shared and unshared).

C.40 A vacancy rate of 3.8% for Bradford has been applied, fixed throughout the forecast period. Using the vacancy rate, the 'dwelling requirement' of each household growth trajectory has been evaluated.