The Potential Impact of Post-Brexit Migration upon the Demographics of West Yorkshire 2014–2039

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Acknowledgements

Abstract

In 2016, the European Referendum took place, resulting in the vote to withdraw Britain from the European Union. A key reason for many of those voting to *leave* was the idea of a restriction on international migration into Britain. A reduction in future inflows would alter current population projections, with a consequent impact upon the size and growth of West Yorkshire's labour force, and the long-term age profile of local authority areas.

This is an apolitical research study that explores how alternative rates of international migration could affect population growth and demographic change in West Yorkshire. This has been achieved through modelling the population and household growth from 2014 until 2039 using the established methodology used in POPGROUP, a suite of demographic models. The model used has been adjusted by myself to perform migration variant scenarios: a baseline scenario that assumes migration stays at current rates, a high migration scenario, a scenario that assumes lower than current migration rates, and a scenario where in which net international migration is zero each year.

The findings show that for West Yorkshire, migration does affect the size of the region's population, thus; the size of the labour force is expected to change along with the number of households. A key change is in the long-term age profile due to the age structure of migrant populations. West Yorkshire has an ageing population, and increasing immigration to the region is expected to have little impact on the rate the population ages. However, lower migration rates are expected to reduce the size of the West Yorkshire's labour force therefore increasing pressure on the working-age population as the old-age dependency ratio increases. If the UK government decide to enforce immigration restrictions, regions such as West Yorkshire will face large demographic change within the next 25 years.

Keywords: Demographics, Brexit, population projections, forecasting, population change, immigration, European Union, migration restriction, labour force, households, ageing, old-age dependency ratio

Word Count: 10,000

Abbreviations

DCLG   Department for Communities and Local Government

EAR   Economic Activity Rate

LAD   Local Authority District

LF   Labour Force

NPP   National Population Projections

MYE   Mid-Year Estimates

NPPF   National Planning Policy Framework

OADR   Old Age Dependency Ratio

ONS   Office for National Statistics

PPG   Planning Practice Guidance

SHMA   Strategic Housing Market Assessment

SNPP   Sub-National Population Projections

WYorkshire West Yorkshire

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1   Introduction

This study of population and demographic change is inspired by recent political changes in the UK as a result of the European Union Referendum that took place on the 23rd June 2016. The referendum question was:

"Should the United Kingdom remain a member of the European Union,
or leave the European Union?"

In 2015, the Conservative government iterated that they were still aiming to reduce net international migration "into the tens of thousands" (Cameron, 2015). This goal harboured public concern around population increase due to migration, thus migration was a central topic in the referendum debate, with 47% of people voting immigration as one of the most important issues facing Britain (Somerville, 2016). 72.2% of the UK population took part in casting ballots, with 48.1% of people voting to '*remain'* in the European Union and 51.9% voting to '*leave'* (BBC, 2016). Following the vote to *leave* and a new UK government in place, the likely impacts of Britain's exit from the European Union (Brexit) decision remains very unclear, adding uncertainty to the long-term demographic outlook for both the UK as a whole and within smaller local communities.

Immigration to the UK, particularly from European countries due to free movement of labour within the EU, has been a substantial driver of population growth; notably in Yorkshire and the Humber since the EU expansion of 2004 (NOMIS, 2011). In 2015, non-UK born residents made up 13.3% of the total UK population (ONS, 2016a); the migrants are often of childbearing age and make up a proportion of the UK's labour force. Reduction in future international migration inflows would alter current population projections, with a consequent impact upon the size and growth of the region's labour force, housing supply, and the long-term age profiles of local authority districts (LADs) (Wadsworth, 2015).

Using a mix of secondary data sources, primarily from the Office for National Statistics (ONS) and Department for Communities and Local Government (DCLG), this apolitical dissertation examines how international migration has shaped population growth in West Yorkshire since 2001, and how it will continue to affect the future population until 2039.

This study of exploring demographic change caused by migration is both timely and relevant given the widespread of negative attitudes regarding immigration around the world, notably with Brexit occurring. Therefore, there is purpose in researching the possible demographic future of West Yorkshire using migration variant scenarios. Due to the type and scope of this project, the political background of Brexit is not covered and there is no attempt to suggest whether immigration restrictions should or should not be put in place and to what extent.

1.1   Aims and Objectives

1.1.1 Aims:

- To build a demographic profile of West Yorkshire (WYorkshire) using the the five local authority districts (LADs) within the county: Bradford, Calderdale, Kirklees, Leeds, and Wakefield.

- To examine how alternative international migration rates may affect the size and shape of the labour force, household numbers, and the age profile of WYorkshire between 2014 and 2039.

- To assess the extent of the potential impact on UK demographics due to changes of international migration policy, caused by the EU Referendum.

1.1.2 Objectives:

- To gather data on populations and households of the LADS in WYorkshire, and to derive data on the labour force based on population forecasts of WYorkshire.

- To discuss existing literatures on demographics and EU migration to the UK.

- To produce demographic scenarios using alternative international migration rates in WYorkshire. This will be achieved using the demographic suite POPGROUP, where each individual population projection component can be altered.

- To analyse the overall impact from altered international migration on WYorkshire's population structure, age-profile, household numbers, and labour force.

1.2   Dissertation Structure

Section 1 outlines the aims, objectives, and structure of the study. Section 2 reviews some available academic literature, statistics and reports covering three main topics:

- Demographic Theory and Context

- The UK's experience of immigration from the of EU

- The Implications of Demographic Change

Section 3 provides a review of WYorkshire's population change from 2001 to 2015.

Section 4 discusses the research methodology, critically evaluating the data and demographic software used in this study, and outlines the scenarios and their assumptions used in the population and household projections.

Section 5 displays and descriptively analyses the results from each of the scenario outputs split into four categories: population change, age structure, household composition and labour force.

Section 6 discusses how different migration rates could affect the demographics West Yorkshire using the scenario results, and states the possible issues local councils could face in terms of planning. This section also highlights the limitations of this study.

Finally, section 7 outlines the conclusions from this research, and recommendations for further research on this topic.

1.3   Context

Migration is a key component of population and demographic change; it is the movement of people from one place to another across an administrative boundary (Raymer and Willekens, 2008). Internal migration is the movement of people across boundaries within the same country, and international migration is the movement of people between different countries. People that migrate to another country are identified as immigrants in the receiving country, and considered emigrants in the country of origin (Raymer and Willekens, 2008). At all geographical scales, international migration affects the population size, which in turn alters the population's needs and composition in terms of supply and demand.

The National Planning Policy Framework (NPPF) (2012) and Planning Practice Guidance (PPG) published by the DCLG sets out the governments planning policies in England. The NPPF ensures that local councils develop local plans to prepare for future population needs and demands, such as housing and jobs. In terms of housing, the PPG (2015) states that household projections from the DCLG should be used as a starting point when local councils are estimating housing need. The NPPF requires local planning authorities to prepare a Strategic Housing Market Assessment (SHMA) that identifies "the scale and mix of housing and the range of tenures that the local population is likely to need over the plan period which… meets household and population projections, taking account of migration and demographic change" (NPPF, 2012. p38). The government suggests that local councils should update their local plans every five years to consider how population change has and could alter housing and economic demands (NPPF, 2012). Local councils therefore need to consider how their populations have changed, assess the economic activity of the population, and consider whether the changes affect the size of the labour force (LF) to see if they economic demands can be met (PPG, 2015). With the uncertainty of how post-Brexit migration rates could alter demographic change, many local plans around England may need to be updated.

WYorkshire is used as a case study for this dissertation, and is made up of the five LADs: Bradford, Calderdale, Kirklees, Leeds, and Wakefield (Figure 1.3.1). This county has been chosen as it is well studied and the LADs have a diverse population in terms of wealth, number of migrants, and jobs. Section 3 provides a more detailed review of how the population size in WYorkshire has changed in recent years.

Figure 1.3.1: Context map of West Yorkshire (Source: author)

2   Literature Review

This review highlights the literature on the causes of population and demographic change and provides a discussion on the implications. There is a strong focus on the ageing of populations, and the importance of immigration in the UK as natural change (the number of births minus the number of deaths) and migration are the two key drivers of population change. The first section focuses on demographic theory and context – detailing the development and increasing importance of recognising migration as a component of population change. The second section discusses how international migration numbers are captured and the UK's experience of migration from EU countries. The final section discusses the implications of demographic change – the importance of preparing for an ageing population in terms of providing specific housing and maintaining a LF. These literature topics have been chosen as Britain has an ageing population, and the potential impacts of altering international migration due to Brexit may increase or decrease the rate that Britain's population grows and ages thus changing needs.

2.1   Demographic Theory and Context

Population change is based on three key variables: births, deaths, and migration, the relationships between these variables determine population growth or decline.

From 1700 onward the world's population increased at a steady rate before accelerating between 1965 and 1970 (Bloom, 2011). The population growth rate of the world reached a peak of 2% per year (United Nations, 2010) due to various changes and developments. The Industrial Revolution led to technological and medical advancements, new farming methods, and developments in transportation, thus improving management of food supplies, work safety, and living standards (Boserup, 1981). This resulted in people living longer, allowing the world's population to reach 7 billion by 2011; this growth is expected to continue (Bloom, 2011).

Population change is a large area of study; political economist Thomas Malthus' 1798 work argued how and why populations change. Malthus (1798) focused on a difference between two key principles: 1. Populations grow at a geometric rate; 2. Food production is based on an arithmetic rate. Malthus' (1798) work suggests that if populations grow faster than technological advancements, the population will be unable to develop or keep up with those countries who industrialised, and food production will be unsustainable. In contrast, Boserup's (1981) work states that technological advancements are based on population growth therefore countries will find ways to maintain a population (Klasen and Nestmann, 2006). With the help of agricultural advancements, climate, technological change and increased transport efficiency, Britain entered the industrialisation process in the 1780s (Mathias, 1969). During the industrial revolution and notably after, the population of Britain increased as healthcare improved, thus supporting Boserup's theory of population growth.

Many demographers, such as Thompson (1929) and Notestein (1945), formulated the demographic transition theory that states "societies that experience 'modernisation' progress from a pre-modern regime of high fertility and high mortality to a post-modern one in which both are low" (Kirk, 1996 p.361). The theory explains the stages of population development that a country will experience. The First Demographic Transition heavily focuses on birth and death rates, suggesting that population growth is due to people living longer and healthier lives. Professor Van de Kaa (1987) proposed the idea of a Second Demographic Transition, suggesting that population growth continues at a lower rate after the Industrial Revolution in Europe due to major changes in people's lifestyles. There is the idea that having a large family earlier in life would hinder the chance of individuals climbing up the social ladder, therefore birth rates fell but the elderly continued to live longer, allowing population growth (Van de Kaa, 2002). The Demographic Transition Theory is widely accepted amongst academics, however Coleman's (2006) work on the idea of a Third Demographic Transition importantly highlights that both previous concepts of demographic transition neglect migration. Coleman (2006) states that in low-fertility countries, migrants from high-fertility countries are the solution to labour shortages, and that many economies are reliant on foreign workers to sustain an ageing population (Coleman, 2006).

The Third Demographic Transition theory explains the UK population change experiences well as migration is a key component. Although UK birth rates continue to remain positive (ONS, 2016b), this is largely due to migration; since 2004 over 20% of live births each year have been to foreign-born mothers (ONS, 2016c). Whilst foreign-born mothers help to maintain UK fertility rates, migration helps the overall growth of the population. In 2015, 10.7% of total employment (those aged 16–64 in full time or part time jobs) was from foreign-born citizens (Rienzo, 2016). Migration plays a large role in maintaining the UK population and its LF, Brexit's possible changes on migration policy may achieve its goal of intentionally slowing the nation's population growth (Rentoul, 2016). However, the likely consequence of reducing the growth may result in a smaller LF, creating economic issues for an ageing population.

2.2 Brief Summary of EU Migration to UK

This dissertation was inspired by one of the pervasive reasons UK citizens voted '*leave*' – to restrict immigration to the UK. In recent years due to a combination of policy change, economic factors, and increased mobility, migration to the UK from the EU has increased (Devlin et al. 2014). Migration to-and-from the UK was first recorded in 1964 when the International Passenger Survey (IPS) was established (Hawkins, 2017). Based on the IPS, Long-Term International Migration (LTIM) and Short-Term International Migration (STIM) estimates were produced from 1991 to categorise immigrants as long-term or short-term migrants. Whilst functioning as an informative measurement, the IPS does not provide a reliable measurement of all immigration to the UK within a specific time period, as short-term migration is based on journeys *not* people, and some can be both a long-term and short-term migrant (ONS, 2016d). The information captured by the IPS is useful for statistical agencies to calculate how many people enter and leave the country. The ONS gathers its international migration data from numerous sources such as the aforementioned IPS, the Labour Force Survey (LFS) that records employment of overseas nationals, and National Insurance Number (NINo) registrations (ONS, 2016d). Using these data, historical migration estimates provide us with an idea on how migration alters the UK population, and which specific areas at the local authority level. The migration data is used in this section to provide a short summary of the UK's experiences of international migration from the EU.

After WWII, the British government required immigrant employment as Britain faced labour shortages and Europe lacked in job provision (BBC, 2002). As well as migrants from Europe settling in Britain, South Asian migrants continued to settle to either seek economic opportunities, join family members who previously settled, or to escape civil war (Hickman et al. 2008). Between 1980 and 1990, international net migration in Britain was relatively low, and became positive after 1994, rising sharply in 1997 (ONS, 2014). Migrants from non-EU countries make up a larger proportion of international migrants in Britain; however, increases in the net migration of EU citizens occurred in 2004 due to the European Union expansion (Figure 2.2.1).

In 2004, the Accession 8 countries "A8" (Table 2.2.1) (including Cyprus and Malta) joined the EU, meaning nationals of these 10 countries have the right to freely travel and live anywhere in EU member states. The UK introduced restrictions on accessibility to the UK job market for A8 nationals, sans Cyprus and Malta. To permit A8 nationals to work in the UK, they must register with the government onto the Workers Registration Scheme, and complete 12 months of lawful employment to be enabled free access to the UK job market (Clark and Hardy, 2011). In 2007, two more countries – Bulgaria and Romania "A2" – joined the EU and similar restrictions were enforced for their nationals. It is important to acknowledge that EU migrants who move to the UK will most likely be working, thus increasing the size of the labour force, and paying taxes.

Table 2.2.1: The Accession 8 and Accession 2 countries that joined the European Union in 2004 and 2007 respectively

A8 Nations*	A2 Nations
Czech Republic	Bulgaria
Estonia	Romania
Hungary	
Latvia	
Lithuania	
Poland	
Slovakia	
Slovenia	

*Cyprus and Malta joined at the same time as the A8 Nations in 2004.

Following the pattern of EU expansions, the UK experienced larger amounts of international migration in 2004 and 2007 (Figure 2.2.1). Figure 2.2.1 shows that since 2013, the level of net migration for EU citizens has followed the same pattern as that for non-EU citizens with a narrowing gap – immigrants from the EU are accounting for international migration to the UK increasingly each year.
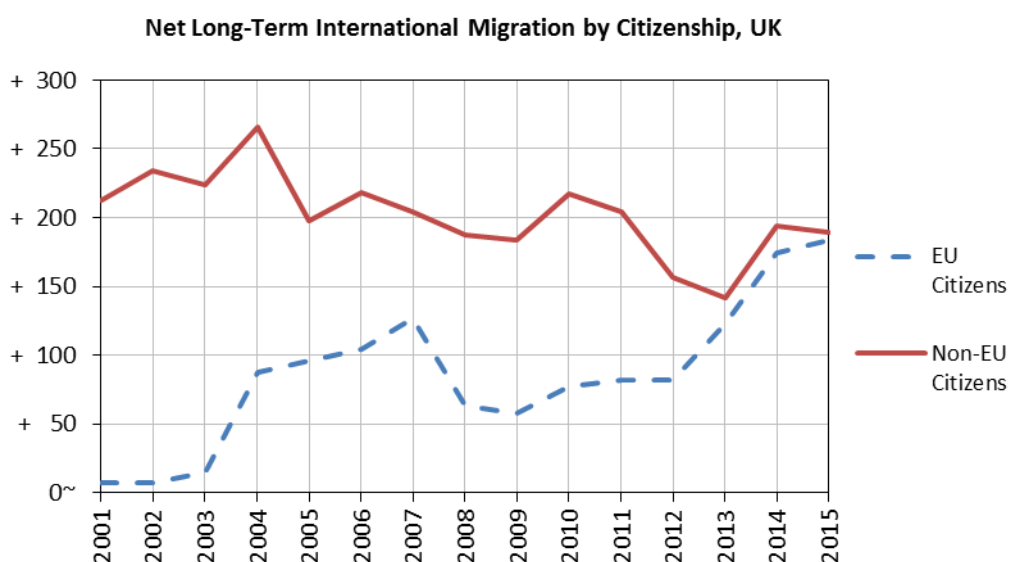
Figure 2.2.1: UK: Net LTIM by citizenship, 2001–2015 (Adapted from: ONS, 2017a)

For the Yorkshire & the Humber region, a net international migration pattern emerged similar to the national scale (Figure 2.2.2). However, the first spike in international migration for Yorkshire & the Humber occurred a year later than at the national level, reaching 32,336 in 2005. The second spike in international migration occurred concurrently with the A2 countries joining the EU in 2007, when international migration reached 45,101, the highest the region has ever observed. The key point from these figures is that there is a link between European Union expansion and the rates of long-term international migration in the UK, affecting LAD population structures. Free movement of labour attracts migrants, restricting this may reduce the UK's LF size.
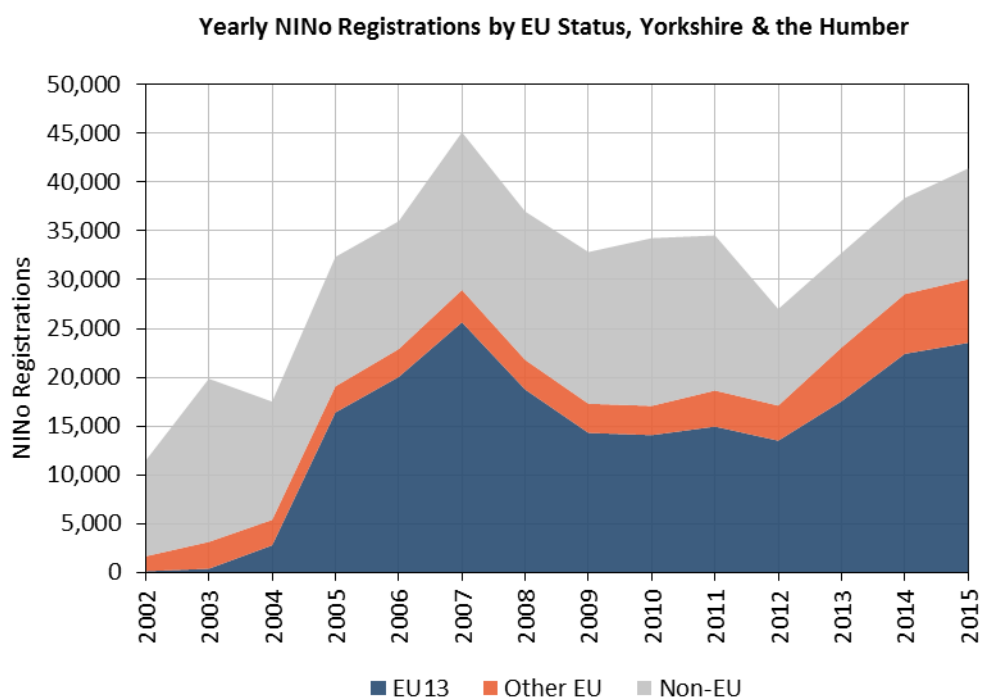
Figure 2.2.2: Yorkshire & the Humber: NINo Registrations per year by EU status, 2001–2015
(Adapted from: DWP, 2016)

2.3   Implications of Demographic Change

Demographics are quantifiable characteristics used to understand the population (Dictionary of Human Geography, 2009), allowing categorisation of persons based on facts. Examples of demographic categories include: sex, age, birthplace, education, income, household composition, employment, etc. The demographic focus in this study is around population ageing, household composition, and the LF size.

2.3.1 Ageing Population

Ageing is a natural part of life, a process that every human experiences until death. Most developed countries have increased the life expectancy of their populations through medical advancements, preventing/handing life-threatening diseases, and promoting healthy lifestyles. Countries of low fertility, low migration and people living longer lives face the issue of an ageing population (Christensen et al. 2009). Increasing the number of older people poses large challenges for not only health-care systems but also on housing provision and maintaining a LF.

The UK has an ageing population (Figure 2.3.1) and it is increasing under current population trends. The population aged 65+ increased by 1.7 million between 1985 and 2010 as people in older age groups are living longer and this trend is expected to continue (ONS, 2012). Table 2.3.1 provides the actual and predicted age distributions of the UK population between 1974 and 2039.

Population ages 65 and above (% of total), UK, 2001 to 2015)
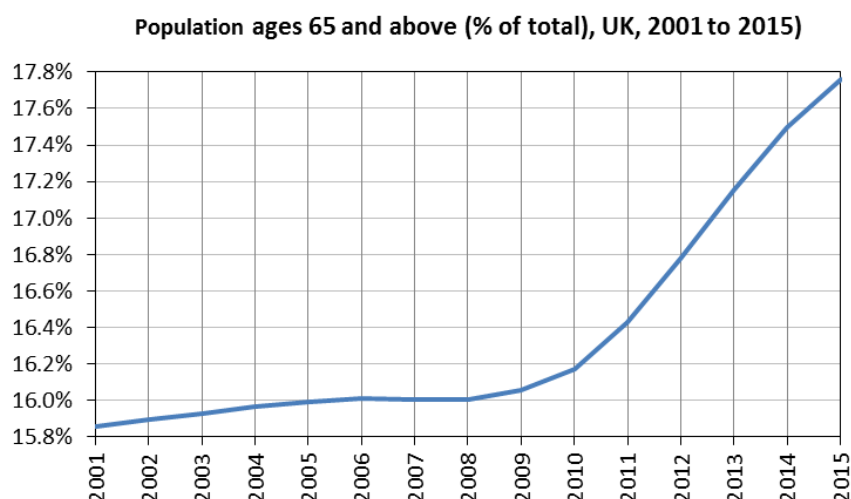
Figure 2.3.1: UK: Population ages 65+ as a percentage of total population, 2001–2015

(Adapted from: World Bank, 2017)

In 1974, the population aged 65+ only made up 13.8% of the UK's total population and those aged 0–15 made up a larger 25.2% (Table 2.3.1). This meant that 39% of the UK population were financially dependent on 61% of the population aged 16–64, otherwise known as the working-age population. The UK experienced a baby boom in 1964 as birth rates peaked at 875,972 (ONS, 2015a), hence why 0–15 year olds made up 25.2% of the UK population in 1974. The age transition of this demographic cohort is shown in Table 2.3.1, it is predicted by 2039 the population aged 65+ will reach 24.4%. With longer life expectancies of a baby boom population and low birth rates, the UK is expected to continue to have an ageing population. The key component of population change slightly slowing the ageing population growth is migration; many international migrants are younger and help maintain birth rates (Migration Observatory, 2016). Some view that migration will encourage the ageing of a population; however, many Eastern European migrants return to their country of birth before retirement (IPPR 2007; Migration Watch UK, 2008).

Table 2.3.1: Age distribution of the UK population, 1974 to 2039 (projected)

Year	Population aged 0 to 15 (%)	Population aged 16 to 64 (%)	Population aged 65+ (%)	Dependent population (%)
1974	25.2	61.0	13.8	39.0
1984	21.0	64.1	14.9	35.9
1994	20.7	63.4	15.9	36.6
2004	19.6	64.5	15.9	35.5
2014	18.8	63.5	17.7	36.5
2024*	19.0	61.1	19.9	38.9
2034*	18.1	58.5	23.4	41.5
2039*	17.8	57.9	24.3	42.1

= from 2014-based ONS population projection   (Adapted from: ONS, 2016h)

Dependent population = population aged 0 to 15 + population aged 65+

2.3.2 Households

As a population changes, its needs and requirements of housing and accommodation change too. The SHMA states (see section 1.3 Context) that all local councils for each English LAD must plan for future populations and provide the correct scale and mix of housing that is needed. As previously mentioned (See Section 2.1), the second demographic transition includes changes in lifestyles and family compositions (Van de Kaa, 2002). Over the past few decades there has been an emergence of 'dual-career households' and 'step' families etc. (Buzar et al. 2006), meaning households have been changing in type, age structure, and demographics. A key change is in age-structure; as the UK has an ageing population, it is expected to further increase the demand of single-person households, care homes, and homes built for the elderly (Dunnell, 2000). The UK government recognise the ageing of the population, and have addressed how to prepare for the future older populations by producing initiatives designed to improve awareness and services for older people (Dunnell, 2000). The UK government also plans for housing based on immigration, ensuring that there are enough homes for those entering the UK from overseas. If future policy restricts immigration, the housing plans for local authorities may need to be recalculated, as different types of homes may be required at different amounts.

2.3.3 Labour Force

The LF is the number of people in an area who are economically active (i.e. employed or looking for work). Having a strong and skilled LF is important for any economy that is looking to continue to develop and maintain its population (ILO, 2010). Wadsworth et al. (2016) found that EU immigrants in the UK often migrate for work, and compared to the UK-born individuals, are on average are more educated and are more likely to be in work. Therefore, it is expected that capping immigration to the UK will alter the skillset and size of the future LF. The UK also has an ageing population that creates gaps in the LF, generating economic opportunities for immigrants. Immigration in substantially large amounts can help slow down the ageing of a population, thus removing the gap in the LF; however, the government is aiming to produce a migration policy to reduce international migration (Migration Observatory, 2013a; Cameron, 2015).

Coleman and Rowthorn's (2004) work shows that increased immigration does not provide great economic benefits to the existing population, only to immigrants themselves. However, their work did not consider the type of jobs occupied by immigrants in the UK LF. Lisenkova's and Sanchez-Martinez's (2014) work on economic impacts of reducing migration in the UK found that lower net migration rates have large negative impacts on the economy, creating a shift in the demographic structure, producing negative impacts on public finances. The demographic shift includes ageing populations where healthcare may increase in demand. The shift will increase the old age dependency ratio for the UK (the ratio is the number of people aged 65+ who are economically reliant on 100 people of working age (16–64)), pressurising the LF (Rendall and Ball, 2004). Many sectors of the economy and public services are dependent on migration labour (GCIM, 2005), 10% of

doctors in the English NHS are from the EU (Dayan, 2016) and 14% were born elsewhere (fullfact.org, 2015). Immigrants are an integral part of the UK's LF, they are highly skilled and their taxes help maintain the British economy. The possible migration restrictions assumed as a result of Brexit could have a large impact on the LF in different areas around the UK. With the literature findings in mind, this study will assess how large of an impact reduced migration will have on the LF of WYorkshire.

3 Demographic Profile of West Yorkshire LADs

Before generating and analysing the population projections for WYorkshire, it is important to know the current demographic profile of WYorkshire and how it has changed.

3.1 Population Change 2001–2015

Between 2001 and 2015, the population of WYorkshire is estimated to have grown by 198,617, an increase of 9.5% (Table 3.1.1). Despite making up over one third of WYorkshire's total population (Figure 3.1.1), the population change within Leeds has not been the most influential driver of population change for the county as a whole (Figure 3.1.2). Bradford accounts for 23% of WYorkshire's population total but is responsible for 30% of the population increase between 2001 and 2015. Figure 3.1.2 shows the underlying components of population change for WYorkshire and its LADs. Population change for WYorkshire since 2001/02 has been driven by natural change, and international migration. Internal migration in the county has been negative each year following a similar pattern to that of Bradford and natural change has slightly been increasing in all LADs, averaging +3,909 per year for WYorkshire.

Net international migration in WYorkshire averaged +7,927 people per year since 2001/02, Bradford being the most influential in this component as net international migration there averaged +3,606 people (Figure 3.1.2) and has the largest foreign-born usual resident population in WYorkshire (Migration Observatory, 2013b). WYorkshire experienced a peak in international migration between 2004/05 due increasing migration to Leeds. The few years of negative growth in international migration in Leeds is due to it being a student city (it has three universities); many international students enter/leave each year at the start/end of their education. International migration is a key driver of population growth in WYorkshire. If immigration restrictions are enforced due to Brexit, the population growth profile may not continue its past and current trends.

Figure 3.1.1: West Yorkshire population distribution by Local Authority District based on the 2011 Census (Adapted from: ONS, 2013a; authors calculations)

Table 3.1.1: Table of population change 2001–2015

Year	Population Growth 2001–2015						
	England	West Yorkshire	Bradford	Calderdale	Kirklees	Leeds	Wakefield
2001	49,449,746	2,083,101	470,753	192,379	388,980	715,609	315,380
2015	54,786,327	2,281,718	531,176	208,402	434,321	774,060	333,759
Change	5,336,581	198,617	60,423	16,023	45,341	58,451	18,379
% Change	10.8%	9.5%	12.8%	8.3%	11.7%	8.2%	5.8%
District contribution of population change in West Yorkshire [9.5%] 2001–2015			30%	8%	23%	29%	9%

(Adapted from: ONS, 2016i; authors calculations)

Components of Population Change 2001/02–2014/15

Figure 3.1.2: West Yorkshire and Local Authority Districts – components of population change 2001/02–2014/15 (Adapted from: ONS, 2016i; authors calculations)

3.2   Age Profile

Between 2001 and 2014, the 65+ population of WYorkshire has increased by 1% (Figure 3.2.1). The baby boomers of 1964 are only in their 50s by 2014, therefore not making a large change in the older age groups. The population pyramids in Figure 3.2.1 show a large increase in almost all age groups, notably in those aged 20–24 and 45–49 years. These age groups make up the majority of the working age population (15–64), meaning that the OADR did not increase at a higher rate (Figure 3.2.1). These age groups increased due to an influx of working age immigrants from the EU to the UK and settling in northern regions such as Yorkshire & the Humber (Figure 2.2.2). A reduction in international migration influenced by Brexit may result in a higher OADR in the future; this is explored through my population projections.

West Yorkshire: Population Age Structure
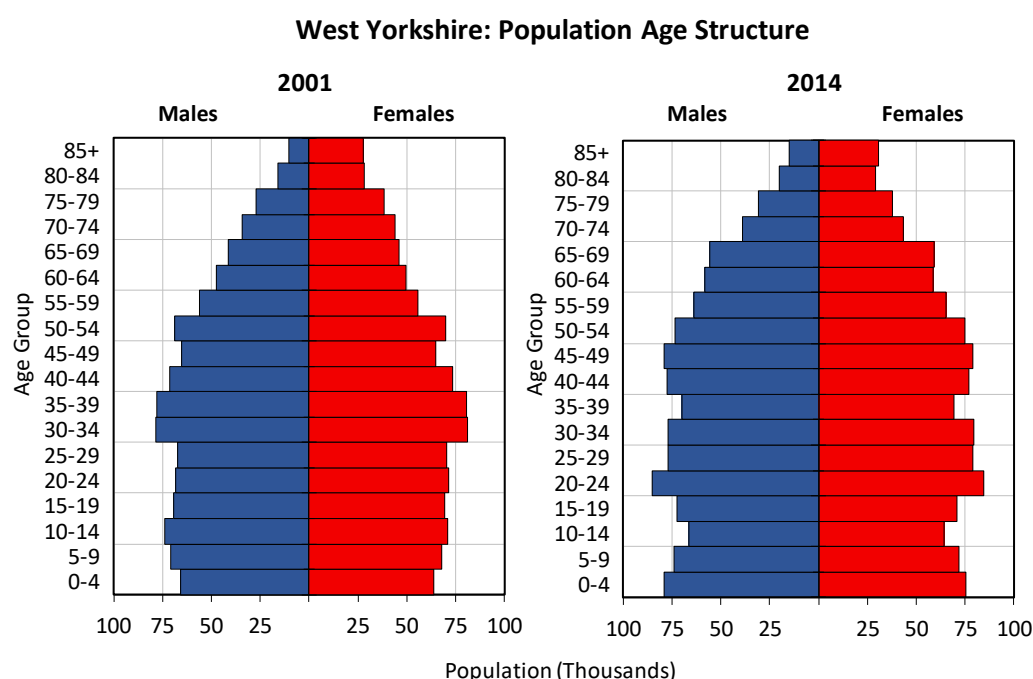
Indicator	2001	2014	Change
% 65+	15	16	1%
% 80+	4	4	0%
OADR*	23.1	24.5	1.4
Median Age	36.6	37.7	1.1

*OADR = Old Age Dependency Ratio
(Population aged 65+ / Population aged 15–64)

Figure 3.2.1: West Yorkshire – population change age-profile 2001–2014
(Adapted from: ONS, 2016i; author calculations)

4   Methodology: Data, Software, Scenario Assumptions

I ran five different setups in POPGROUP for the LADs in WYorkshire: Bradford, Calderdale, Kirklees, Leeds, and Wakefield. These setups each contain district-specific data on population numbers, birth rates, death rates, and migration rates from the ONS 2014-based SNPP. The projection period chosen is the same as the one used in the 2014-based SNPP, 2014–2039, to keep consistency. Within the setups, I created four scenarios based on the same data mentioned, except the international migration rates differed. The next few sub-sections explain in detail the assumptions used, and how they differ.

After setting up the scenarios for each LAD, I ran them through the DF model to apply relevant household rates – the rates were from the DCLG's 2014-based household projections. This allowed me to derive the number of households expected to be formed by 2039 based on my population forecasts. Again using DF, I applied economic activity rates to my forecasted populations to derive the labour force total of each LAD in each scenario. Finally, using Excel, I combined the scenario results for each LAD to make the total of WYorkshire. The result included four different scenarios for WYorkshire that differed in migration assumptions.

The next sub-section provides a summary of the data used in this study, discussing why the data was chosen and where it originated. Section 4.2 explains the demographic model used to produce projections; the model is then validated explaining how the model utilises input data (Section 4.3). Section 4.4 outlines the methodological approach I took in producing migration variant scenarios; the assumptions I used and why.

4.1   Data

This study solely utilises secondary datasets; population numbers extracted from the ONS, and household numbers extracted from the DCLG. These data have been processed by myself in order to be used in demographic software ('POPGROUP', see Section 4.2) that allowed me to produce population projections based on the data I have selected for different scenarios.

Collecting reliable, robust, and accurate data on population and household numbers for numerous LADs is incredibly time consuming, expensive, and inaccessible for a person working alone (Ghauri, 2005). Therefore, I have chosen to use data from official statistical and governmental agencies that intentionally produce continuous and regular surveys for research purposes, policy development, and the planning and running of public services (ONS, 2017b). However, secondary data may be inappropriate, or of low quality. Collecting primary data would allow me to ensure that relevant data is collected regarding my research question. Secondary data is often widely available in large amounts and used to answer different research questions, therefore potentially less valid in my own work (Denscombe, 2007). Data may also be of low quality depending on the methods used, sample size, and if the information is collected without a purpose (Walliman, 2005; Saunders, et al. 2006).

With the mentioned concerns in mind and data availability, ONS population statistics and DCLG household statistics have been used in this project. The ONS is the UK's largest producer of official statistics and "is the recognised national statistical institute for the UK" (GOV.UKa, 2017). They hold responsibility for the collection and publication of statistics on the economy, population, and society at various scales including the national, regional and local (GOV.UKa, 2017). Along with their datasets, the ONS provide information on how their data is collected and processed, and put their statistical findings through "a rigorous quality assurance (QA) process" to ensure that users have confidence in quality and accuracy of the data (ONS, 2017c). As the UK government recognise the ONS as a trustworthy and reliable data source, I believe this validates the usage of their data in this dissertation. The datasets I have used from the ONS for population numbers and assumptions include the 2011 Census, 2015 mid-year population estimates (MYEs), the latest 2014-based sub-national population projections (SNPP) and 2014-based national population projections (NPP).

The UK census is planned and carried out by the ONS every ten years, recording a count of all people and households in each LAD on that specific day (ONS, 2016,e), with the latest census being held in March 2011. Using the latest census available as a starting point, the ONS publishes mid-year population estimates (MYEs) for each local authority, estimating the population by single-year of age and sex. The population estimates are created using a cohort component method that uses reliable and high quality data sources to inform components of population change (ONS, 2016f, p.11). The MYEs are verified once a new census is released to ensure that the yearly change in the estimates equate to the latest census population totals. It is important to note that a quality issue was found after the 2011 Census, this is referred to as 'Unattributable Population Change' (UPC) (ONS, 2015b). The MYEs had either population surplus or deficit in LADs; therefore, the MYEs between 2002 and 2010 had to be 'rebased' to align with the 2011 Census. This ensured the correct transition of the age-profile between 2001 and 2010 and to verify that population projection assumptions were robust and up to date (ONS, 2013b). The ONS (2015) states that UPC was likely due to sampling variability, and the difficulty of capturing international migration information. The MYEs have been used in my population projections to calculate historical components of population change between 2001 and 2014, and the international migration component does include UPC.

From 2015 to the end of my projection period (2039), the latest 2014-based sub-national population projection statistics are used. The SNPPs produced by the ONS are based on the MYEs and compose the 25-year population projection periods for each local authority area in England (ONS, 2016g), hence why my projection end year is 2039, 25 years from 2014. These are produced on a bi-yearly basis, and the sum of the SNPPs total to the national population projection (ONS, 2016g). The ONS also publishes its national population projections (NPP) on a bi-yearly basis; this provides the key assumptions on fertility, mortality and international migration, which are used to estimate the population growth for the UK (ONS, 2015c). From the NPP, sub-national population projections

(SNPPs) are derived that use a combination of national and local authority-level assumptions on births, deaths and migration (ONS, 2015c). The NPP also includes migration variant projections (Low, High and Principle) for the UK (Figure 4.1.1); however, these variants are not available at a smaller geographical scale. Therefore, as part of my dissertation the migration variant rates used in the NPP have been scaled down to the sub-national scale and applied to the setups for the LADs. The scaling was achieved with the help of those at Edge Analytics who provided the area-specific migration differentials and schedules of each LAD in WYorkshire to calculate a relative migration rate.
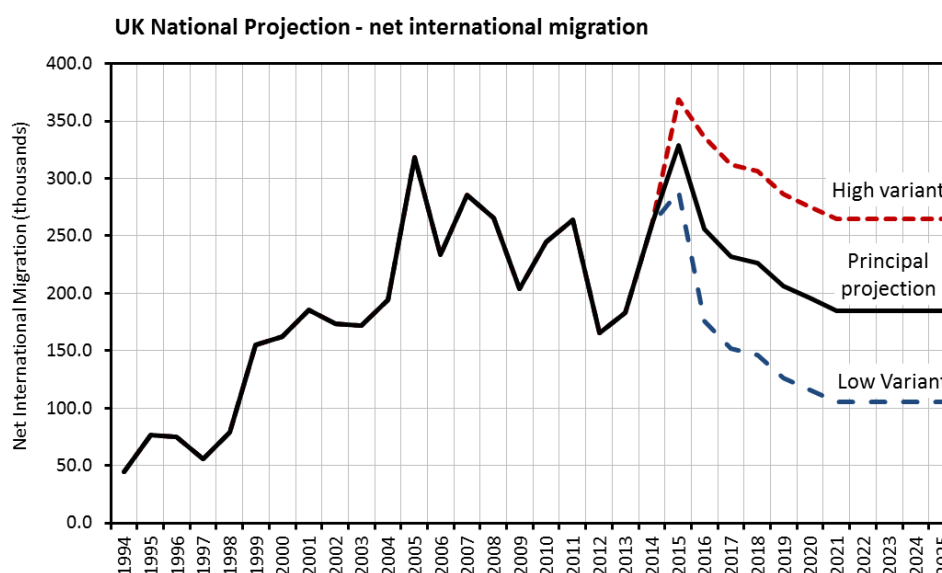
Figure 4.1.1: Migration sensitives for national projections (Data source: ONS, 2015c; author)

The DCLG are responsible for managing local governments in terms of housing, jobs, and society. The DCLG manage housing supply, home ownership, local government budgets and public services, and due to a focus on housing management, they provide household projections for English LADs using the ONS' SNPP and Census 2011 (DCLG, 2016; GOV. UKb, 2017). The DCLG's household projections methodological report (DCLG, 2016) provides the methodologies used in their projections, data source, and offers a discussion on the reliability and possible uncertainties in their work. The DCLG uses household data from the ONS that has been through a rigorous quality assurance test, suggesting the data is valid and robust enough for this dissertation. The dataset used in this study from the DCLG is the latest 2014-based household projection to provide data on household numbers and assumptions such as headship rates, and the number of people who do not live in households (e.g. boarding schools, care homes, prisons).

A downfall in the DCLG data is that in order to derive the number of households, a calculation is made from census data and categorisation. The person who is the "head of the household" – the eldest male in the household (Holmans, 2012) - is recorded and their relationship status helps calculate household compositions. The household head is categorised by relationship and living status. However, data in 'couples (married or cohabiting)' categories, only the male is registered. This disregards same-sex female

couples who are married. This may be an issue for this project as Calderdale in WYorkshire is home to the UK's 'lesbian capital' – Hebden Bridge (Smith and Holt, 2005). The data flaws are acknowledged and the data is still used; Calderdale's population only makes up 9% of WYorkshire (Figure 3.1.1), thus not having a large impact on population change in this particular study.

4.2   POPGROUP V.4 and Derived Forecast Models

To carry out this project, the Excel-based demographic modelling suite POPGROUP was used alongside its counterpart Derived Forecast model (DF). POPGROUP software allows users to create population projections that are calculated using a single-area cohort component model that uses single-year-of-age and annual cycles. In order to use the software, you must provide single-year-of-age schedules of fertility, mortality, and transition migration in- and out flows that are area specific (Figure 4.2.1 provides a visual explanation). The DF model works alongside POPGROUP and derives further information about the projection population (Figure 4.2.2), for example in this study; I applied headship rates from the DCLG 2014-based household projections to my population forecast to calculate the household growth over my projection period (2014–2039). The headship rate is the ratio of the number of persons in a sub-group of the population that are classed as the head of the household to the total number in that population (Markandya, 1983). To derive LF numbers, I used the population numbers from my population forecasts and applied age and area-specific economic activity rates (EAR) from the 2011 Census. The EAR measures the proportion of the working age population who are economically active and able to work.

I decided to use POPGROUP and DF as I have access to the suite, and have experience using and testing the software daily for 14 months as part of my placement year. Before producing my forecasts, I questioned the construct validity of POPGROUP, enquiring whether the model itself is well designed and robust. The software is recognised as the "industry standard in the UK for demographic analysis within strategic planning" (CMIST, 2017) and the software is often used to produce demographic forecasts to inform local plans, something I have experience of doing for local councils on behalf of Edge Analytics. POPGROUP's delivery of population projections and derived household and LF projections are based on a cohort component methodology, a reliable and robust method used by other statistical agencies such as the ONS (Andelin and Simpson, 2007; Edge Analytics, 2016a). Cohort component models are popular in population forecasting for the following key reasons suggested by Rowland (2003): 1. The method can be applied at both national and sub-national scales, allowing the comparison of different series of projections. 2. The model delivers projections by both age and sex, providing extra detail on projected population structures and will allow further analysis. 3. It is a flexible model as assumptions on different components of population change can be varied, this is key for this dissertation as my population projections will vary in international migration rates to present the potential impacts of Brexit.
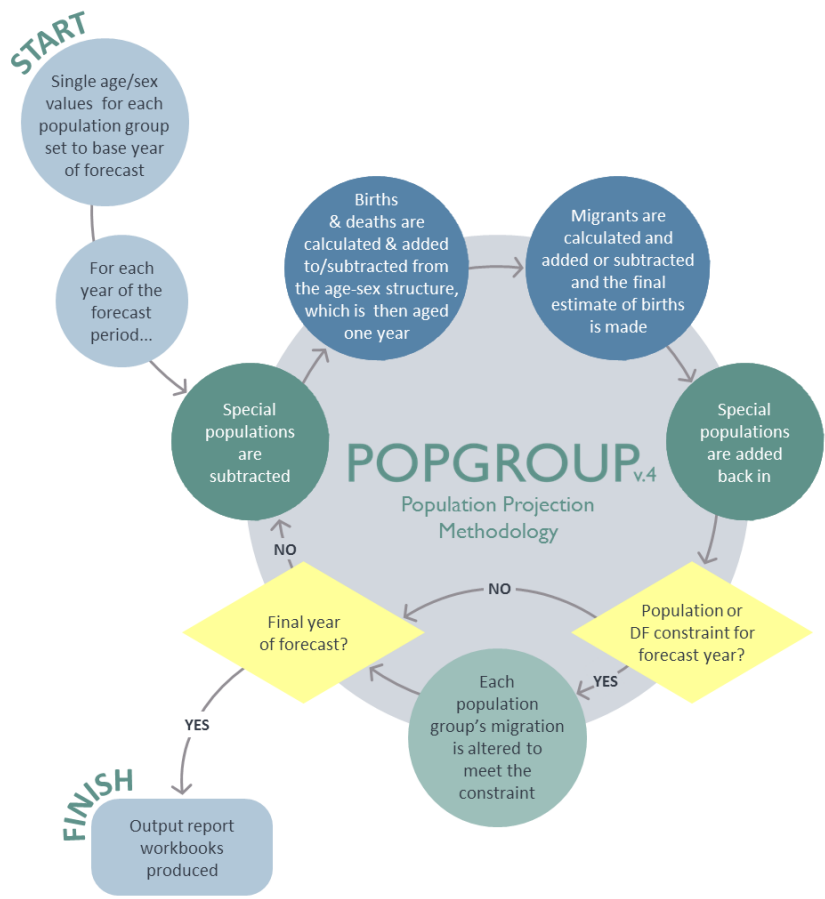
Figure 4.2.1: POPGROUP V.4 Population Projection Methodology (Source: Edge Analytics, 2017)

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

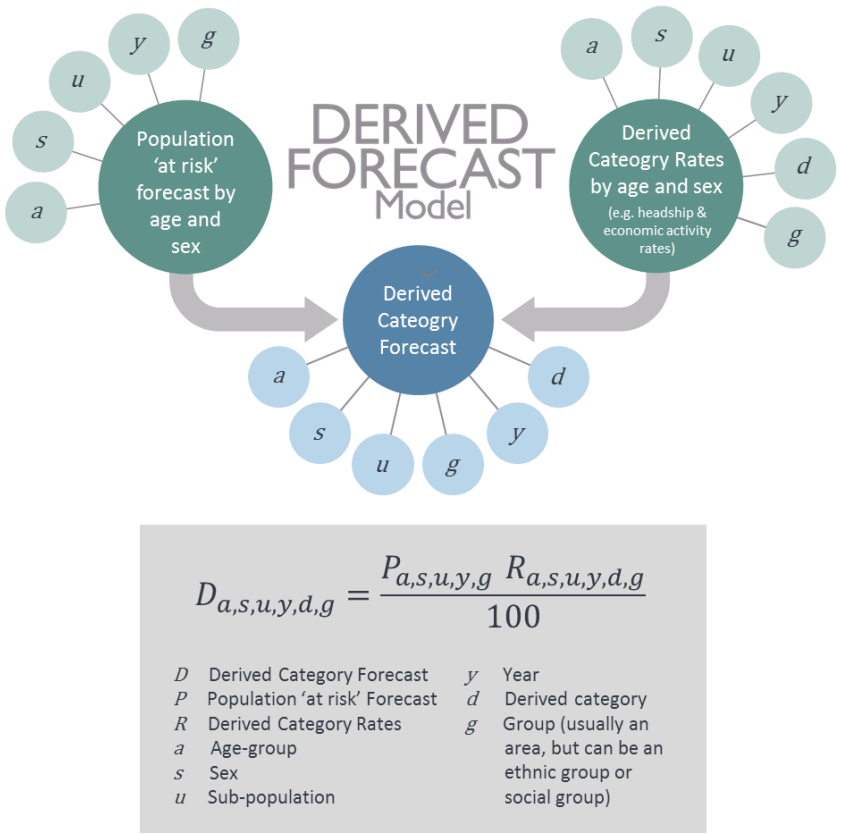|			
D	Derived Category Forecast	y	Year
P	Population 'at risk' Forecast	d	Derived category
R	Derived Category Rates	g	Group (usually an
a	Age-group		area, but can be an
s	Sex		ethnic group or
u	Sub-population		social group)

Figure 4.2.2: POPGROUP V.4 - DF Projections Methodology (Source: Edge Analytics, 2017)

4.3 POPGROUP Data Modules

The POPGROUP demographic suite is developed and distributed by Edge Analytics, who specialise in demographic analysis. As a former employee of Edge Analytics, I participated in the testing and distribution of POPGROUP software, including their Data Modules. POPGROUP provides Data Modules to users that contain the same data used in official projections for populations and households in the UK, in a format that is intended for POPGROUP (CMIST, 2017). The three latest Data Modules available are; the "ONS2014POP" for population projection to replicate the ONS 2014-based SNPP, the "CLG2014HH" for household projections to replicate the DCLG 2014-based household projections, and the "ENG2011LF" which provides economic activity rates for local authority areas in the UK from the 2011 Census and Office for Budget Responsibility. Whilst on placement at Edge Analytics between June 2015 and September 2016, I took part in testing the Data Modules, ensuring they used the exact numbers used in official projections, and verified the inputs and outputs rigorously. Once all testing is complete, the Data Modules are then released to POPGROUP users such as commercial businesses and local councils. Essentially, the Data Modules solely contain data that is available to the public from the ONS in a format that can easily be used in POPGROUP. The reasons I have decided to use Data Modules in my project are as follows:

- To be time-efficient; this project contains five local authorities that together makeup WYorkshire. Therefore, five separate models had to be run, involving the collection of a large quantity of data.

- The data in the Data Modules are robust and tested as I worked on them along with other demographic analysts and provided them to users.

- They include area-specific differentials and schedules for components of population change. I found it difficult locating these for each local authority from the ONS, and these make projections as accurate as possible and area-specific

Please note that the data in the Data Modules I have used solely originates from the ONS or DCLG and only the format has changed. Therefore, when discussing the setup of my POPGROUP scenarios, the original data is referred to.

4.4 Scenarios Definitions

To examine the impact that international migration could have on UK population change, four scenario variants were produced based on the ONS' latest datasets. To derive household numbers, headship rates and rates of those not in households are applied to the population projections. To derive the LF numbers, EARs are applied to the working age population forecasted from the population projections.

Using the latest population statistics available, four scenarios were produced to reflect possible population growth trajectories based on variations of international migration in WYorkshire between 2014 and 2039. The scenarios include:

- SNPP-2014

- High Growth

- Low Growth

- Lowest Growth

The three migration variant scenarios use the same fertility and mortality assumptions as the SNPP-2014 scenario, and the internal and international migration assumptions differ based on the ONS national projection variants.

4.5   Assumptions

4.5.1 Fertility and Mortality

In all four scenarios, the future births and deaths were calculated by myself using fertility and mortality rates from the 2014-based SNPPs. These were used in combination with long-term fertility and mortality assumptions that are area specific for each of the five LADs. The amount of births and deaths are calculated in each year of the forecast by POPGROUP, thus the number of births and deaths will vary depending on the population structure and how it changes over time. A population with more elderly people will lead to a larger number of deaths, and a more youthful population will lead to a larger number of births.

4.5.2 Internal Migration

Internal migration has two components: in-migration, and out-migration. In this research project, future projections of migration are based on the product of age- and sex-specific rates that are applied to a corresponding population. The migration rates are also from the 2014-based SNPP. In-migration is treated differently to out-migration in terms of population projections in POPGROUP. Out-migration utilises rates that are applied to the area-specific population, the population who are most likely to be migrating out of an area. The in-migration rates are applied to an external 'reference' population, those who are most likely to be migrating into an area.

The SNPP-2014 scenario's reference population is defined as the 2014-based national principal population projection for the UK. The three variant scenarios all use reference populations defined as the 2014-based national population projection from the ONS, but correspond to the related ONS projection. The High Growth scenario's reference population is from the ONS 'High Migration' variant scenario and the Low Growth's reference population is defined as the ONS 'Low Migration' variant scenario. The Lowest Growth scenario's migration reference population for internal migration is defined as the 2014-based NPP from the ONS 'Zero Migration' variant scenario. The selected reference

populations have been chosen carefully to ensure that the replication of ONS data is accurate. The national rates are applied to in conjunction with a schedule of age specific migration rates for each individual local authority, this produces a rate of migration that is relative the LADs population and its structure. The schedules have been derived from the ONS; the 2014 SNPP provides these data for all of England's LADs.

4.5.3 International Migration

The future levels of international migration in each scenario are based on a fixed count of migrants, by age and sex. The SNPP-2014 scenario uses international migration counts directly from the 2014-based SNPP.

The High Growth and Low Growth scenarios use international migration counts from the ONS 2014-based national population projection, as they do not provide alternative rates of migration at the sub-national level. With the help of Edge Analytics, the national migration counts have been scaled down using the appropriate national population project variant (the High Growth scenario counts are scaled to the 'High Migration' ONS variant, and the Low Growth scenario counts are scaled to the 'Low Migration' ONS variant). The scaling considers the relationship between the migration counts from the 2014-based SNPP for a given Local Authority area and the 2014-based national projection (that together sum the SNPPs total). The 2014-based SNPP international migration counts have been adjusted using the 'High migration' or 'Low Migration' national variant projection, whilst maintaining the existing age profile of migrants, but resulting in a different overall total. The Lowest Growth scenario's net international migration is zero in each year of the forecast to result in no increase or decrease.

With a reliable demographic tool available and datasets from the ONS and DCLG in a workable format, I had the means to produce demographic forecasts that are as accurate as the ONS', and are justified. The four scenarios use a variety of migration rates, and are relevant to the concerns on immigration in Britain due to Brexit. The SNPP-2014 is used as a benchmark scenario and is used to demonstrate how the population could change if net migration remained at its current rates.

The Low Growth scenario is the most likely scenario to happen in the UK if future immigration is restricted by Brexit policy change. The Lowest Growth scenario assumes that net international migration balances to zero, therefore having no impact on the yearly population change. This scenario is the most unlikely but also the closest to what the Conservative government aimed for (Cameron, 2015), it was generated to show what the population could be if immigration did not increase. Finally, the High Growth scenario is the opposite of what inspired this dissertation, it shows what could happen if immigration to WYorkshire increased exponentially.

5 Results and Analysis: West Yorkshire 2014–2039

This section presents the results from the scenario output generated using POPGROUP. A descriptive analysis is provided for all figures and tables; these were created by myself to provide visual comparisons between scenarios. This analysis is used in section 6 to discuss possible reasons for such demographic changes over the forecast period. Due to limited space in this project, only West Yorkshire as a whole is analysed.

5.1 Population Change

In this study, the SNPP-2014 scenario is the benchmark as it is a reproduction of the official population and household projections produced by the ONS and DCLG. In this scenario, the population of WYorkshire is forecast to increase by 13% at an average of +11,332 people per year between 2014–2039 (Figure 5.1.1).

West Yorkshire, SNPP-2014: Population Growth 2014–2039
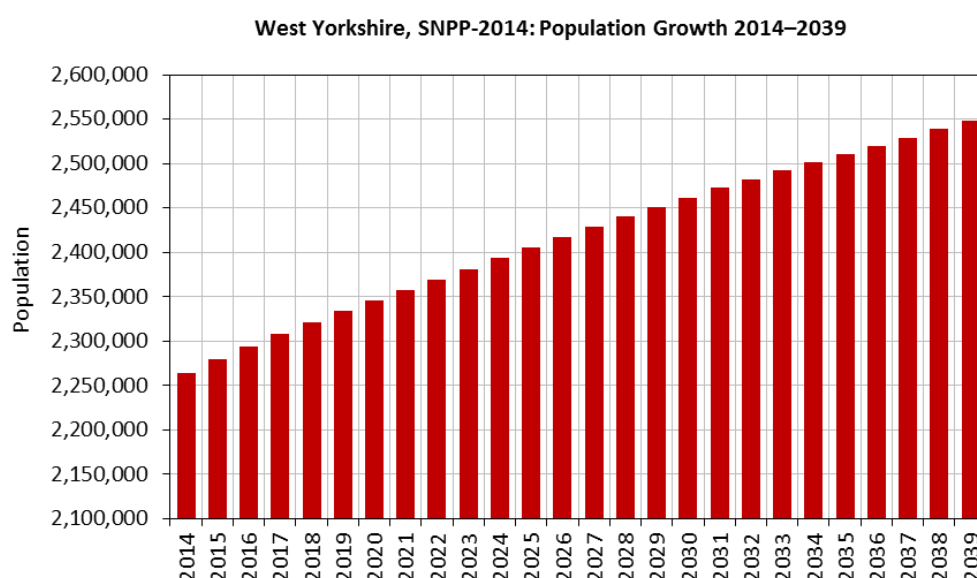

Figure 5.1.1: West Yorkshire, SNPP-2014 population projection

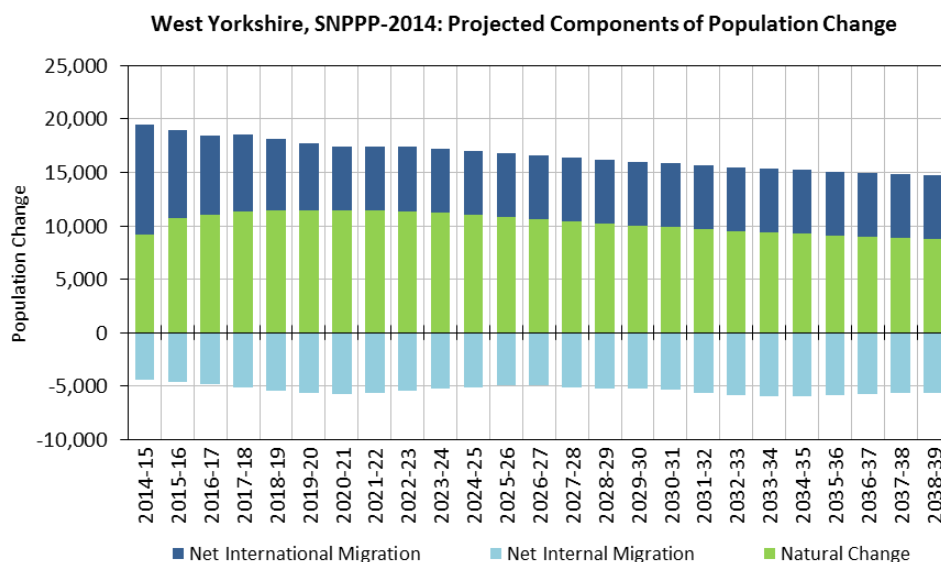**West Yorkshire, SNPPP-2014: Projected Components of Population Change**

Figure 5.1.2: West Yorkshire, SNPP-2014 components of change 2014/15–2038/39

Figure 5.1.2 shows that natural change will remain positive, but becomes less of an influence over the second half of the forecast. This scenario also suggests that net international migration will stabilise in WYorkshire in 2020 to the end of the forecast period (Figure 5.1.2). For WYorkshire, the main two drivers of population change are natural change, which is anticipated to have a less of a large impact over time; and international migration, that is expected to remain at a steady growth rate. The components of population change in the other scenarios are not shown as they follow the same pattern above, except each component of change is either lower or higher depending on the migration assumptions.

The results of the migration variant scenarios are presented in Figure 5.1.3 and Table 5.1.1. As shown in Figure 5.1.3, each scenario produces different levels of population growth, following a similar trend. As intended, the High Growth scenario results in the largest amount of population growth: +15.8% between 2014 and 2039, 3.3% higher than the SNPP-2014 scenario. The Low Growth scenario produces a population in 2039 that has grown 3.2% lower than the baseline scenario. This iterates that if WYorkshire were to experience lower rates of future net international migration, it is expected that there will be 72,192 less people in the county in 2039 compared to the SNPP-2014 scenario output. If net international migration were to remain at zero each year, the population in 2039 would be 2,396,400, 150,946 people less than if the migration rate continues at its current rate (Table 5.1.1).
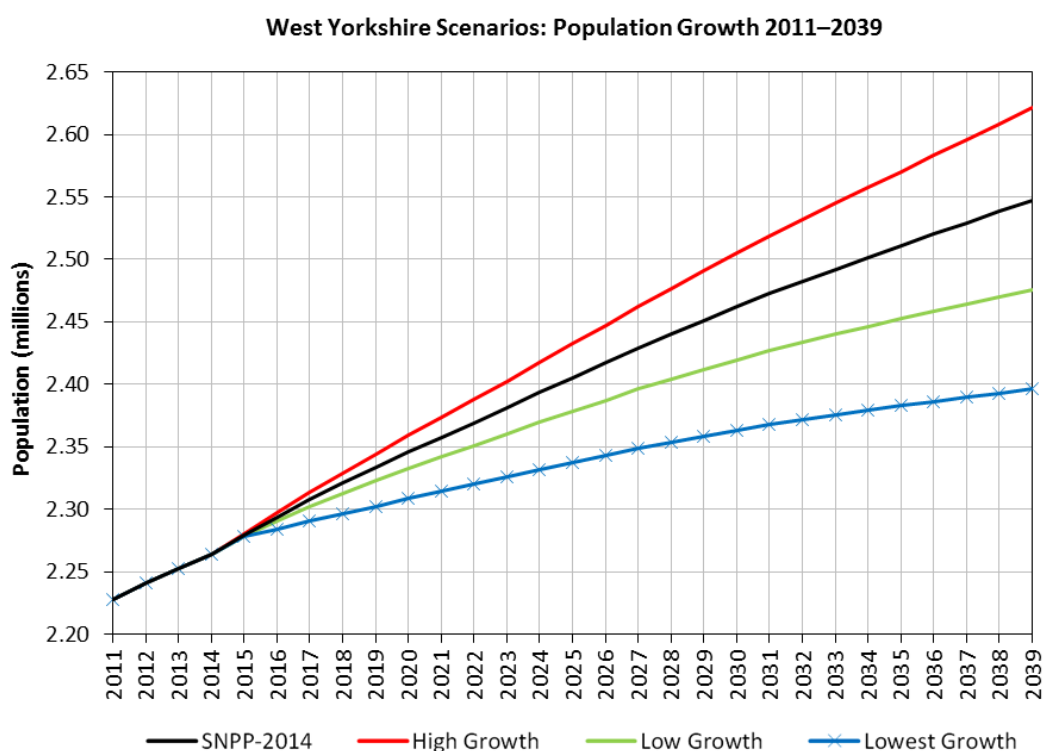

Figure 5.1.3: West Yorkshire variant scenarios: population growth 2011–2039

Table 5.1.1: West Yorkshire variant scenarios: population growth summary 2014–2039

Scenario	Population Growth 2014–2039				
	2014	2039	Change	% Change	Average Annual
High Growth	2,264,329	2,621,205	356,876	15.8%	14,275
SNPP-2014		2,547,634	283,305	12.5%	11,332
Low Growth		2,475,442	211,113	9.3%	8,445
Lowest Growth		2,396,400	132,071	5.8%	5,283

5.2   Age Structure

As the projections were created using cohort component methodologies, each person of the WYorkshire population 'aged' at every year of the projection, allowing the movement of people through age cohorts. The international migration assumptions varied in each scenario, influencing the age structure that could possibly occur. The SNPP-2014 scenario expects that in 2039, the population aged 65+ would make up 22% of WYorkshire's population (Table 5.2.1). The High Growth scenario has the lowest population aged 65+ (21%) and the Low Growth scenario has the same as the SNPP-2014 (Table 5.2.1). Referring back to Table 5.1.1, by 2039 there is a huge variation in the population size in in each scenario, however in each scenario variant, the population will likely have around 20% aged 65+. The population pyramid for each scenario looks very similar in 2039, having large populations between ages 20–24, and 85+ (Figure 5.2.1). The Low Growth and Lowest Growth scenarios however, have smaller populations aged 0–14 and 35–44 compared to both the SNPP-2014 and High Growth Scenario (Figure 5.1.2).

Table 5.2.1: West Yorkshire variant scenarios: old age summary 2014–2039

	2014	Population Projection Output at 2039			
		SNPP-2014	High Growth	Low Growth	Lowest Growth
Population Aged 65+	16%	22%	21%	22%	23%
Population Aged 80+	4%	7%	7%	7%	8%
Old Age Dependency Ratio	24.5	36.3	35.3	37.4	38.3
Median age	37.7	39.9	39.6	40.3	40.3

OADR = Old Age Dependency Ratio (Population aged 65+ / Population aged 16–64)

2014 Population Structure of West Yorkshire

SNPP-2014 (2039)   **High Growth (2039)**

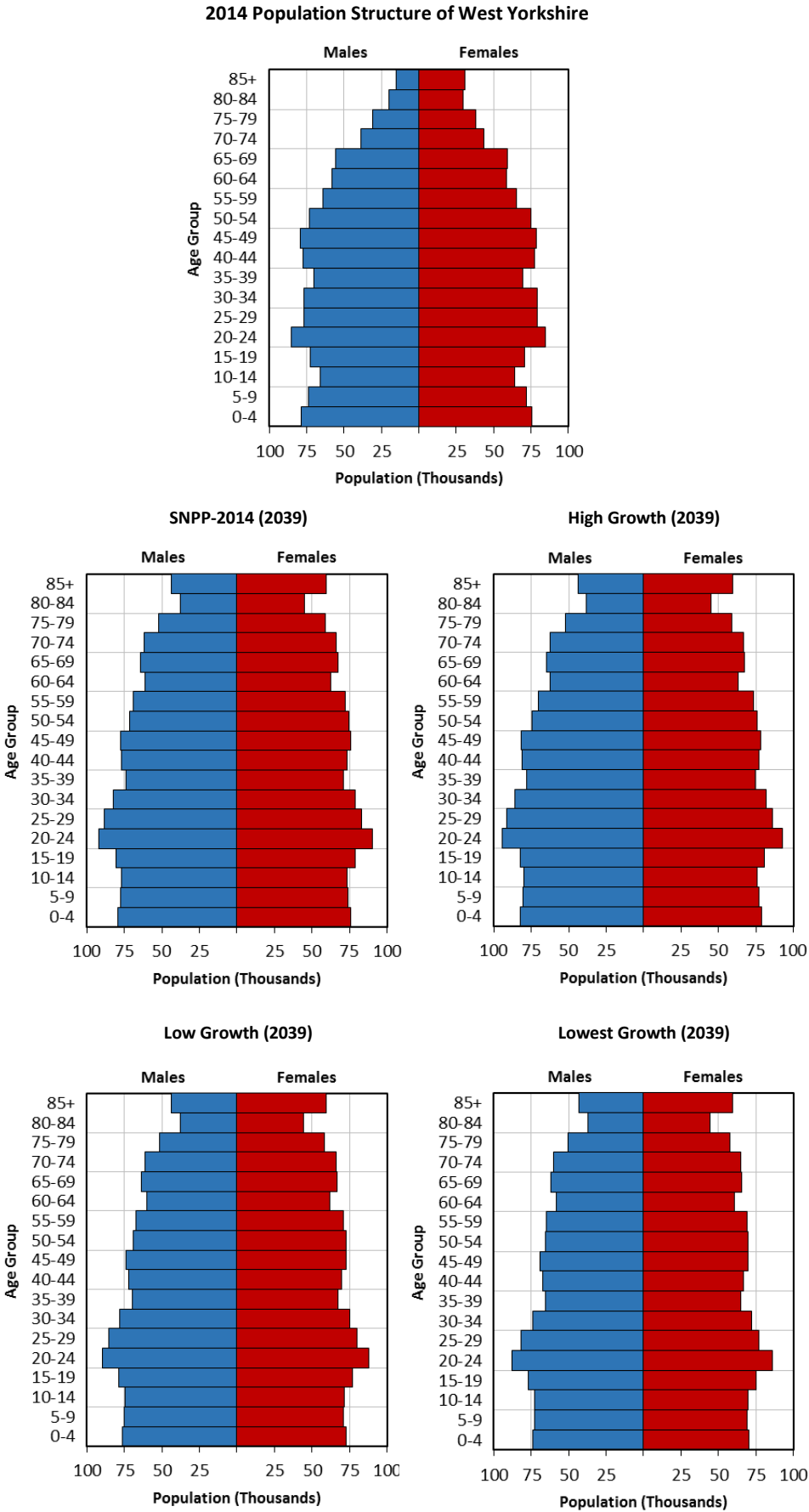**Low Growth (2039)**   **Lowest Growth (2039)**

Figure 5.2.1: West Yorkshire, SNPP-214: age structure change 2014–2039

5.3 Households

The household growth in each scenario is expected to follow the same pattern as population growth (Figure 5.1.3 and Figure 5.3.1). The population under the SNPP-2014 scenario will have an average annual growth of households of +6,960 from 2014–2039; the Low Growth scenario's average annual growth is +5,797. The difference between the scenarios is in terms of household type, as populations with lower migration rates have less households that have children (Figure 5.3.2). It is likely that in all scenarios over the next 25 years there will be an increase in one-person households (Figure 5.3.2), and households where the representative is aged 75+ (Figure 5.3.3). This is expected as the UK has an ageing population which international migration cannot substantially slow down. The High Growth scenario is the only one to assume a large growth in households with children, linking back that migrants are often of childbearing age and help increase birth rates. The Low and Lowest Growth scenarios expect that there will be a large decrease in households where the representative is aged 25–34 (Figure 5.3.3).
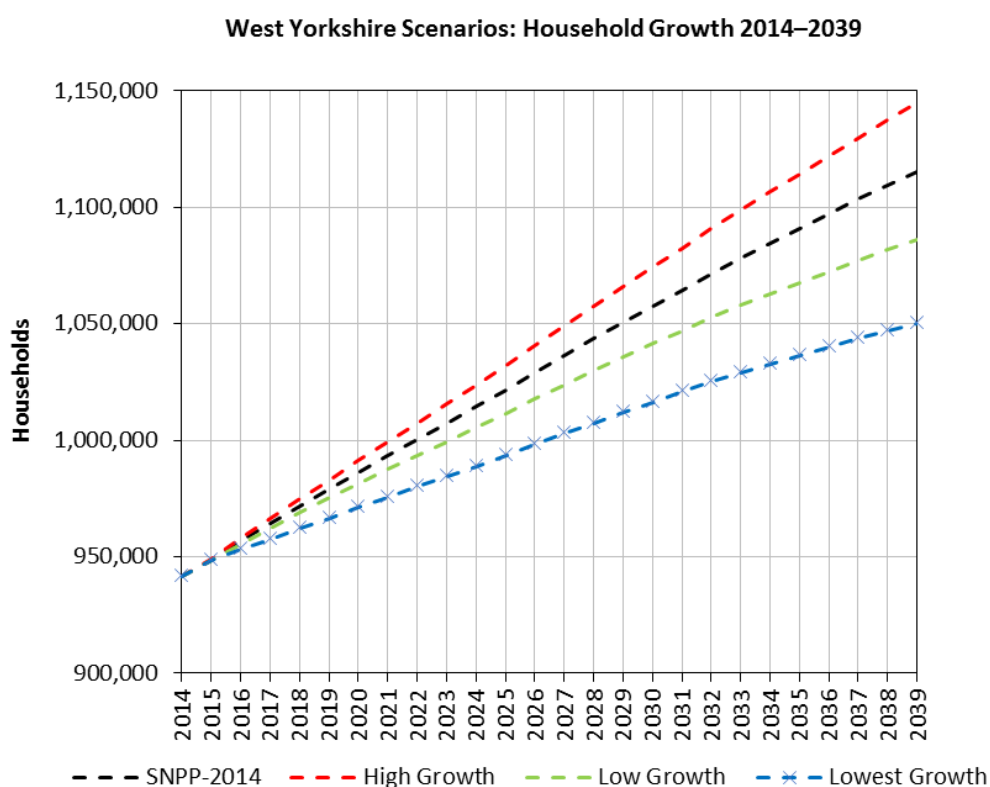
Figure 5.3.1: West Yorkshire variant scenarios: household growth 2014–2039

Table 5.3.1: West Yorkshire variant scenarios: household growth summary 2014–2039

Scenario	Household Growth 2014–2039				Average Annual Dwellings Required
	2014	2039	Change	% Change	
High Growth		1,144,820	203,534	21.6%	8,461
SNPP-2014	941,285	1,115,283	173,998	18.5%	7,233
Low Growth		1,086,199	144,914	15.4%	6,025
Lowest Growth		1,050,313	109,028	11.6%	4,533

Household Change by Type 2014–2039

SNPP-2014 Scenario

High Growth Scenario

Low Growth Scenario

Lowest Growth Scenario

Figure 5.3.2: Scenario Output: Household Change by Type, 2014–2039

The %'s represent change compared to 2014 data

Household Change by Age 2014–2039

SNPP-2014 Scenario

High Growth Scenario

Low Growth Scenario

Lowest Growth Scenario

Figure 5.3.3: Scenario Output: Household Change by Age, 2014–2039

The %'s represent change compared to 2014 data

5.4   Labour Force
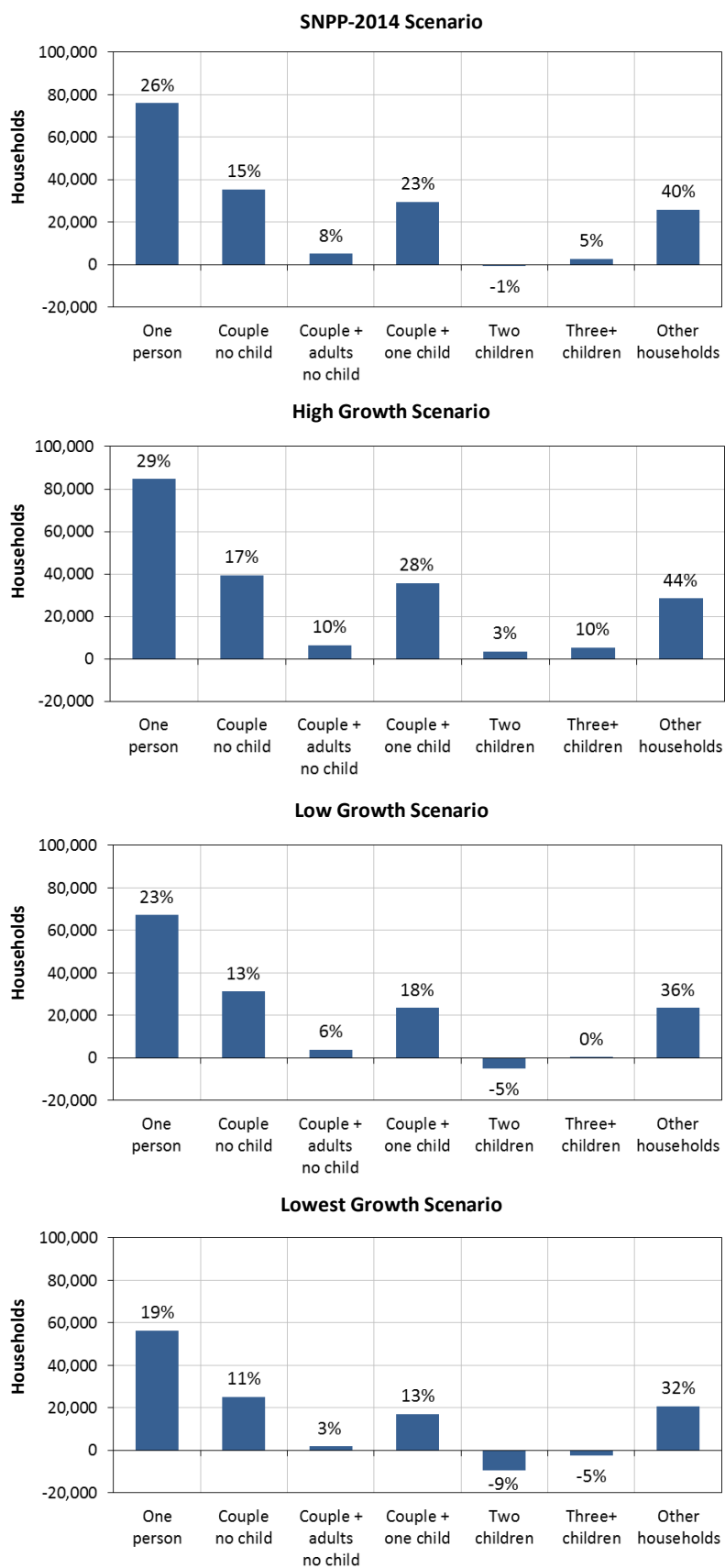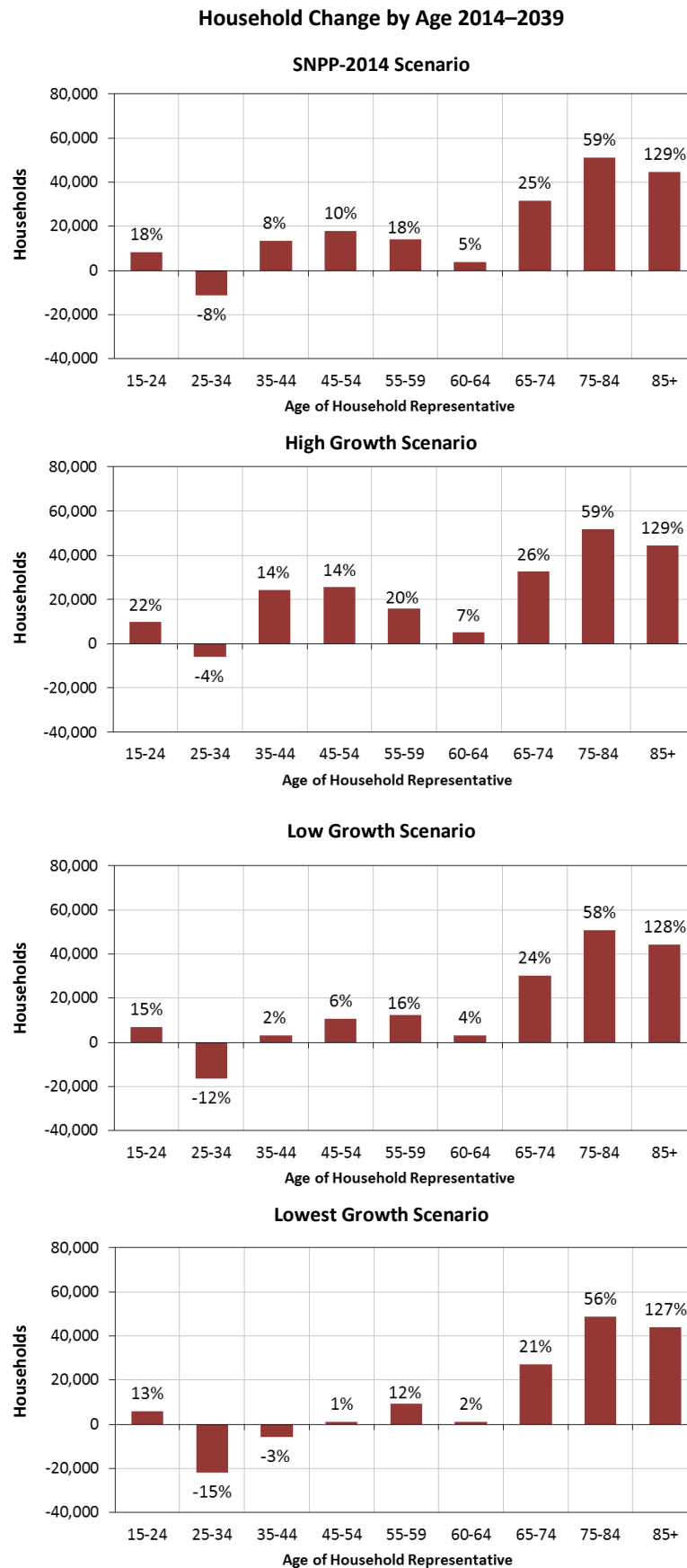
In 2014, the LF of WYorkshire stood at 1,095,018 people. It is expected that under current migration rates (SNPP-2014), it will increase by +57,178 people over the next 25 years. If international migration were to decrease to the Low Growth scenario assumptions, the LF would only increase by +15,424 people (Table 5.4.1). This is a large difference and makes it clear that immigrants do form a large part of WYorkshire's LF. This is exaggerated in the Lowest Growth scenario, if net international migration did not increase each year, the LF will have decreased by -30,458 people between 2014 and 2039. If the UK government encouraged international migration to the UK and experienced rates of migration assumed in the High Growth scenario, the LF could increase by almost +100,000 over the 25 years (Table 5.4.1).

Table 5.4.1: West Yorkshire variant scenarios: labour force growth summary 2014–2039

Scenario	Labour Force Growth (Ages 16–64) 2014–2039				
	2014	2039	Change	% Change	Average Annual
High Growth		1,194,862	99,844	9.1%	3,994
SNPP-2014	1,095,018	1,152,196	57,178	5.2%	2,287
Low Growth		1,110,442	15,424	1.4%	617
Lowest Growth		1,064,660	-30,358	-2.8%	-1,214

6   Discussion

This section provides small discussions on the outcomes of each scenario, suggesting how migration could impact the demographic profile of WYorkshire. It must be understood that this study focuses on how migration could change WYorkshire's demographics, and suggests the implications; these have not been thoroughly researched due to the scope of this project.

Before discussing the scenarios individually, it is important to acknowledge that each LAD within WYorkshire contributes to WYorkshire's population change differently. The population change of WYorkshire from 2001 to 2015 was primarily due to large amounts of international migration in Braford (Table 3.1.1). Therefore, one would expect Bradford to continue to be a large contributor to WYorkshire's future population growth as the scenarios are concerned with migration rates. However, if migration were to continue under current rates, it is expected that Leeds would be the largest contributor to WYorkshire's population change (see 'SNPP-2014' in Figure 5.4.1). This is expected as Leeds is the largest city within WYorkshire, and international migration is not expected to continue to be as high as it had been in the past under the ONS 2014-sub national population projections. Figure 5.4.1 show that each LAD is expected to contribute a similar amount of population change for WYorkshire in each scenario, similar to their population size that make up WYorkshire (Figure 3.1.1). The 'Lowest Growth' scenario produces a slight variation in LAD contribution compared to the other scenarios. Under zero migration assumptions, Leeds increases

further to make up for 45% of WYorkshire's population change. This is not extraordinary as Leeds does have the largest population change in terms of natural change (Figure 3.1.2). When migration has no influence on population change, Bradford contributes less to WYorkshire's population change (Figure 5.4.1); this is because Bradford's population is maintained through international migration (Figure 3.1.2). Instead, smaller LADs such as Calderdale and Kirklees have a greater influence than Bradford, as these areas experience greater rates of internal migration (Figure 3.1.2). From these data, it is reasonable to conclude that international migration does affect population change in LADs differently, thus changing the population growth rates for WYorkshire as a whole.
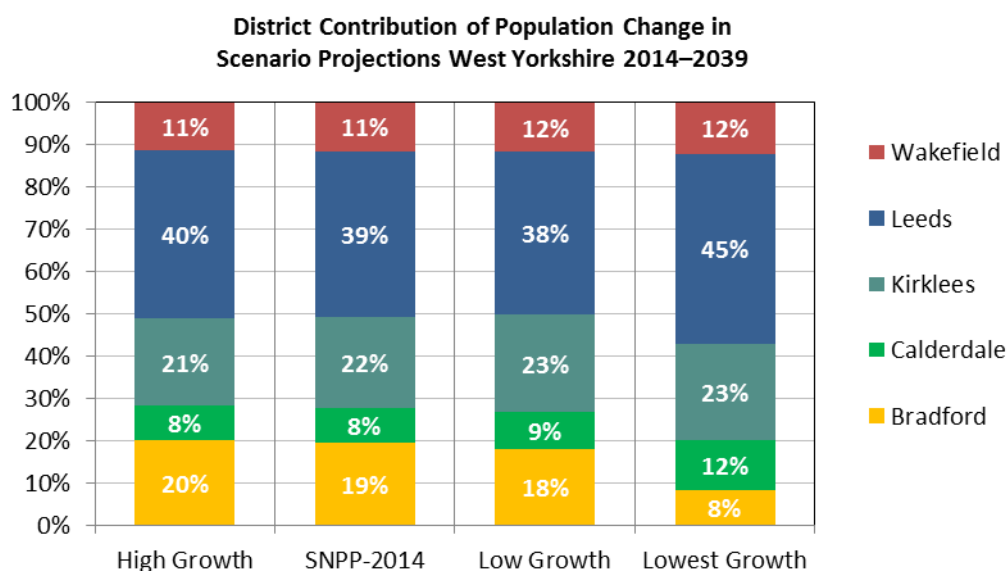

Figure 5.4.1: Scenario Output: LAD contribution to West Yorkshire's projected population growth

6.1   SNPP-2014 Scenario

If migration continued at current rates, the population of WYorkshire is expected to grow by +11,332 people per year, much lower compared to previous years; the population growth averaged at +14,187 people per year between 2001–2015 (Figure 3.1.1). The historical higher growth rate was due to international migration peaking in 2004/05 and 2009/10 (Figure 3.1.2) as mentioned in Section 3.1. The natural change component is maintained throughout the projection period due to Britain's current post-modern societal status (Kirk, 1996). The UK's expectation of declining birth rates could be accountable for the slight assumed decline in natural change (Nargund, 2009); however, this effect is only slight as immigrants maintain birth rates (ONS, 2016c). International migration at current rates is expected to stabilise in 2020 at around +5,986 people per year (Figure 5.1.2), suggesting WYorkshire will not experience an influx of immigration like in the past (Figure 2.2.2); though, the model does not predict real life happenings, such as the expansion of the European Union. Net internal migration continues to decline each year, similar to the population change between 2001–2015, this is because international migration does not affect internal in this model.

Under current migration rates, those aged 65+ years are expected to make up 22% of WYorkshire's population in 2039, an increase of 6% since 2014 (Table 5.2.1). The 85+ aged population is also expected to increase to 7%. If migration continues at this rate over the 25-year period, the OADR could grow by 11.8 (Figure 5.2.1). This OADR could add strain on WYorkshire's LF that is only expected to grow by 5.2% between 2014–2039 (Table 5.4.1). Migration is a way of helping build and maintain a LF, especially with a population ageing at such a rate, but is not necessarily a sustainable solution. The likely increase in elderly people will also affect household composition, as there is an expected increase of single-person households (Figure 5.3.2). However, there is an increase in most household types as those entering the UK will often move in with families, or start their own families. If migration continues at current rates, I expect the local councils within WYorkshire will be able to cope with the ageing population as the LF is continuing to grow alongside population growth.

6.2 High Growth Scenario

Under high migration assumptions, the population of WYorkshire is expected to be over 2.6 million by 2039, a huge increase of over 350,000 people over 25 years (Table 5.1.1). This increase is due to an influx of migrants each year who are likely to have families (ONS, 2016c), therefore exaggerating the population growth. Whilst migration is increasing population numbers, those aged 65+ will still be around 20% in 2039 in WYorkshire (Table 5.2.1), a similar size compared to the SNPP-2014 scenario. The key difference between the scenarios is that higher migration rates result in an increase in the working age groups, helping balance or maintain the age structure (Migration Observatory, 2016). The OADR is the lowest under the High Growth scenario (Table 5.2.1) as the LF is expected to increase by +99,884 people between 2014 and 2039. If migration is encouraged, and EU nationals still have free movement in the labour market, the LF will grow and will be more likely able to support older populations economically (GCIM, 2005).

The housing demand under high migration rates will increase significantly. The local councils within each WYorkshire LAD would have to assess where to build the +8,461 dwellings required each year in order to keep up with demand. This will be costly too; however, a larger LF who are taxpayers will perhaps lessen the stress on economic costs as migration helps reduce UK government debt (Office for Budget Responsibility, 2013).

This migration variant scenario is unlikely under the new government; however, it is interesting to see how demographics could change by altering one component of population change. It can be concluded that although migration brings more youth to a population, there is still the issue of an ageing population; migration alone in WYorkshire is not substantial enough to reverse or slow down the ageing of a population.

6.3 Low Growth Scenario

This scenario is the most likely to occur if immigration is restricted. Under this scenario, it is expected that population growth will be lower and there could be a shift in the types of

households required (Figure 5.3.2). Less migrants in WYorkshire results in less children (Figure 5.2.1), therefore there is a possibility that couples will desire specific types of homes sizes (Van de Kaa, 2002). This means that local councils will have to address the change in household demand, considering the numbers and types. The OADR is expected to increase in this scenario, and due to lower migration rates, the LF will also be much smaller compared to the SNPP-2014 scenario (Rienzo, 2016; Table 5.4.1;). As there are less young people to work, it could result in less support for the old. A high OADR and smaller LF puts pressure on the working-age population, and much of WYorkshire's employment is from foreign-born workers (Migration Observatory, 2013). Therefore, lower migration may result in less people able to work in WYorkshire, as less foreign-born people can enter the country; the existing LF will have increased pressure. A main way of minimising the OADR in an area where birth rates are slowly declining is by introducing migrant populations (Simon et al. 2012); however, the High Growth scenario shows that the increase in migration is not substantial enough to reduce OADR. Reducing migration rates will change the demographics of WYorkshire, the government will need to assess whether the balance between retired people and economically active people is enough to sustain the population.

6.4   Lowest Growth Scenario

This scenario assumes that net migration is zero each year; an equilibrium is reached between the number of people leaving the UK and those entering. Under this scenario, population and household growth is the lowest out of all scenarios, and the LF size is in decline over the projection period. Having zero migration in WYorkshire implies that in order to occupy jobs to sustain the economy, the county would have to attract commuters from local districts in surrounding areas. Low migration rates suggest that the population will be older; possibly being costly to the government as there may need to be an increased budget for healthcare provision and the building of care homes. The taxes paid by the LF help maintain service provision, but if the LF is inadequate and public service demands are high, this could cause an unsustainable economy. However, that is an observation lacking in solid evidence as this study is primarily focusing on how migration affects demographics. Older people do contribute to society financially through spending power, volunteering, and some continue to work past the state pension-age. If the UK did encounter a LF shortage in most counties whilst the population ages, it is expected that the state-pension age will need to increase to make the working age range larger.

6.5   Limitations

There are numerous limitations within this project, the first being that you cannot predict the future, you can make assumptions and produce scenarios but knowing which will happen is unknown. Additionally, the demographic model does not consider world changes such as the expansion of the EU or natural disaster. An interesting addition to the scenarios would be to incorporate assumptions that consider old-age disease. As an ageing population is prominent throughout all scenarios, it would be fascinating to see if there would be an increase in deaths caused by common ailments associated with elderly

people. This combined with decreasing migration could further reduce the population growth rate for WYorkshire. These suggestions could be incorporated into the model, but the changes would need further validating and sufficient evidence to justify its consideration.

There is the limitation that statistics are not always correct, the ONS found issues with UPC and migration is the hardest component of population change to record (Coleman, 2008), therefore the exact numbers produced in my scenarios cannot be taken as fact.

And finally, the Brexit decision on immigration policy has not been finalised, therefore the migration rates used in the variant scenarios could be dissimilar to those actually proposed in policy. However, that is why a range of migration variant scenarios were chosen, to cover high, medium, low, and lowest rates of migration.

7   Conclusion

The scenario outputs vary largely all due to different migration assumptions; this iterates how important international migration is for population growth and demographics. The number of projected people alone do not provide us enough information to analyse the impacts in an area in terms of planning; demographics needs to be considered in order to make this data useful.

The British are living longer, by 2039, those who were born in the 1970s will be turning 65, and the baby boomers of 1964 will be over the age of 70. Britain has an ageing population, and the population increase from higher rates of international migration are not substantial enough to reduce the ageing rate of WYorkshire (Coleman, 2001). However, reducing migration will not drive population ageing either, it will continue at the current rate unless net migration reaches zero.

Arguably, the most important demographic change from the scenarios in this project are concerned with the age structure of the LF. The LF is important in creating a sustainable economy, and migration is an integral part of the LF. Reducing migration results in an increased OADR, putting pressure on the LF, although it is important to acknowledge that not everyone retires at state pension age, older people do add value to the economy, and do not necessarily put pressure on healthcare.

Whether net migration increases or decreases, the population of WYorkshire is expected to continue to grow over the next 25 years, what happens after that remains a mystery. Due to changes in population and LF size, the types and numbers of households are expected to change too, thus Local Plans may need to be altered to cope with demographic change.

Immigration policy for post-Brexit Britain must consider the demographic changes and issues raised around reducing migration numbers, if the nation and local authority areas are not prepared for such change, there could be costly and unexpected consequences for

local councils. This dissertation piece has successful in reaching its aims and objectives of producing populations projections for WYorkshire, exploring how migration may affect demographics. The piece is timely and relevant due to the EU referendum result, making an interesting read.

7.1   Further Research

If this project were to be expanded on, it would include a more in depth investigation on how the scenarios have impacted the LADs within WYorkshire, as each will experience population change differently. Due to the nature of this study, an overall analysis was comprehensive enough to fulfil the project aims and objectives.

Additional research on the current local plans of each LAD in WYorkshire could be explored, noting their housing targets, site allocations, and requirement of a labour force. Using this information, housing-led and jobs-led scenarios could be produced, for example, to compare the difference between jobs needed and jobs required in forecasts. Further research could consider other demographic factors such as the health of the population and deprivation scores to see whether migration affects these demographics. Finally, analysing each scenario at local authority level would be one of the most important next steps, as each LAD will be affected differently in terms of experiencing different rates of migration.

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