Office for
**Budget Responsibility**

# Fiscal sustainability analytical paper: **Fiscal sustainability and public spending on health**

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# Fiscal sustainability and public spending on health

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## Abstract

This paper reviews the latest evidence on the demographic and non-demographic determinants of health spending in the UK and its implications for our long-term health spending projection. We find that demographic effects have explained only a small part of the increase in health spending over past decades and that they are likely to remain a relatively small, although growing, driver of spending in the future. Income effects are an important driver of real health spending, though not of spending as a share of GDP. Most significantly, other cost pressures (for example increasing relative health care costs and technological advancements) have been bigger contributing factors over the past and are likely to remain important drivers of spending in the future. We find that our long-term projection is particularly sensitive to the inclusion of non-zero estimates of other cost pressures. A key implication of this paper for our long-term health spending projection is therefore that we should recognise and quantify an explicit non-zero assumption about other cost pressures. Given the scale of uncertainty around these pressures, sensitivity analysis will remain vital when presenting our long-term fiscal projections.

JEL references: H51, I12, I18
Keywords: public health spending, demographic and non-demographic factors

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# 1 Introduction and context

## Introduction

1.1 Each year since 2011, the Office for Budget Responsibility (OBR) has published a *Fiscal sustainability report (FSR)*, in which we consider the fiscal consequences of *past* government activity, as reflected in the assets and liabilities on the public sector's balance sheet, and the consequences of *future* government activity, through the use of long-term demographically driven projections beyond our latest medium-term forecast horizon.

1.2 Due to the uncertainty that followed the result of the 23 June referendum on the UK's membership of the European Union, we decided to cancel the *FSR* that we had planned to publish on 12 July. We felt it was likely that some of the conclusions would not be informative at that time. Instead, we published some elements of the analytical work that would have featured in July's *FSR* as 'fiscal sustainability analytical papers'. This working paper forms part of that series of analytical papers. As with the papers published in late July, it will also help inform our first *Fiscal risks report*, which we plan to publish next year.

1.3 The paper builds on our previous analysis of long-term pressures on health spending, for example in Annex B of our 2012 *FSR*, and several reports from domestic and international organisations.[1] In it, we:

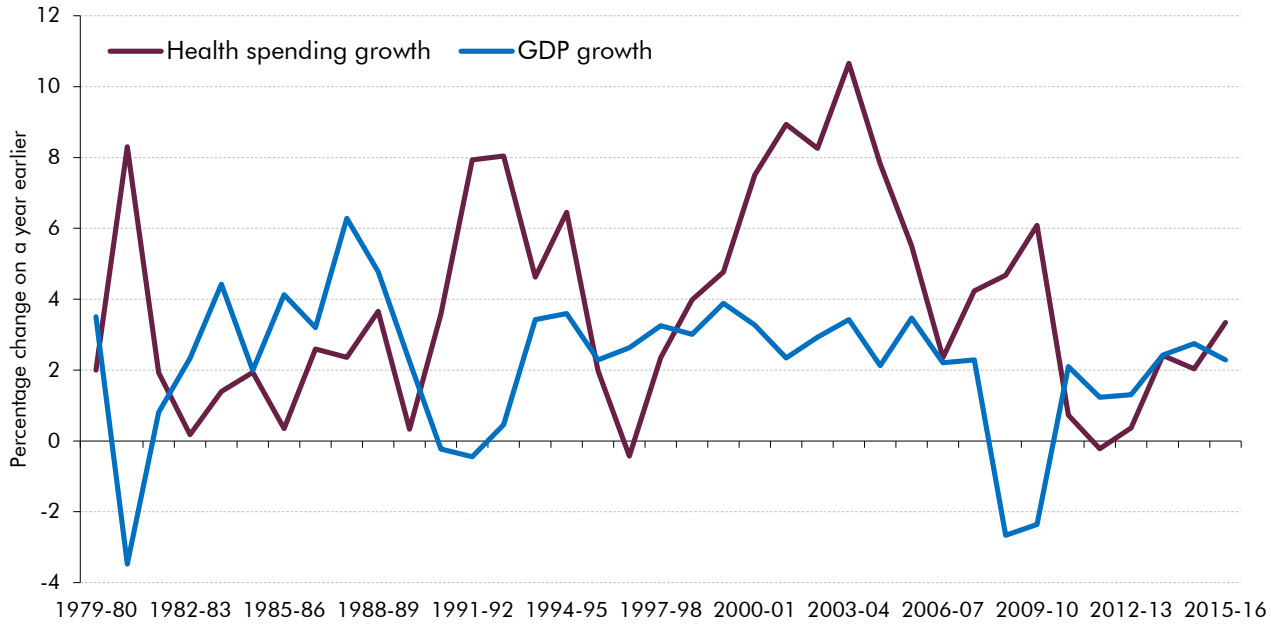
- **investigate the long-term trends in public sector health spending** in the UK;
- **review the latest research and evidence** on the determinants of health spending, considering the role of both demographic and non-demographic factors;
- **update our 2015 *FSR* health spending projection** on the basis of new population projections and detailed spending plans set out since our last report;
- **test the assumptions and methodologies underpinning that projection**, including our usual illustration of the sensitivity associated with health sector productivity and more granular sensitivity analysis looking at different assumptions about morbidity, income elasticity and other cost pressures; and
- **draw conclusions** about appropriate assumptions to underpin the health spending component of our future long-term fiscal projections.

[1] OECD (2013 and 2015) and European Commission (2013 and 2015) on long-term projections and the role of non-demographic factors; IMF (2010 and 2014) on the fiscal implications of demographic pressures; Nuffield Trust (2012), NHS England (2013) and the Health Foundation (2015) on 'funding gaps'; US CBO (2008) on the role of technology; and the Wanless Review (2002).

## Context

1.4 Many domestic and international studies see upward pressure on health care spending as one of the greatest challenges to long-term fiscal sustainability. In the UK public spending on health has increased by 3.8 per cent a year on average in real terms since 1978-79, while the economy has grown by an average of just 2.2 per cent a year (Chart 1.1).[2] Over this period health spending exceeded GDP growth in the majority of OECD countries.[3]

Chart 1.1: Year-on-year increases in real health spending and GDP in the UK



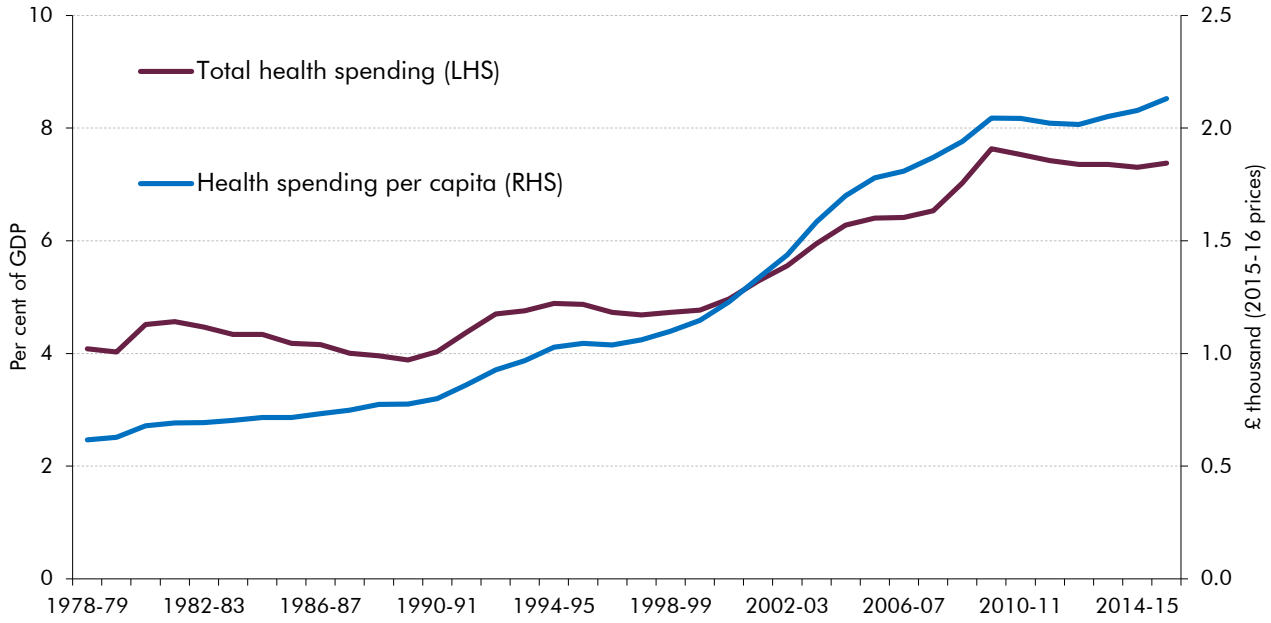

Source: HM Treasury, ONS

1.5 Chart 1.2 shows that health spending increased as a proportion of GDP from 4.1 per cent in 1978-79 to a peak of 7.6 per cent in 2009-10. It has since declined very gradually. Health spending in the UK has also increased steadily in real per capita terms. As will be shown later in this paper, demographic change alone cannot explain these rising trends, with other factors generating further upward pressures on health spending.

[2] The data on public sector expenditure on health used in this paper follow the United Nations 'Classification of the functions of government' (COFOG). This functional definition includes expenditure on services provided to individual persons and those provided on a collective basis. For the UK, it therefore covers a somewhat broader range of health services spending than is represented by the NHS, including health services provided by the devolved administrations and local authorities.

[3] Precise international comparisons over time are complicated by recent accounting changes to the OECD system for health accounts, which reclassified a large proportion of publicly-funded spending on long-term care as health spending. See e.g. Appleby (2016).

## Chart 1.2: Total and per capita health spending in the UK




Source: HM Treasury, ONS

1.6 Table 1.1 shows the Government's latest plans for health spending by central government over the period covered by the 2015 Spending Review, taken from the 2016 Public Expenditure Statistical Analyses published in July. These figures are higher than the NHS budget, since they also include spending by the devolved administrations and other departments. It is this functional classification of health spending – adjusted also to include spending by local government – that we use in our long-term projections.[4]

1.7 The table shows that in real terms – adjusted for the whole economy measure of inflation – health spending is set to rise by only 0.5 per cent a year on average over the next four years to 2019-20. On the basis of the latest ONS population projections, that would mean real spending per person falling by 0.9 per cent cumulatively over that period. Based on our March 2016 *Economic and fiscal outlook* forecast for nominal GDP, this would correspond to a fall in health spending from 7.2 to 6.8 per cent of GDP.

## Table 1.1: Health spending plans up to 2019-20

| | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 |
|---|---|---|---|---|---|
| Cash spending (£ billion) | 135.3 | 138.9 | 142.3 | 145.2 | 148.2 |
| Real spending (£ billion, 2015-16 prices) | 135.3 | 136.8 | 137.7 | 137.6 | 137.9 |
| Real per capita spending (£, 2015-16 prices) | 2079 | 2087 | 2086 | 2070 | 2061 |
| Per cent of GDP | 7.2 | 7.2 | 7.0 | 6.9 | 6.8 |

Note: the table shows functional health spending (current and capital) by central government only, based on the published PESA numbers to 2019-20.

[4] The projections set out in the remainder of this paper assume that the increase in the demand for health care are solely met by future governments. Implicit in this assumption is that there is no relative shift towards privately funded health care over time as a result of increasing demand.

# 2 Drivers of health spending

2.1 In this chapter, we look at the factors that help determine the path of health spending over time. We divide them into three commonly used categories:

- **demographic factors** capture the effect of changes in the age structure of the population, including health status at given ages and death-related costs. These are the main driver of the long-term projections for public health spending that we have published in our previous *Fiscal sustainability reports (FSR)*;[1]

- **income effects** reflect the fact that health care is a 'normal good', which means that people generally demand more of it as their incomes rise. This means that spending rises in cash and real terms as incomes rise, but whether spending rises or falls *as a share of GDP* depends on whether the 'income elasticity of demand' is greater or less than one. To date our central projections have implicitly assumed an elasticity of one, so that a 1 per cent rise in income is associated with a 1 per cent rise in spending on health, leaving the ratio of the two unchanged; and

- **other cost pressures** include non-demographic factors such as increasing relative heath care costs, the impact of technological advances and the rising prevalence of chronic health conditions. Our central projections have not factored these in to date.

2.2 In Chapter 3 we present an update of our 2015 *FSR* health spending projection based on new population projections and health spending plans and test the sensitivity of it to different assumptions about these three drivers.

## Demographic factors

### Population ageing

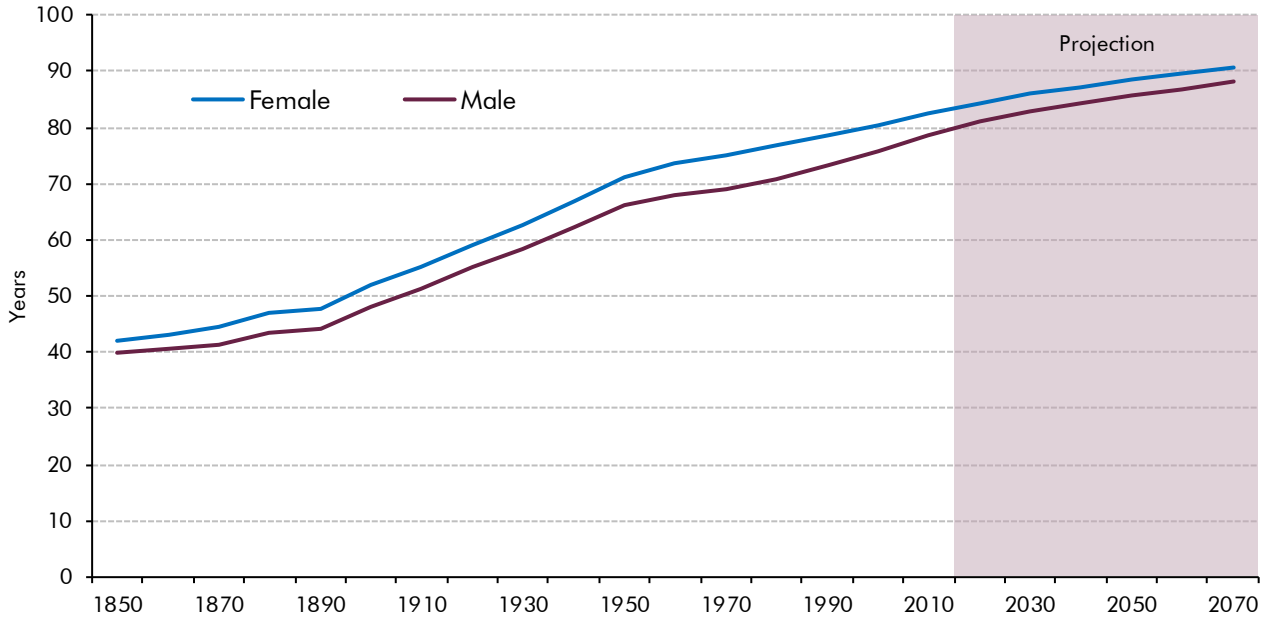
2.3 Life expectancy has increased consistently over the past century. Chart 2.1 shows life expectancy at birth since 1850. It shows substantial increases, especially in the 20th century, with the Office for National Statistics (ONS) expecting further increases over the next 50 years.

2.4 Up to World War II, most of the increase in life expectancy resulted from reductions in deaths from infectious disease (such as tuberculosis) and improvements in infant survival. Life expectancy at 65 grew only very slowly until the 1950s, but has since risen more quickly

[1] The projected size and structure of the population are determined by assumptions regarding longevity, fertility and net migration. As illustrated in Box 3.3 of our 2014 *FSR*, changes in these assumptions cumulated over a period of decades can have big effects, with important implications for the public finances.

(and is expected to continue doing so) as a result of new medical technologies and techniques. That said, some of the improvements in mortality in recent years are due to cohort specific effects and improvements in public health (e.g. less smoking) that are unlikely to be repeated in future.[2] As a result, the latest projections assume convergence towards a relatively slow rate of improvement in life expectancy from the 2040s onwards.

## Chart 2.1: Life expectancy at birth (England and Wales)

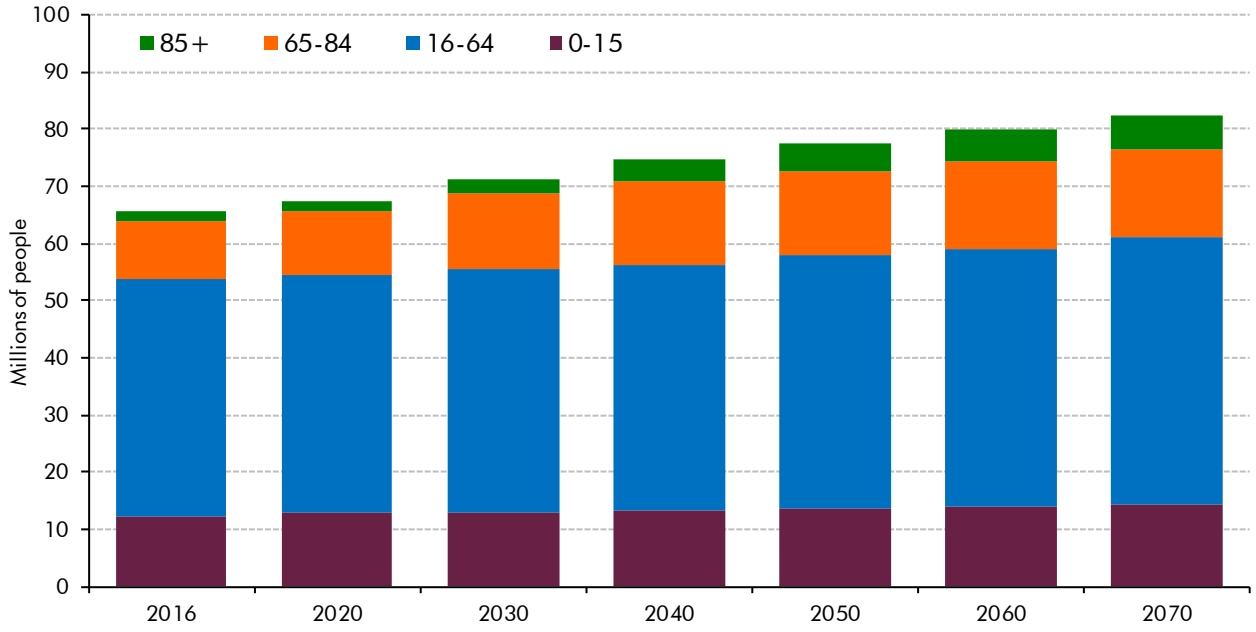



Source: ONS

2.5 The trends shown in Chart 2.1 mean that the pressure on health spending from ageing is set to increase substantially. The ONS currently projects that the UK population will increase from 65.6 million in 2016 to 82.6 million in 2070 (Chart 2.2), with a marked increase in the proportion of people older than 65 years – the biggest consumers of health care. While the UK's working-age population is expected to expand modestly over the coming decades, the number of old and very old people is expected to grow much more quickly. For example, the number of over-85s is expected to treble between now and the early 2050s and the number of centenarians is expected to increase from 14,500 today to over 450,000 in 2070. As a result, the proportion of the population aged 85 and over is projected to rise from 2.4 per cent this year (and just 0.8 per cent in 1970) to 7.3 per cent in 2070.

[2] ONS (2016).

## Chart 2.2: UK population structure (2016-2070)




Source: ONS

## Age-specific spending on health care

2.6 Demographic pressures translate into higher pressure on health spending via two main channels. First, health spending increases with the size of the population, as meeting the needs of a larger population is more expensive. Second, health spending increases with the proportion of older people in the population, because per capita spending tends to be higher for the old than the young. Demographic pressures will only increase health spending as a share of GDP if they increase health spending by more than GDP, which is more likely for population ageing than across-the-board increases in population.

2.7 Chart 2.3 shows the representative profile for age-related health spending used in our long-term *FSR* projections.[3] It shows that health spending per person is relatively high in early age due to birth and health-related costs at young ages, such as vaccinations. They are then low during working age before increasing substantially in later life. As a result, unless the projected increase in life expectancy is accompanied by an equivalent increase in the number of years spent in good health, an ageing population would be expected to raise average health spending per capita and thus the aggregate health spending.

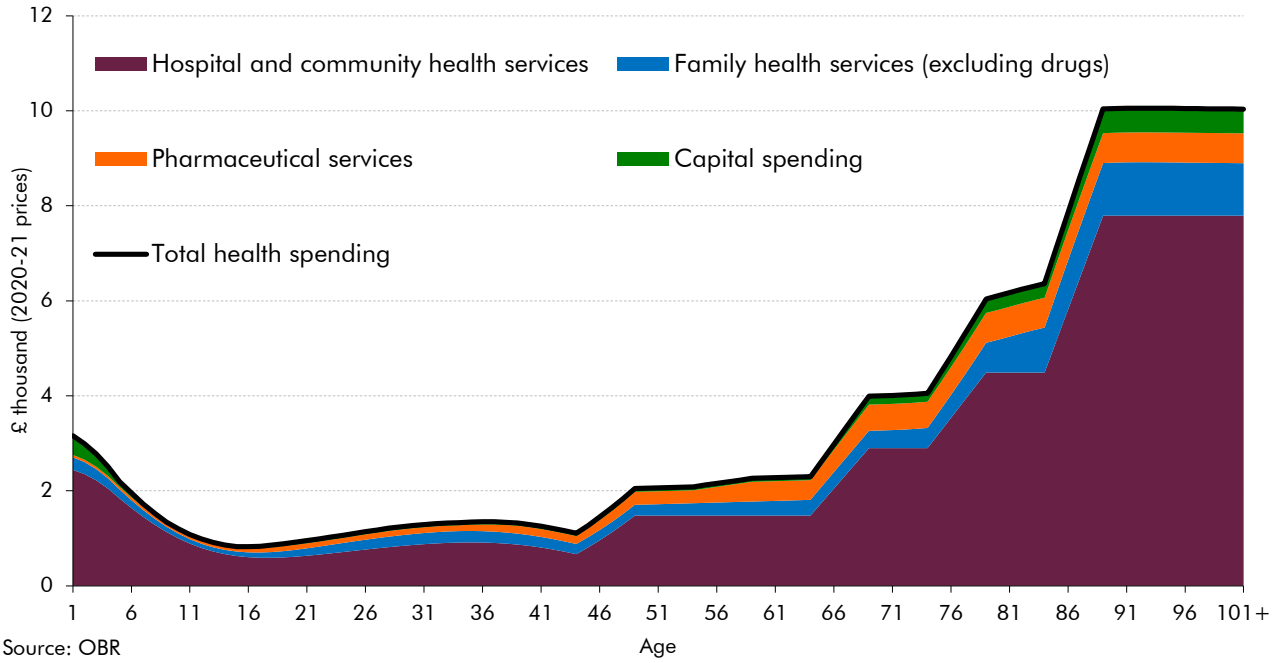
2.8 The representative profile shown in the chart includes the following four elements:

- **hospital and community health services** – this represents secondary health care (i.e. services provided following referral by a primary care professional). It is assumed to account for the majority of current health spending in our model;

[3] The construction of these representative profiles was informed by available data on per capita spending and NHS England spending data on primary and secondary care. We plan to undertake further work to update the profiles in the future.

- **family health services (excluding drugs)** – this covers elements of primary health care (e.g. GP and dental services) excluding pharmaceutical services;
- **pharmaceutical services** – this captures the elements of primary care related to drug prescriptions; and
- **capital spending** – this is investment undertaken by the central and local government (e.g. building new hospitals).

## Chart 2.3: Representative profile for health spending




Source: OBR

2.9 While population ageing may lead to higher health spending per capita, there is in fact little evidence that this 'pure demographic' effect has been the main driver of rising health spending. Proximity to death is a more important influence on health spending than age, as hospital costs increase significantly in the final months of life for an average individual regardless of their age. So part of the reason that per capita spending is higher at older ages is that mortality rates are higher at older ages, so a higher proportion of those cohorts will be subject to the much higher costs associated with the final months of life.[4]

2.10 Using a single age-profile for spending, associated with both survivors and those dying in a given year, would overstate the effect of demographic change. We therefore model hospital and community health services costs for the over 45 age group using two separate profiles:

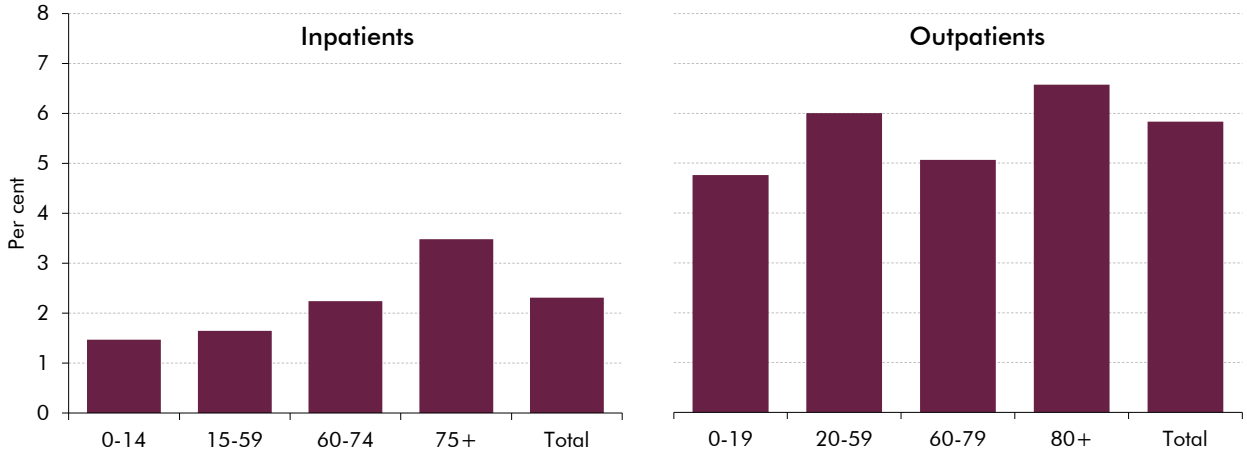
- **over 45s 'age-related' costs** – this is equivalent to the cost of survival in a year, consistent with the assumption that the population of 'survivors' aged 45 in a particular year is equal to the population aged 46 at the beginning of next year; and

[4] The simple argument that spending rises with age, rather than with proximity to death, is known in studies on health spending pressures as a 'red herring'. For a discussion see Zweifel, Felder and Meiers (1999), Seshamani and Gray (2004) and Howdon and Rice (2015).

- **over 45s 'death-related' costs** – this captures the acute health care costs in the final 12 months of life.

2.11 Recent trends in health care activities provide evidence of stronger growth in consumption by older age groups than younger age groups. Chart 2.4 shows that inpatient and outpatient utilisation rates (the number of episodes per person) in England have increased most among older groups.[5] In particular, inpatient utilisation rates in the 75+ age group increased by more than 50 per cent between 2000-01 and 2013-14. While the difference across age groups was smaller for outpatient attendance rates, growth was still highest for the 80+ age group. As well as age-related drivers, there is also evidence that inpatient admissions linked to chronic conditions are likely to rise with age bands.[6]

## Chart 2.4: Average growth in inpatient and outpatient utilisation rates by age




Note: Average annual growth between 2000-01 and 2013-14 for inpatients and between 2003-04 and 2013-14 for outpatients.
Source: HES, ONS

2.12 The strong growth in utilisation rates seen over the past years (even at younger ages) could provide evidence that spending on health care increases with income (i.e. it is a normal good), although it is also possible that higher spending (e.g. on new technologies) may itself have led to higher admissions. We discuss this in the following sections. Continuation of these trends in utilisation rates would amplify the effect of population ageing on health spending. For example, it is possible to project future health care activity by combining the projected utilisation rates with the latest ONS population projections. Using this approach, we estimate that the total number of inpatient and outpatient activities would increase threefold and fourfold respectively over the next 50 years or so. Within that, inpatient and outpatient activities for the old-age group would increase by about 7 and 10 times

[5] The chart is based on the hospital episode statistics (HES) dataset. These are administrative data on publicly funded inpatient and outpatient hospital care. Inpatient activity is measured in terms of the number of 'finished consultant episodes' (FCEs), which is a count of the number of episodes (periods) of continuous admitted patient care under the same consultant that ended during a given financial year. Where a patient is transferred to a second or subsequent consultant this is counted as another episode of care. Outpatient activity is measured in terms of the number of attendances. These activity data are subject to important limitations. Most notably, they are only available on a consistent basis for the past few years, making it difficult to assess long-term trends. The increase in recorded activities over the period might reflect improvement in the recording of activities rather than a true underlying increase (e.g. the introduction of payments by results has provided a financial incentive for hospitals to ensure that all their activities and clinical coding are fully recorded).
[6] Roberts, Marshall and Charlesworth (2012). The regression estimate referred to 2009-10. See also Dunn, McKenna and Murray (2016) for a discussion on the impact of chronic conditions on the demand for NHS services.

respectively – reflecting both population growth and, more significantly, the rising utilisation rates. Growth in inpatient and outpatient activities for those in younger cohorts would be much less pronounced, reflecting both smaller increases in utilisation rates and lower population growth.

## Morbidity

2.13 Morbidity – periods of ill-health – is another key driver of health spending. Whether gains in life expectancy increase the years an individual can expect to spend in good health or ill health has important implications for fiscal sustainability. More years spent in ill health would be associated with greater pressure on health spending while more years spent in good health might boost GDP by more than any age-related increase in health spending. There are three main theories about the impact of life expectancy on morbidity:

- the **expansion of morbidity** theory suggests that the increase in life expectancy is generally associated with more years spent in ill health. If reduced mortality is driven by increasing capabilities of medical technology to prevent fatal outcomes from degenerative chronic diseases, while the underlying prevalence and progression of the disease remain unchanged, the proportion of life spent in ill health would increase despite mortality rates falling. All else equal, this expansion in morbidity would put upward pressure on health spending;

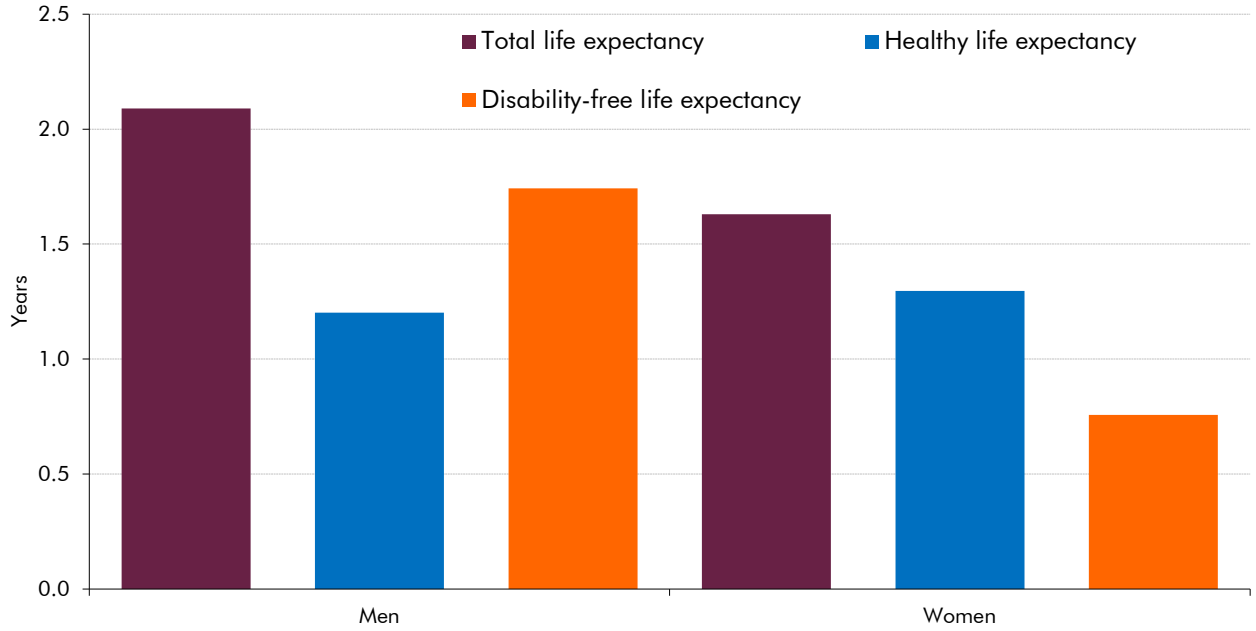
- the **compression of morbidity** theory argues that the increase in life expectancy is associated with more years spent in good health. For example, new medical technologies can improve the effectiveness of secondary prevention in slowing the progression of chronic diseases and preventing the onset of their associated disabilities. Such interventions can yield cost savings in long-term care and treatment if they help to stem the prevalence of certain conditions. If an intervention is morbidity-compressing then, all else equal, it would put downward pressure on health spending; and

- the **dynamic equilibrium** theory suggests that years in ill health will increase but that the severity of morbidity will fall. If medical interventions delay the end of life and improve the quality of life, without eliminating the disease altogether, then there will be more years spent in ill health but the level of treatment will not be as intensive. Depending on the relative strength of the different effects, this could place upward or downward pressure on health spending.

2.14 Empirical research has not yielded a clear-cut winner among these three theories. The evidence around morbidity in the UK is mixed.[7] Chart 2.5 shows that both healthy life expectancy and disability-free life expectancy improved in the 2000s, but that neither did so by as much as overall life expectancy, indicating some expansion in morbidity too.

[7] See e.g. Jagger (2015).

Chart 2.5: Change in total, healthy and disability-free life expectancy at 65 between 2000-2002 and 2009-2011




Source: ONS

2.15 In our central health spending projection we assume a constant health status for a person of a specific age and gender. Implicitly this assumes that the increases in life expectancy projected by the ONS will be spent partly in ill health – an expansion of morbidity. We test the sensitivity of this assumption in Chapter 3.

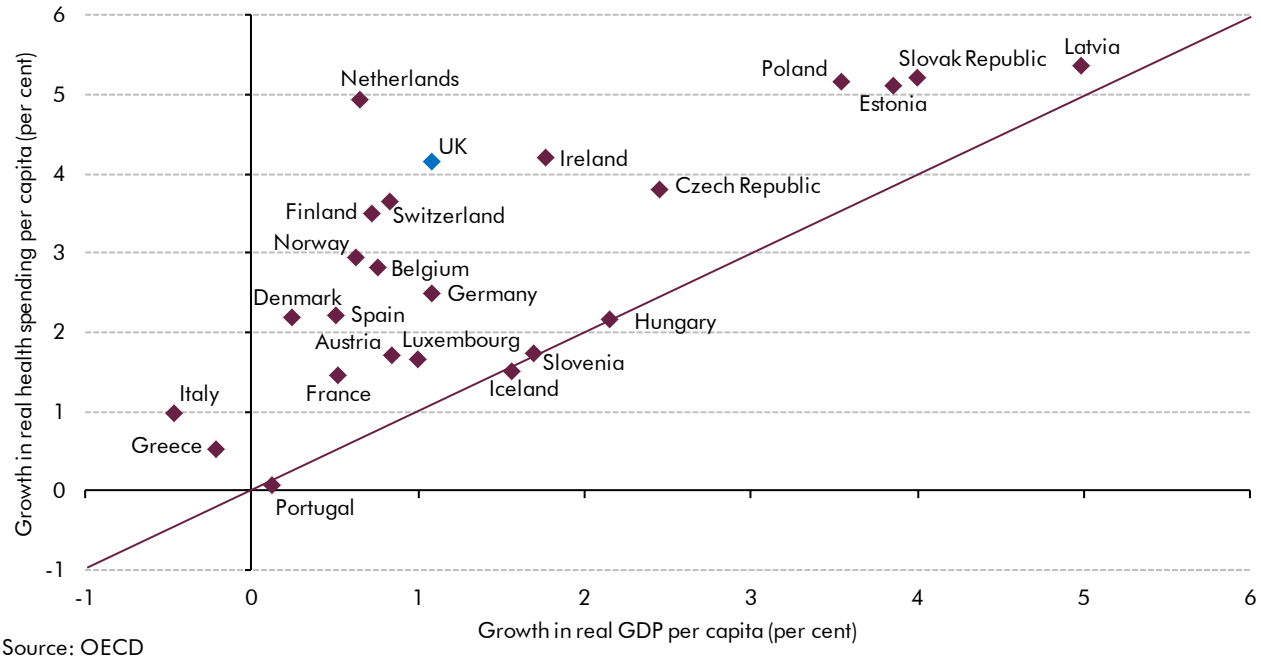
## Income effects

2.16 Chart 2.6 shows that health spending has risen faster than GDP in almost all European countries over the past decade (almost all dots are above the diagonal line). There is a broad consensus that the relationship between per capita health spending and GDP in OECD countries is positive – that the income elasticity of health spending is above zero – but there remains disagreement on the strength of this relationship.[8] That disagreement partly relates to how much of the growth researchers assign to the income elasticity or to other cost pressures, some of which are discussed in the final section of this chapter.

2.17 In our central *FSR* projections, we have implicitly assumed that health care is a normal good with an income elasticity of one. This implies that, all else being equal, health spending will grow at the same pace as national income so that it will remain stable as a share of GDP. When the income elasticity for a good or service is greater than one, spending rises proportionately more than income, meaning that it increases as a share of GDP.

[8] See OECD (2013) for a review of whether health care is a luxury (income elasticity above one) or a necessity (income elasticity below one).

Chart 2.6: Growth of real health spending and GDP per capita (2000 to 2015)




Source: OECD

2.18 Over the 50-year horizon that we focus on in our *FSRs*, an income elasticity below one would mean that, in the absence of demographic and other factors, health spending would trend down as a share of GDP; an elasticity above one would mean it trended up. In the very long term, an income elasticity above/below one would imply that all/no income would eventually be spent on health care. We assess the sensitivity of our long-term health spending projection to alternative income elasticity assumptions in Chapter 3.

## Other cost pressures

2.19 Empirical studies have found that the impact of ageing on health spending has been relatively small historically. For example, the OECD (2013) found that real public health spending per capita in OECD countries between 1995 and 2009 was mainly driven by rises in income and other non-demographic drivers, rather than demographic effects (Chart 2.7).[9] In a similar exercise for EU countries, the European Commission (2013) found that population ageing had a positive effect on spending growth, but that it was less important than changes in income, technology and institutional settings. In both cases, if the results were expressed in terms of changes in spending as a share of GDP – where an income elasticity of one is consistent with no change – rather than real growth rates, the majority of the change would be assigned to non-demographic factors.

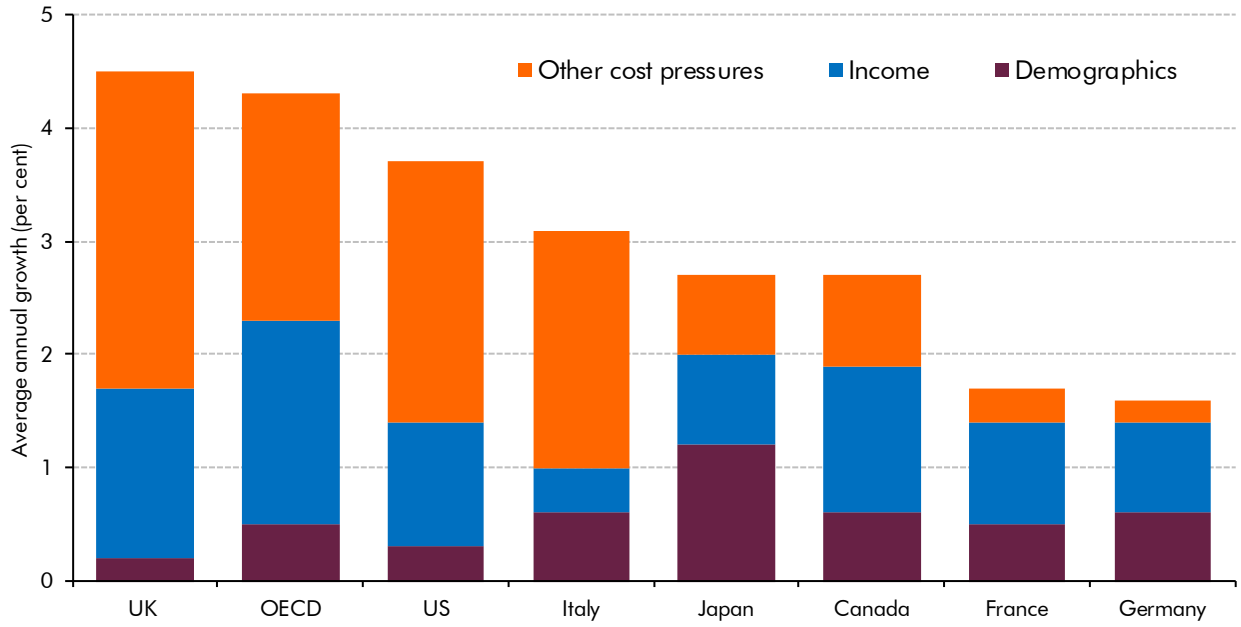
2.20 These other cost pressures cover a multitude of factors but it is generally accepted that increasing relative health care costs (for example, resulting from lower productivity growth in the health care sector relative to the rest of the economy) and the effect of technological

[9] See De la Maisonneuve and Oliveira Martins (2013).

advances (e.g. medical equipment, techniques and procedures) are the main drivers. The rise of chronic conditions is also expected to be an important factor.

2.21 There is also an important connection between other cost pressures and low productivity growth in the health care sector. If other cost pressures mean that it becomes more expensive to undertake a procedure, then under the standard output measures used by the ONS (discussed further below) this would show up as a fall in productivity despite the improvement in health outcomes brought about by the technological advance. Explicitly allowing for other cost pressures could therefore be seen as another way of reflecting lower productivity growth in the health care sector in projections.

## Chart 2.7: Growth in public health spending per capita (1995-2009)




Source: OECD

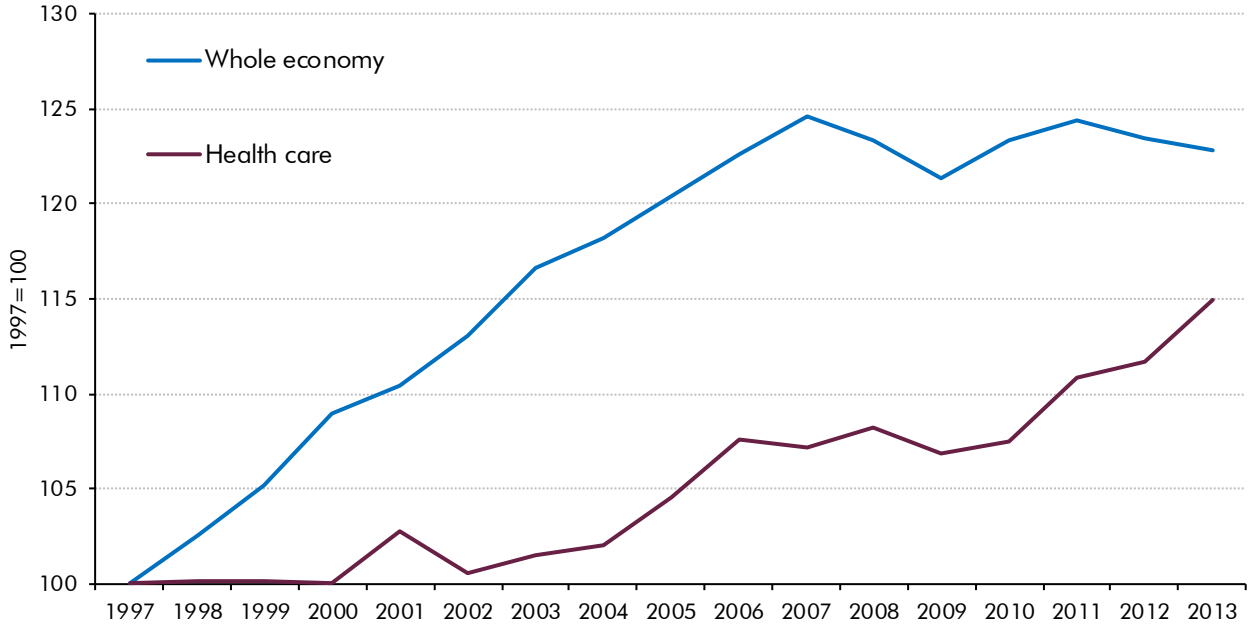
## Increasing relative health care costs

2.22 Health care is a relatively labour intensive sector. For example, the King's Fund found that staff accounted for around 70 per cent of a typical hospital's total costs and that this proportion had grown over time.[10] Cost and price pressures have generally been stronger in the health sector than in the rest of the economy, while productivity growth has tended to be lower. According to the so-called 'Baumol cost disease' theory, real wages in the health care sector have to keep pace with the rest of the economy in order to attract and retain staff, but slower productivity growth means that additional input would be needed to achieve the required improvement in care per person. As a result, the cost of health services will rise relative to other sectors of the economy.

[10] See Appleby, Galea and Murray (2014).

2.23 Our central long-term projections for health spending have assumed that health sector productivity will grow at the same rate as in the rest of the economy. But, given the trends shown in Chart 2.8, in Chapter 3 we have also presented a variant of the projection in which health sector productivity lags the rest of the economy and spending is increased to maintain growth in health output. (We have also presented this as a variant projection in our recent *FSRs*.) Box 2.1 describes trends in measured health sector productivity.

## Chart 2.8: Cumulative productivity growth in health care and in the whole economy




Source: ONS

### Box 2.1: Productivity in the health care sector

Measuring productivity in the health care sector is not straightforward because output is difficult to measure, but some measures of productivity have been put forward.

Since 2004, the ONS has produced a regular productivity index for publicly funded health care in the UK. The index is produced by comparing changes in quality-adjusted health care outputs with changes in inputs. Between 1997 and 2000, estimated health sector productivity was largely flat. Between 2000 and 2004, it increased by only 0.5 per cent a year on average during a period of strong input growth – health spending was increased sharply in the Spending Reviews during this period. More recently, slightly stronger growth in health care productivity has reflected slower growth in inputs as public spending growth has been reduced. On these ONS estimates, average growth of health care productivity from 1997 to 2013 was 0.9 per cent a year.

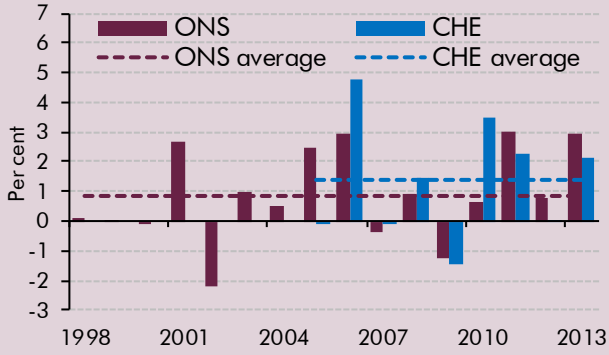
The University of York's Centre for Health Economics (CHE) produces productivity estimates for the NHS in England.[a] Although its estimate is constructed using a similar approach to the ONS, there are a number of differences (e.g. coverage and scope of quality adjustment), which means that the two measures are not directly comparable. Nevertheless, Chart A shows that the trends in productivity growth from the two measures are broadly similar. Over the 2004-2013 period,

the CHE measure averages 1.4 per cent a year while the ONS measure averages 1.3 per cent. Both are relatively volatile from year to year.

Other studies also suggest that productivity in the health care sector has been relatively low. For example, the Health Foundation recently investigated NHS Acute Trust level productivity between 2009-10 and 2014-15 and concluded that productivity in the acute care sector had increased by an average of just 0.1 per cent a year.[b]

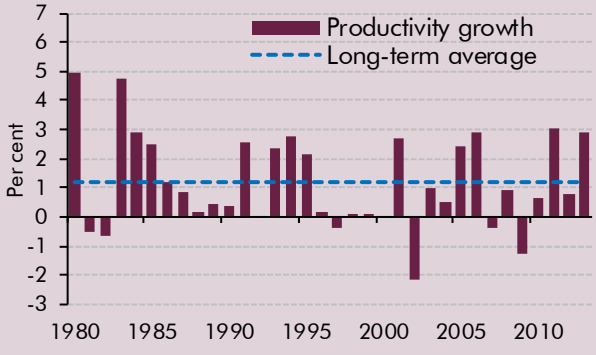
Recent trends in health care productivity may not be representative of future long-run trends. Most of the period since the mid-1990s, a similar period to that covered by the ONS estimates, was characterised by big increases in NHS funding in successive Spending Reviews, driving rapid input growth. It should therefore come as no surprise that productivity estimates have fallen, since it takes longer for the resulting increase in output to materialise. Unfortunately, there are few reliable estimates of productivity in the health sector before the mid-1990s. In order to construct a longer time series, we combined estimates of productivity growth back to 1979, from the cost weighted activity index provided by Oliver (2005), with the latest ONS productivity measure.[c] Chart B shows that the annual average productivity growth since 1979 has been about 1.2 per cent a year. This was well below the long-term whole economy productivity assumption used in last year's *FSR* of 2.2 per cent a year.

### Chart A: Annual productivity growth in the health care




Source: ONS, CHE

### Chart B: Long-term productivity growth in the health care




Source: Oliver (2005), ONS

[a] Bojke *et al.* (2016). We combined the mixed and indirect productivity estimate to calculate our reference measure.
[b] Lafond, Charlesworth and Roberts (2016).
[c] There are significant limitations to the dataset developed by Oliver (2005). In particular, no account is taken for quality. However, they do hint that there was positive productivity growth in the NHS until 1995-96 (1.9 per cent per year), before productivity fell sharply until 2000-01 when the estimates stop. There are some significant differences between what the ONS and Oliver indices suggest was happening to productivity in the period where they overlap – the former implies flat growth whereas the latter shows tumbling productivity. See also Annex B of the 2012 *FSR* for a discussion.

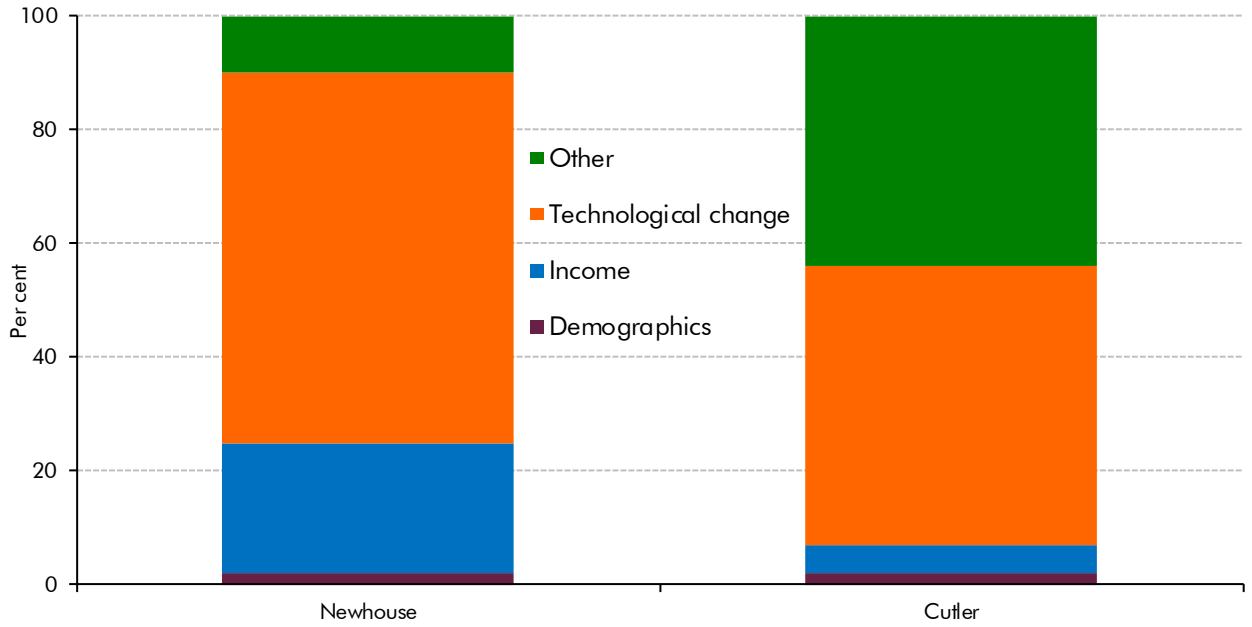
## Technology costs

2.24 Exposure to new or better technologies can lead to improvement in healthy life expectancy but, unlike in other industries, technological innovations in the health care sector have generally been cost-escalating rather than cost-containing. Different studies attribute between 27 and 75 per cent of growth in health spending in advanced economies to

technological change.[11] If, however, the uptake of new technologies leads to better health outcomes, part of this higher spending may be recovered in lower spending further in the future. And to the extent that those better health outcomes lead to higher employment rates, they would boost GDP and thereby reduce pressure on spending as a share of GDP.

2.25 Most empirical studies investigating the aggregate impact of technology on health spending have focused on the US, where approximately a third to a half of non-demographic cost increases have been attributed to technological advances. For example, Newhouse (1992) suggests that technological change accounted for more than 65 per cent of the growth in US health spending from 1940 to 1990; while Cutler (1995) estimates it accounted for 49 per cent (Chart 2.9). In the UK, the 2002 Wanless Review highlighted the role of future advances in medical technology as a key driver of health spending.

## Chart 2.9: Estimates of causal factors accounting for growth in US per capita health spending (1940-90)




Source: Newhouse (1992), Cutler (1995)

2.26 There are several reasons why technology may be a source of cost pressure in the health sector. New technologies often treat conditions for which there was previously no, or no effective, treatment (e.g. renal dialysis and coronary artery bypass grafts), or expand existing methods to wider patient populations (known as 'treatment expansion'). Even if an advance leads to a lower cost of treatment, spending can increase if that treatment finds wider medical uses and hence addresses unmet demand for care. Box 2.2 provides an example of how this has happened in the case of treatment for coronary heart disease.

[11] See European Commission (2015) and Productivity Commission (2005).

## Box 2.2: Case study: technological advances in treating coronary heart disease

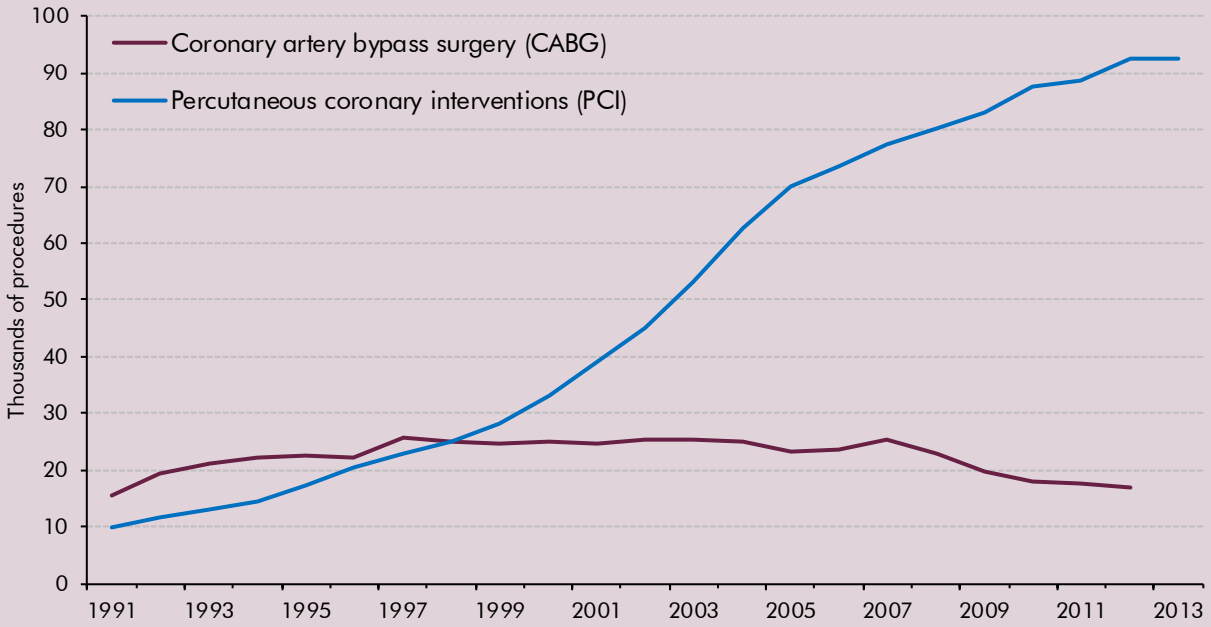
Cutler and Huckman (2003) examine the impact that the diffusion of a specific surgical procedure for coronary heart disease – percutaneous transluminal coronary angioplasty (PTCA) – had on treatment costs in New York State from its introduction in the 1980 to 2000.[a] PTCA usually involves using stents to open blocked coronary arteries, and thereby restore arterial blood flow to heart tissue, without requiring open-heart surgery.

As PTCA is cheaper than coronary artery bypass grafts (CABG), a major open-heart surgery usually reserved for severe cases, it might be expected that total health care costs for this disease would fall. In fact, while PTCA acted as a substitute for CABG for many patients, it also led to treatment expansion as less severely ill patients were treated.[b] So, despite substitution away from a more expensive technique, the overall impact was to increase health care costs.

Examining the impact of the diffusion of CABG and PTCA for coronary heart disease in the UK, McGuire *et al.* (2010) found that about 30 per cent of stent procedures (PTCA) were replacements for open-heart surgery (CABG) and the remaining 70 per cent were additional treatments for patients who would have not received a surgery. This conclusion provides further support for the idea that, although PTCA is effective and less expensive than CABG, expanding the potential treatment population increases overall health care costs.

As shown in Chart C, up until 1997 the number of CABG and percutaneous coronary intervention (PCI) procedures rose together, with the PCI rising faster than the CABG, suggesting an expansion of treatment. After 1997, the rates have moved in opposite directions, suggesting that PCI continue to expand as a result of both complementary and substitution effects as it becomes a growing substitute for CABG over time.

### Chart C: Number of surgical procedures in the UK




Source: British Heart Foundation

[a] Percutaneous transluminal coronary angioplasty (PTCA) is part of percutaneous coronary interventions (PCI), which also include broader group of new percutaneous techniques capable of relieving coronary narrowing.

[b] The 1980s constitute a period of treatment expansion during which total costs rose with increased utilisation rates for both PTCA and CABG, as patients who would have otherwise only received medical treatment received PTCA. Following learning and technological improvements over time, including the introduction of coronary stents which reduced the occurrence of adverse effects post procedure, PTCA began to be used on increasingly severe cases. Therefore during the 1990s utilisation rates for CABG fell due to the substitution of PTCA for CAGB, allowing patients to shift from more to less intensive and costly interventions.

2.27 Technological cost growth may also be driven by the expansion of morbidity resulting from the growth in chronic conditions (discussed in more detail below). For example, population ageing and lifestyle trends encourage the development of technology that delays mortality from chronic conditions and improves the quality of life of the sufferers. This means that new treatments are constantly in development for various conditions such as mental health, cardiovascular disease or cancer. These diseases currently have no cure and so medical technology is focused on finding new or better ways to extend or improve the life of the sufferers. If they spend longer in need of care as a result, health spending will rise.

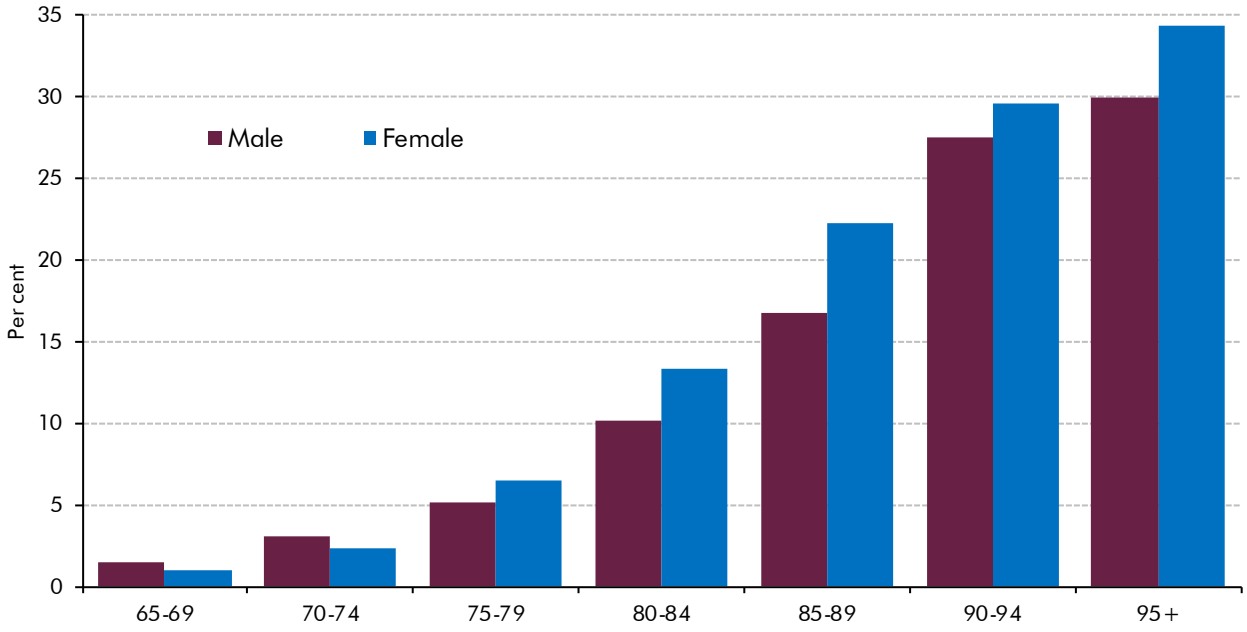
## Chronic health conditions

2.28 Evidence is accumulating to suggest that morbidity arising from chronic conditions is likely to translate into additional pressures on health spending over the long term, due both to ageing and to changing lifestyles. For example, Nuffield Trust shows how the inclusion of chronic conditions (alongside age, gender, geographical region and final year of life) is an important explanatory factor in estimating demand for emergency inpatient care.[12] But this likely additional pressure is not accounted for in our current central projection, as in effect we assume that the mix of conditions that people suffer from remains unchanged over time.

2.29 Demographic change will raise the prevalence of chronic conditions even if their age-specific incidence does not rise. Research by the King's Fund suggests that the cost of mental health to the NHS will grow by nearly a half in real terms between 2007 and 2026 due to increased prevalence.[13] The largest cost increase would be concentrated in dementia,[14] although other disorders would increase too. Chart 2.10 shows how population ageing would increase the prevalence of dementia. The King's Fund has projected that the number of dementia sufferers will increase by more than half between 2007 and 2026. In addition, mental disorders are associated with lower productivity and earnings, which would reduce GDP and therefore further raise health spending as a share of GDP.

[12] Roberts, Marshall and Charlesworth (2012). The regression estimate referred to 2009-10.
[13] McCrone *et al.* (2008).
[14] Dementia is a degenerative condition that is chronic in the vast majority of cases and requires increasingly intensive care over time.

## Chart 2.10: Prevalence of dementia amongst different age groups

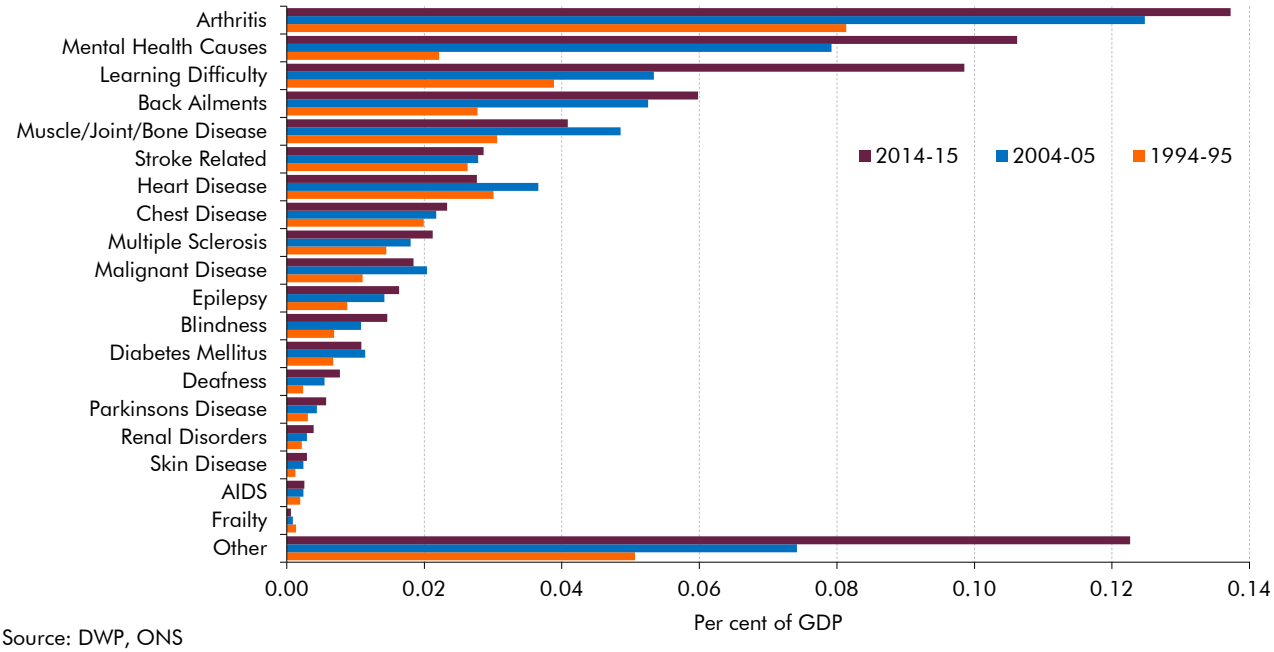



Source: Alzheimer's Society

2.30 Age-specific incidence of chronic conditions might also rise, which would put upward pressure on health spending even in the absence of an ageing population. Lifestyle changes, especially increasing rates of obesity, are likely to raise the age-specific incidence of chronic conditions such as cardiovascular disease and diabetes. Furthermore, chronic conditions are often co-morbid (for example, poor physical health can worsen mental health problems) complicating treatment and creating health and social care co-ordination problems.

2.31 The nature of some chronic conditions may affect the public finances via spending on social security as well as health care. Focussing on disability living allowance (DLA), total spending has almost doubled as a share of GDP over the past 20 years, but there have been even larger increases for spending on some disabling conditions. For example, Chart 2.11 shows that by far the largest increase has been for spending on mental health conditions, which has increased five-fold from 0.02 per cent of GDP in 1994-95 to 0.11 per cent in 2014-15 (taking it from 5.7 to 14.2 per cent of total DLA spending). This trend has not been limited to older people, with growing number of children and younger working-age people claiming DLA because of mental health problems and learning difficulties.

## Chart 2.11: DLA spending by main disabling condition




Source: DWP, ONS

# 3 Health spending projections and sensitivity analysis

3.1 Health spending is the largest component of age-related spending in our *Fiscal sustainability report (FSR)* projections, which means that our assessment of long-term fiscal sustainability is sensitive to the assumptions we make about the drivers of health spending that were covered in Chapter 2. In this chapter we:

- **update our 2015 *FSR* health spending projection** to be consistent with the latest ONS population projections and health spending as set in the 2015 Spending Review and detailed in the 2016 Public Expenditure Statistical Analyses (PESA) publication;
- **present an international comparison of health spending projections** published by some international organisations; and
- **carry out sensitivity analysis** of the effect of different assumptions about productivity, morbidity, income elasticity and other cost pressures.

## Updated 2015 *FSR* projection

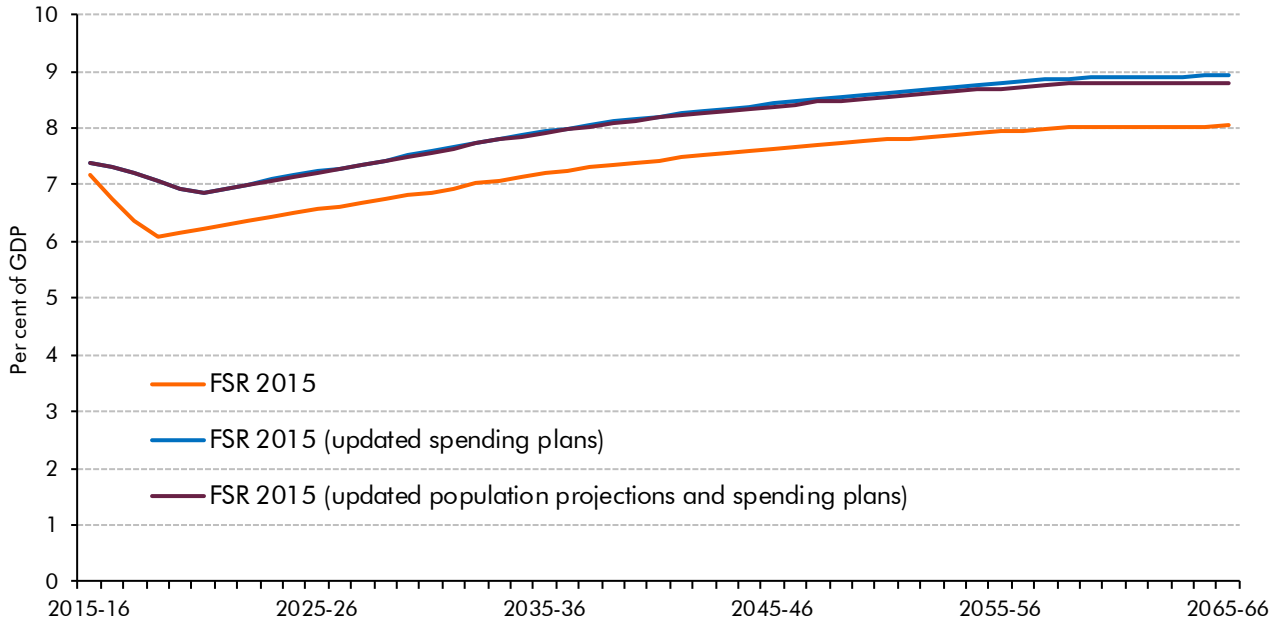
3.2 To provide a more up-to-date baseline against which to compare our projection against others, and to carry out sensitivity analysis, we have updated our 2015 *FSR* projection to be consistent with three new sources of information published since our June 2015 report:

- the new **2014-based population projections** that were published by the Office for National Statistics (ONS) in October 2015. These included relatively small changes in assumptions about fertility, mortality and migration, so they do not have big implications for our health spending projection;
- the departmental spending totals set out in the **2015 Spending Review** in November. For the Department of Health, these included current and capital spending totals for the five years up to 2020-21. The Government decided to allocate a rising share of the overall departmental spending budget to health; and
- the detailed functional breakdown of the Spending Review plans published in **PESA 2016** in July. It is this functional breakdown that we use as the basis of our long-term projections. It captures all health spending by central government – including the devolved administrations and other departments – to which we add our own estimate of health spending by local government as that has not yet been published. Health spending on this basis is planned to be 0.6 per cent of GDP higher in 2020-21 than was factored into last year's *FSR* projection.

3.3 Chart 3.1 presents our updated long-term spending projection. It shows that:

- our **2015 *FSR* projection** estimated health spending to rise by 1.8 per cent of GDP between 2020-21 and 2065-66 – from 6.2 to 8.0 per cent of GDP;
- the Government's **new spending plans increase health spending** significantly in the period to 2020-21, which knocks through to the rest of the projection period. Updating the projection only for the higher spending plans would lead to health spending rising by 2.1 per cent of GDP between 2020-21 and 2065-66; and
- the **new population projections** have only a small effect, in particular reducing the pace at which spending rises towards the end of the projection period due to slightly higher mortality rates at older ages. That reduces the extent to which health spending is projected to rise between 2020-21 and 2065-66 to 1.9 per cent of GDP. That is still slightly higher than in our 2015 *FSR,* thanks to the higher starting point, which means there is more health spending to which demographic pressures will apply.

## Chart 3.1: 2015 *FSR* health spending projection and updates




Source: OBR

## Comparison of *FSR* 2015 assumptions to Spending Review 2015 plans

3.4 Given the relatively large change in the 2020-21 starting point of the projection, it may be of interest to break it down further. Our 2015 *FSR* projection was consistent with our March 2015 *Economic and fiscal outlook (EFO)* forecast, in which the Coalition Government had pencilled in significant cuts to total departmental spending over the period to 2019-20. In the absence of firm spending plans, we assumed that health spending would fall in line with total departmental spending. The new Conservative Government increased the amount allocated to departmental spending in its July 2015 Budget and allocated a rising share of

higher departmental spending to health in its November 2015 Spending Review. In March 2016, total departmental spending was cut again, but not health spending, for which firm plans for 2020-21 have already been set (unlike for most other spending areas).

3.5 The upward revision to health spending therefore reflects Government decisions both to increase overall departmental spending and to allocate a greater share of it to health. Overall, current health spending is projected to be £13.3 billion higher in 2020-21 than we assumed in last year's *FSR*. Less than half the change can be explained by higher departmental spending, holding the share allocated to health constant, while more than half reflects health spending making up a higher proportion of the total.

3.6 Since Parliament has proscribed us from considering alternative policies, we could not present alternative projections that assumed departmental spending would be increased, but we did present a scenario in which the share of spending allocated to health was driven by demography rather than being held constant as a share of total departmental spending.[1]

## International comparison

3.7 Many studies concur that health spending will grow faster than GDP over the long term in the UK (and in most advanced economies):

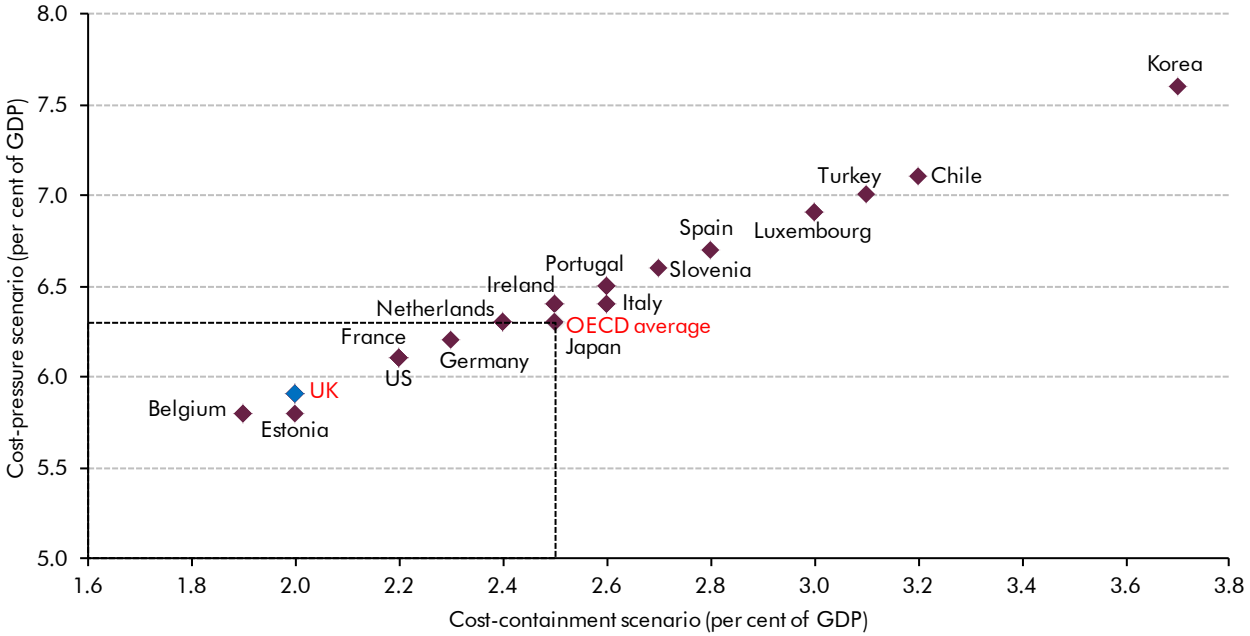
- in their cost pressure scenario, **the OECD** (2013) projected that health spending would increase by around 6 per cent of GDP between 2010 and 2060. Other non-demographic cost pressures are the main contributor to the increase;[2]
- **the IMF** (2010, 2012) has projected an 8.2 per cent of GDP increase in health spending between 2010 and 2050. As with the OECD projection, other non-demographic cost pressures drive the IMF's results; and
- **the European Commission's** latest *Ageing Report* (2015) projected that health spending would grow faster than GDP over the long term (but by only about 1 per cent of GDP between 2020 and 2060). These projections do not factor in other cost pressures, which explains the much smaller increase than projected by the IMF or OECD (see also paragraph 3.24 below).

3.8 Chart 3.2 shows that the UK is not alone in facing upward pressure on health spending. In both the cost-containment and cost-pressure scenarios presented by the OECD, the UK is projected to see an increase just below the average across all OECD countries. These projections assume that the increase in demand is fully met by the government. An alternative scenario (not considered here) would be to assume that the relative share of total health spending accounted for by the private sector climbs over time as overall demand for health care increases. The mix between public and private health spending will be

[1] This was illustrated in the sensitivity to the composition of spending in 2019-20 in our 2015 *FSR*.
[2] See De la Maisonneuve and Oliveira Martins (2013).

determined by a large number of factors that are difficult to predict with any degree of certainty – not least the relative cost of private health care.

## Chart 3.2: Change in age-related spending in the OECD (2010-2060)




Source: OECD

3.9 Chart 3.2 also shows that the OECD's projections for public health spending increases in the UK and the US are relatively similar. But there remain differences in the starting level of spending as well as the funding mix. For example, total health spending in the US was nearly twice as large as a share of GDP in 2015 compared to the UK, whereas private spending was four times larger. Box 3.1 summarises the US Congressional Budget Office's assessment of the drivers of health spending in the US.

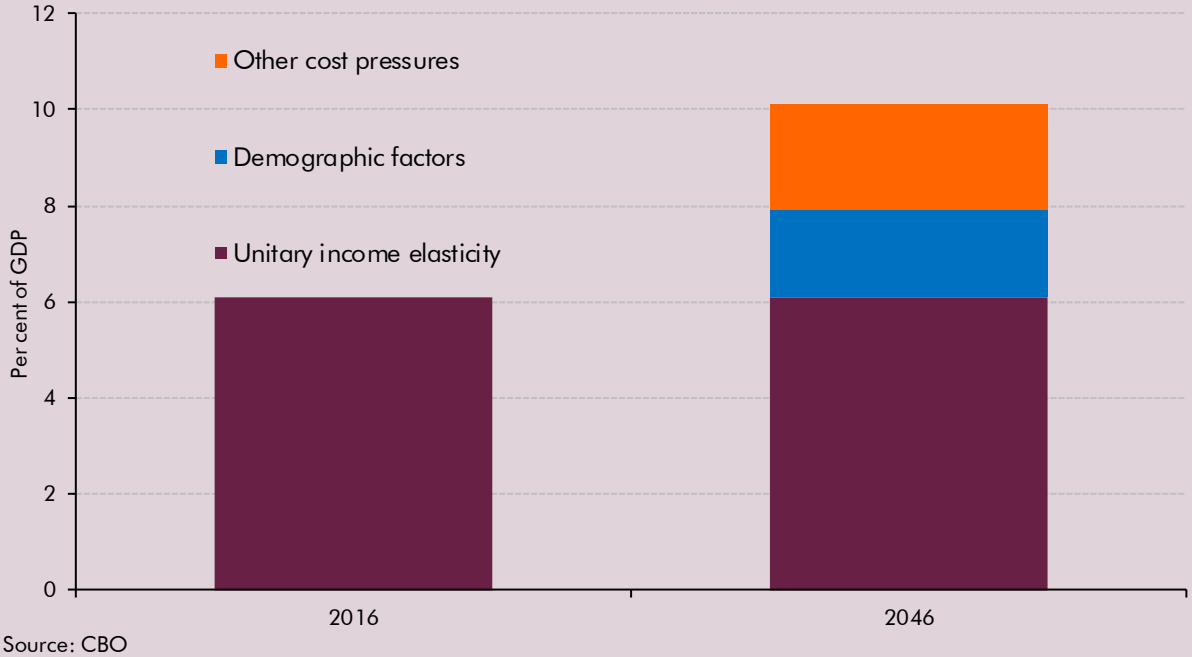
## Box 3.1: CBO analysis of drivers of long-term health spending in the US

The US Congressional Budget Office (CBO) publishes projections for federal health spending in the US as part of its *Long-Term Budget Outlook*. In their latest report, published in July, the CBO has projected that gross health spending will increase by 4 per cent of GDP between 2016 and 2046. Income effects (based on a unitary income elasticity), demographic factors and other cost pressures are the main drivers of this increase.

Chart A shows the projected drivers of growth in federal health spending as a share of GDP over the next 30 years.[a] It shows that demographic factors explain just under half of the increase in spending for major health care programmes. As the population ages, the number of Medicare and Medicaid beneficiaries in the 65+ age group (who tend to have higher average spending) is projected to grow as a share of the population, and the average age of those beneficiaries is projected to rise. Both of those trends increase health spending as a share of GDP.

As shown in Chart A, other cost pressures, which push up spending per beneficiary, account for just over half of the increase in spending between 2016 and 2046. The CBO has estimated that these other cost pressures (or 'excess growth') have ranged between 0.6 and 1.9 per cent per year on average, depending on the medical programme. The CBO also projects that other cost pressures for Medicare, Medicaid, and private health care providers will be positive, on average, over the next 30 years. Up to 2026, the rate of excess cost growth for each programme is assumed to match the rate implied by baseline projections. After 2026, excess cost growth for all programmes is assumed to converge to 1 per cent, the CBO's estimate of the long-term average rate of excess cost growth for the health care sector.

### Chart A: US gross spending on the major health care programmes




Source: CBO

[a] Total (public and private) spending on health care in the US is in fact much higher than reported in this box. According to the OECD system for health accounts, current health spending amounted to 16.9 per cent of GDP in 2015, around half of which was attributed to private providers. The share of US private health spending was also the highest in the OECD.

## Sensitivity analysis

3.10 Spending on health is the largest component of age-related spending in our *FSR* projections. Given its importance, in past reports we have shown a number of alternative scenarios using different assumptions about productivity growth in the health sector and about morbidity. We discussed these in detail in Annex B of our 2012 *FSR* and summarised them in Box 3.3 of our 2015 *FSR*.

3.11 Table 3.1 summarises the key underlying assumptions in our central projection and provides a comparison with the assumptions used by other international and domestic institutions. The main differences between our approach and that of these other institutions relate to the effect of rising life expectancy on morbidity and the adjustment made for other non-demographic cost pressures.

### Table 3.1: A comparison of key underlying assumptions for health spending

| | Health status (morbidity) | Income effect (elasticity) | Other cost pressures |
|---|---|---|---|
| **OBR (2015)** | Implicit expansion | 1 | Not included |
| **CBO (2016)** | Healthy ageing | 1 | Converging to 1 per cent by 2046 |
| **European Commission (2015) reference scenario** | 1 year gain in life expectancy = 1/2 year in good health | 1.1 in 2013 converging to 1 in 2060 | Not included |
| **OECD (2013) cost-pressure scenario** | 1 year gain in life expectancy = 1 year in good health | 0.8 | 1.7 per cent (not country specific) |
| **IMF (2010, 2012)** | 1 year gain in life expectancy = 1/2 year in good health | 0.3 (not country specific) | 1.5 per cent (country specific) |

3.12 In the remainder of this chapter we use our updated *FSR* 2015 projection as a baseline against which to quantify the sensitivity of long-term health spending to alternative assumptions. We look at:

- the implications for our updated long-term health spending projection of **alternative sector-specific productivity** assumptions;
- the effect of **compression rather than expansion of morbidity** as is implicitly assumed in our central projection;
- the effects of **other cost pressures** beyond demographic and income related factors; and
- **comparison with external organisations' projections** shown in Table 3.1.

## Sensitivity of health spending to alternative long-term productivity assumptions

3.13 Our 2015 *FSR* central projection assumed that productivity in the health care sector would increase by 2.2 per cent a year, in line with whole economy productivity. This implicitly means that the level of service provided per person would rise at the same rate as output in the rest of the economy. In the absence of demographic effects, health spending would therefore remain constant as a share of GDP.

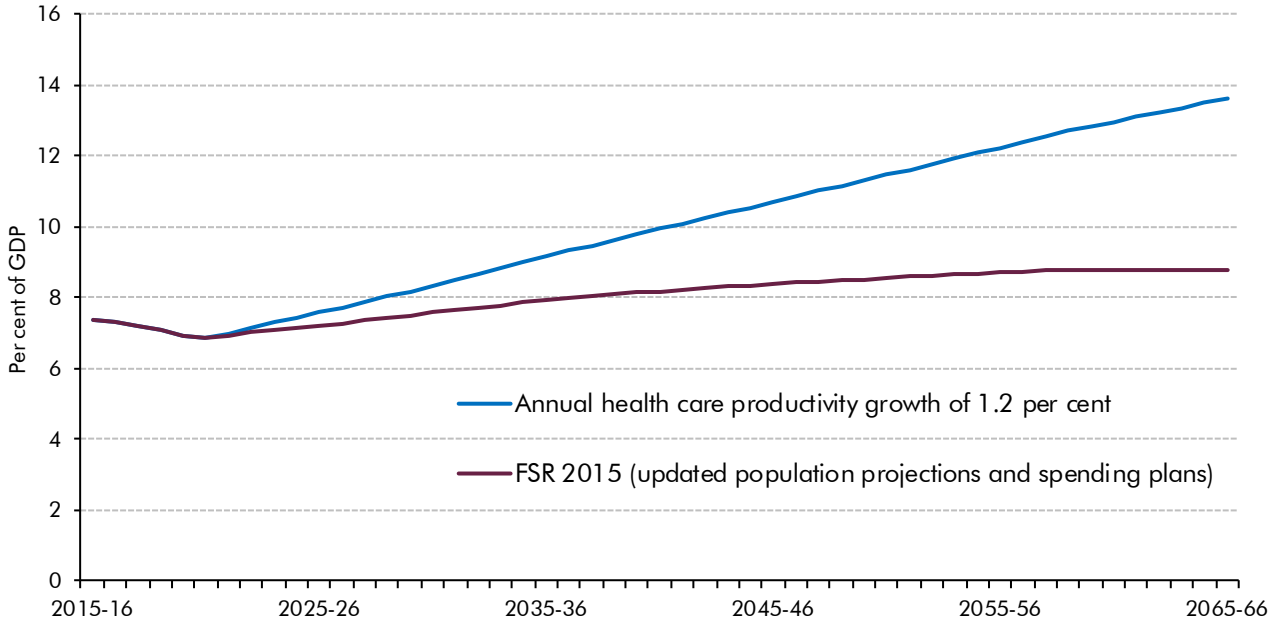
3.14 Given an income elasticity of one, so that output of the health sector grows in line with GDP, health spending would rise or fall as a share of GDP depending on the difference between productivity growth in the health care sector and the rest of the economy. If productivity in the health care sector grew more slowly than in the economy as a whole, health spending would have to rise as a share of GDP to maintain health output growth. And the opposite would be true if health sector productivity increased faster than in the economy as a whole.

3.15 As shown in Chapter 2, health productivity growth has on average been slower than in the economy as a whole. Yet over the long term, wages in the sector would still need to rise in line with those in the whole economy, leading to what is known as 'Baumol cost disease' where costs in the public sector rise relative to other sectors.[3] To maintain an increase in the level of service provided in line with increases in real output across the rest of the economy, governments would have to increase spending more quickly.

3.16 The long-term average rate of health sector productivity growth presented in Box 2.1 – of 1.2 per cent a year – would imply that real health spending per person would need to rise by 3.2 per cent a year to increase health output by 2.2 per cent a year (in line with real earnings growth assumed in last year's *FSR*). Chart 3.3 shows that interpreting unchanged policy towards health spending in this way would see health spending in 2065-66 almost 5 per cent of GDP higher than in our updated *FSR* 2015 projection.

[3] See Baumol and Bowen (1966).

## Chart 3.3: Sensitivity of health spending to alternative productivity assumptions in the health sector




Source: OBR

## Sensitivity of health spending to alternative morbidity assumptions

3.17 Our central projections for health spending assume a constant health status for a person of a specific age and gender as the population ages. Implicitly this assumes that the increases in life expectancy projected by the ONS will be spent partly in poor health (an expansion of morbidity). It means that growth in the proportion of the population that are older also means growth in the proportion consuming higher amounts of health spending (see the age profile of spending in Chart 2.3 in Chapter 2).

3.18 As shown in Table 3.1, international institutions typically assume some compression of morbidity. For example, the OECD (2013) assumes in its cost-pressure and cost-containment scenarios that all of a one year gain in life expectancy will be spent in good health, with morbidity being pushed back a year and the period of ill health falling slightly as a proportion of total life. In its reference scenario, the European Commission (2015) factors in some compression or slower expansion of morbidity, by assuming that half of every one year gain in life expectancy is spent in good health.

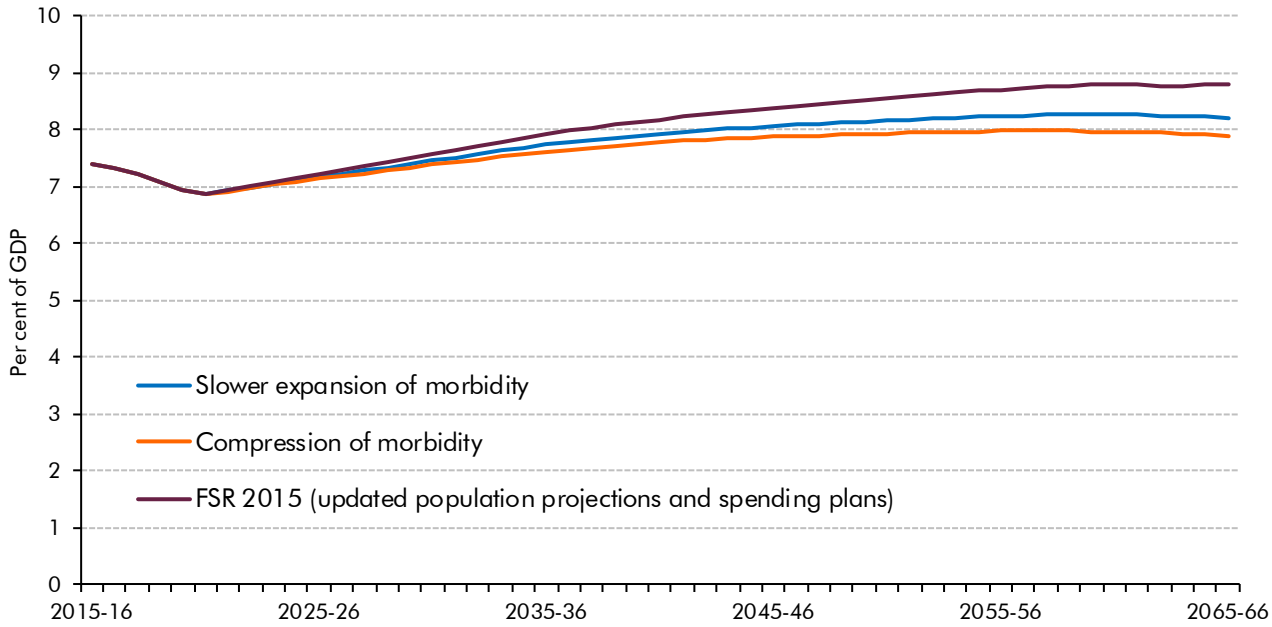
3.19 An alternative, discussed in Annex B of our 2012 *FSR,* would be to assume that increases in life expectancy involve some increase in years of good health followed by some increase in years of ill health (as in the Commission's projections). The ONS population projections used to generate our health spending projections imply that life expectancy at 65 increases by one year every eight years. Assuming that the proportion of life spent in good health is around 0.6 of total life expectancy at 65, this would imply that healthy life expectancy

increases by one year every thirteen years.[4] This scenario would still be consistent with an increase in the number of years spent in ill-health, but would represent a slower expansion of morbidity than that implicitly assumed in our *FSR* projections.

3.20 A more pronounced alternative would be to assume that health status improves in step with life expectancy (as in the OECD projections). This would imply that healthy life expectancy increases by one year every eight years of the projection period, in line with the rate of improvement in life expectancy. So the expected years of ill health are simply shifted later in life – a 'full' compression of morbidity. This is not supported by the available ONS evidence (see Chart 2.5 in Chapter 2), but it provides a useful test of the sensitivity of our projections.

3.21 Chart 3.4 illustrates the sensitivity of our health spending projection to these two alternative scenarios. Assuming that the cost profile for age-related health spending on those over the age of 65 is shifted upwards in line with healthy life expectancy would imply, for example, that spending per person on an individual aged 70 in 2033-34 is equivalent to spending on an individual aged 69 in 2020-21 (slower expansion of morbidity) or in 2025-26 (compression of morbidity). As would be expected, the resulting slower increase in morbidity implies a smaller increase in health spending over the projection period.

## Chart 3.4: Sensitivity of health spending projection to alternative morbidity assumptions




Source: OBR

## Sensitivity to alternative income elasticity of demand for health care

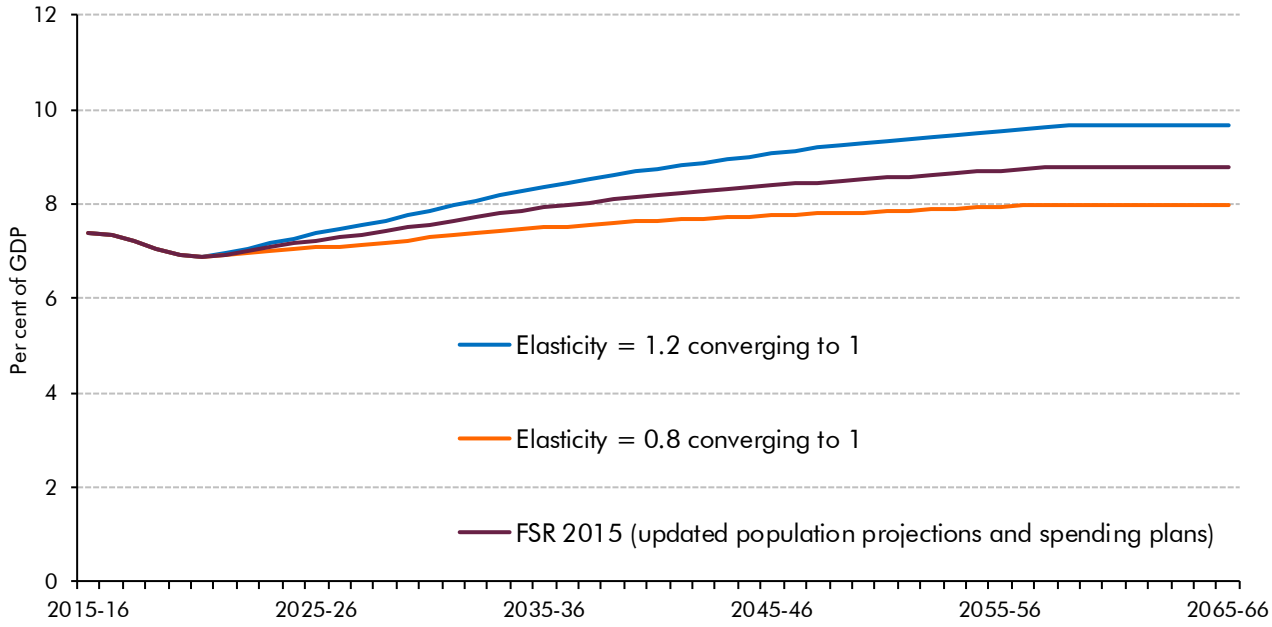
3.22 Our *FSR* projections are consistent with assuming that income elasticity of demand for health care is one. The OECD has recently used estimates of both 0.8 and 1. It has argued

[4] According to ONS estimates of healthy life expectancy, the proportion of life expectancy at 65 spent in 'good' health is around 0.6.

that estimates of higher elasticities (above one) in some studies may be due to biases, such as failure to control appropriately for true price effects.[5] As discussed in Chapter 2, an income elasticity higher than one would place health spending on the explosive path relative to GDP over the very long term. An income elasticity of one would therefore appear to be a reasonable central assumption for the purposes of our long-term projections.

3.23 It is still useful to conduct sensitivity analysis. We do so using an income elasticity of 0.8 and 1.2, in both cases gradually converging to one at the end of the projection period. Relative to our updated *FSR* 2015 projection, the initial income elasticity of demand of 0.8 would mean that health spending would reach around 8.0 per cent of GDP by 2065-66 while an initial value of 1.2 would increase health spending to 9.7 per cent of GDP by that point.

## Chart 3.5: Sensitivity of health spending projection to income elasticity assumption




Source: OBR

## Sensitivity to other cost pressures

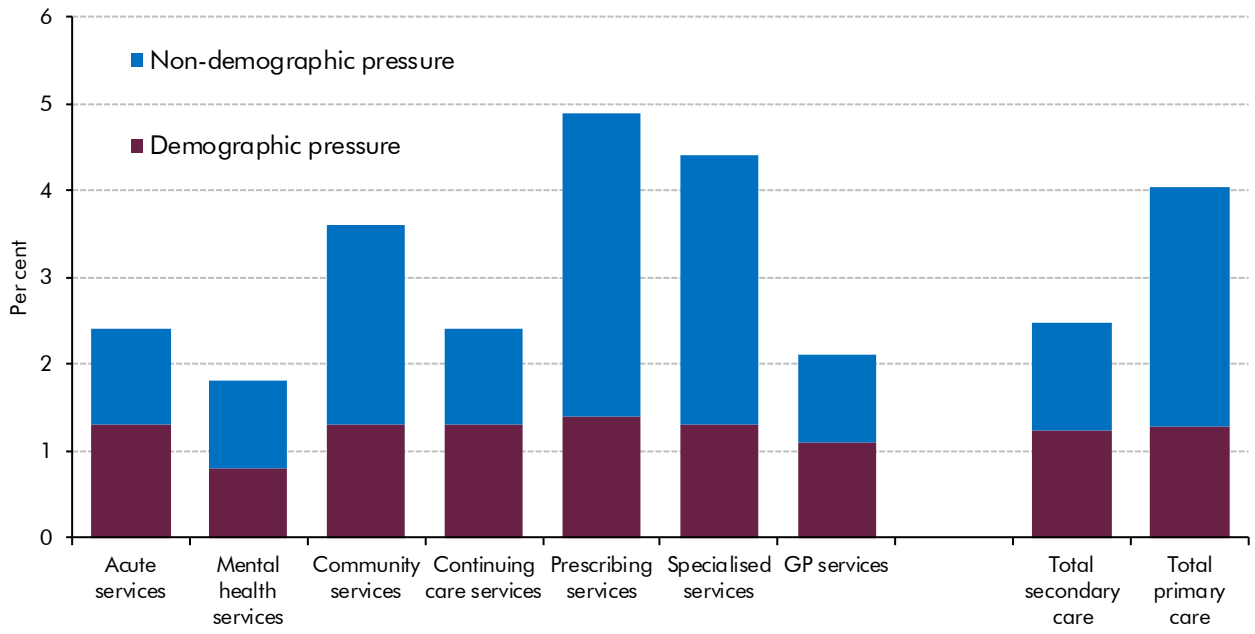
3.24 Our *FSR* projections have not included any explicit adjustments for other cost pressures, in contrast to the institutions summarised in Table 3.1. They have emphasised the importance of these other cost pressures, principally via the impact of increasing relative health care costs and the impact of advances in technological innovation.[6] For example, the OECD (2013) assumed in its cost-pressure scenario that other cost pressures increase spending by 1.7 per cent a year beyond what would result from demographic change and income effects.[7] The IMF (2010, 2012) has estimated an additional cost pressure for the UK of about 1.5 per cent a year between 1980 and 2008 and 2.2 per cent a year between 1995

[5] Estimates of elasticity tend to increase with the degree of income aggregation implying that health care could be "an individual necessity and a national luxury" (Getzen, 2000).
[6] Other cost pressures are usually referred to as 'excess costs growth'. This is generally measured as the excess of growth in per capita spending on health over growth in GDP per capita after controlling for the effect of demographic change and income growth.
[7] The study used a common average residual growth given large differences across countries.

and 2008. In the US, the CBO (2016) has included an adjustment converging to 1 per cent a year after 2026 (see also Box 3.1). In this section we illustrate the impact on our long-term health spending projections of making explicit assumptions about other cost pressures.

3.25 NHS England (2016) has recently estimated non-demographic cost growth pressures for the NHS up to 2020-21 by stripping out an estimate of demographic cost pressures from historic activity. As shown in Chart 3.6, this suggests that on average other cost pressures have added 1.3 and 2.7 percentage points to growth in secondary and primary care spending in 2015-16 respectively.[8] The size of the effect varies significantly by spending category, being particularly large for prescribing and specialised services. By contrast, demographic factors are similar across most services, contributing on average around 1.3 percentage points to the total annual activity growth rate.

## Chart 3.6: Demographic and non-demographic pressures (2015-16)




Source: NHS England and OBR

3.26 In order to account for other cost pressures in our long-term health spending projection, we have used two variants:

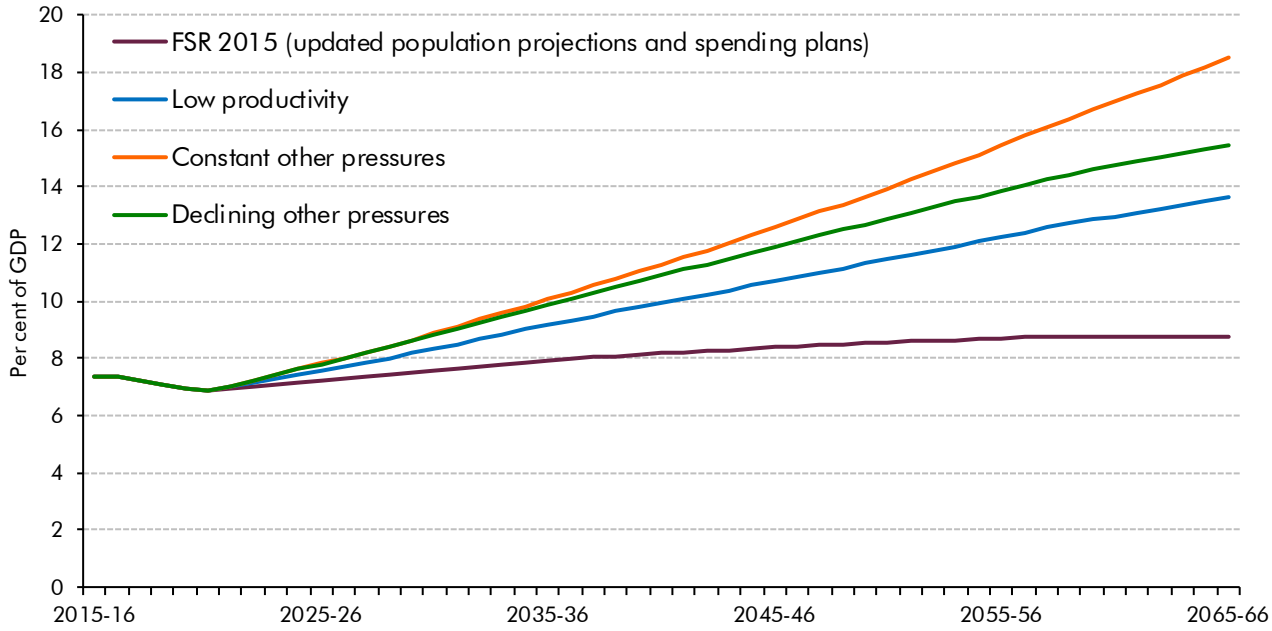
- **constant other pressures** assumes that the additional pressures remain unchanged from 2021-22 onwards. In this scenario, our primary and secondary health spending projections grow by 2.7 and 1.2 per cent a year faster than in our central projection.[9] On this basis, health spending is projected to reach 18.5 per cent of GDP by 2065-66, an increase of 9.7 per cent of GDP relative to the updated *FSR* 2015 projection (see Chart 3.7); and

[8] The weights are derived by assuming a fixed proportion of total functional UK (PESA 2016) spending on clinical commissioning group service, NHS England service and other service in 2014.
[9] This estimate is also broadly in line with the OECD estimates for advanced economies of other cost pressures beyond demographic and income related effects of about 1.7 per cent. When considering these estimates, it is also worth noting that the OECD assumes a lower income elasticity of 0.8 in their analysis and the different spending jump-off point.

- **declining other pressures** assumes a linear convergence towards a 1 per cent annual increase by the end of the projection period in each activity. This reflects the significant uncertainty over how pharmaceuticals, medical procedures and technology might evolve over the future. It follows the CBO approach, which considers in its long-term assumptions both the average excess cost growth over the past 30 years and the flexibility to restrain costs in the future (see Box 3.1). Under this second scenario, health spending reaches 15.5 per cent of GDP by 2065-66, an increase of 6.7 per cent of GDP relative to the updated *FSR* 2015 projection.

3.27 As shown in Chart 3.7, these results are somewhat higher than the low health care productivity scenario that we tested earlier, but tell a similar story of much greater future pressures on public spending. The mechanism behind these variants is slightly different, such that other cost pressures are less reliant on the hard-to-measure productivity series that are heavily influenced by the cyclicality of input growth. Both scenarios point to a significant upward risk to our central projection resulting from non-demographic drivers of spending.

## Chart 3.7: Long-term projections and other cost pressures




Source: OBR

## Summary of key sensitivities

3.28 As shown in Table 3.1, there are some significant differences in underlying assumptions between our *FSR* projections and those used by other external institutions. Table 3.2 summarises the impact of different sensitivities on the level of health spending in our long-term projection. The two key areas of difference are on morbidity and other cost pressures.

3.29 On morbidity, while the expansion assumption implicit in our projections is unusual, it is not out of line with the available ONS evidence or the growing evidence on the rise of chronic conditions (some of which are not age-related). Moreover, as shown in Table 3.2, our long-

term projection is not particularly sensitive to changes in the assumed expansion or compression of morbidity.

3.30 On income elasticity, our implicit assumption of an elasticity of one is similar to the assumptions used by the OECD, the European Commission and the CBO estimates for the US. Our projections are slightly more sensitive to the chosen variants on this assumption than to the morbidity variants, but in absolute terms the sensitivity is not huge.

3.31 The biggest difference between our *FSR* projections and those used by the international institutions is the treatment of other cost pressures beyond demographic and income effects. The OECD and the IMF capture these pressures via explicit non-zero adjustments. The Commission does not include an explicit adjustment in its central projection, but it does assume an income elasticity above 1 (converging to 1 over the long term) that may partly capture some of these other cost pressures.

3.32 Table 3.2 shows that our projection is very sensitive to the variants we have chosen to reflect evidence of other cost pressures. This suggests that the sustainability of the UK's long-term fiscal position may be more vulnerable to health spending pressures than has been highlighted in our previous *FSR* central projections. In previous *FSRs*, the biggest risk that we have considered has been the variant in which productivity growth in the health sector is permanently lower than the economy as a whole and health sector output growth is maintained through faster growth in spending.

## Table 3.2: Summary of the impact of sensitivities on the level of health spending

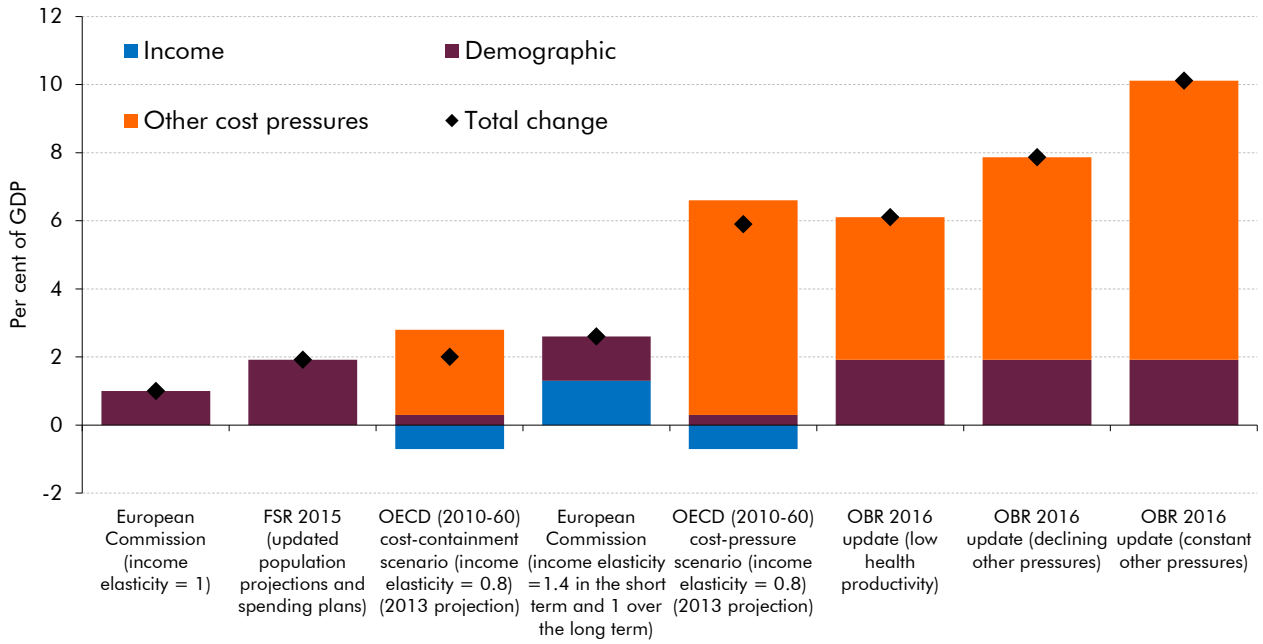
| | Per cent of GDP | | |
|---|---|---|---|
| | Level in 2065-66 | Deviation from central projection | Change since 2020-21 |
| FSR 2015 (updated population projections and spending plans, whole economy productivity growth) | 8.8 | - | 1.9 |
| Lower health productivity growth | 13.6 | 4.8 | 6.8 |
| Slower expansion of morbidity | 8.2 | -0.6 | 1.4 |
| Compression of morbidity | 7.9 | -0.9 | 1.0 |
| Initial income elasticity of demand of 1.2 | 9.7 | 0.9 | 2.8 |
| Initial income elasticity of demand of 0.8 | 8.0 | -0.8 | 1.1 |
| Constant other cost pressures | 18.5 | 9.7 | 11.7 |
| Declining other cost pressures | 15.5 | 6.7 | 8.6 |

3.33 There remains considerable uncertainty over the contribution of demographic, income and other cost pressures among the drivers of health spending. Chart 3.8 shows that across most projections the inclusion of other cost pressures to capture the effect of increases in relative prices and of technological development has the largest effect on the projected increase in health spending over the long term.

3.34 It may also be the case that alternative variants discussed in this chapter are not mutually exclusive or are subject to non-linearity, which further adds to uncertainty. For example, high other cost pressures might well be partly driven by a high rate of technological

advance. That would increase cost, but it could also increase productivity in the health care, as in the example shown in Box 2.2. This would in turn offset some of the pressure. While it is difficult to quantify such interactions, there is a significant risk that our 'constant other pressures' variant might overestimate health spending over the long term.

## Chart 3.8: Long-term projections of changes in health spending (2020-2060 unless otherwise stated)




The demographic components in the European Commission and OECD projections include an assumption of compression of morbidity and are therefore not entirely comparable with OBR scenarios that are purely demographically driven.

Source: European Commission, OECD, OBR

# 4 Conclusions

4.1 Health spending has risen as a share of GDP in most OECD countries, including the UK, over the past 40 years. Consistent with the projections of various international institutions, we project that health spending in the UK will continue to rise as a share of GDP in the future. This represents a key risk to the sustainability of the UK public finances.

4.2 While there is agreement about the direction of this challenge, there is disagreement over its scale. The biggest source of that disagreement relates to the effect of cost pressures, beyond those related to demographics and to the fact that rising incomes are associated with rising spending on health care. Of course, these factors are not independent of one another, for example technological innovation that creates other cost pressures is highly correlated with income growth, while successful technological shifts can increase healthy life expectancy. That makes it difficult to isolate the individual contribution of each driver or to interpret the different estimates and assumptions underpinning different projections.

4.3 By comparing our assumptions against those used by various external institutions and against the evidence presented in Chapter 2, we can draw the following conclusions:

- our **morbidity** assumption about the implications of rising life expectancy for time spent in poor health is unusual, but it is not out of line with the available ONS evidence. In any event our projections are not very sensitive to this assumption;

- assuming an **income elasticity** of one is broadly in line with other institutions and has the attractive quality of not implying an explosive trajectory for health spending over the very long term; and

- while we have tested the sensitivity of our projections to a lower health sector productivity growth assumption, we have not made an explicit assumption about **other cost pressures** in our central projections. This is both unusual and a source of significant difference from most external institutions' projections.

4.4 On the basis of this analysis, we are likely to assume when defining 'unchanged policy' in future *FSRs* that health spending will increase to reflect growth in other costs in our central projection. This would capture the upward pressure on health spending that we have illustrated to date via a variant that assumes permanently lower productivity growth in the health care sector. We will decide exactly how large an adjustment to make in each *FSR* but as the two 'other cost pressure' variants set out in Chapter 3 have shown, explicit assumptions in this area could have significant effects on our long-term fiscal projections. Given the uncertainty around such projections, we will of course continue to present sensitivity analysis including a variant based on the assumptions that have underpinned our

previous *FSR* projections. And we will keep this and our other assumptions – particularly around the relationship between changes in life expectancy and morbidity – under review.

# References


Appleby, J. (2016), 'Is the UK spending more than we thought on health care (and much less on social care)?', The King's Fund, June.

Appleby, J., Galea, A. and Murray, R. (2014), 'The NHS productivity challenge', The King's Fund, May.

Baumol, W. and Bowen, W. (1966), 'Performing Arts: The Economic Dilemma', New York: The Twentieth Century Fund.

Bojke C., Castelli, A., Grašič, K., Howdon, D. and Street, D. (2016), 'Productivity of the English NHS: 2013/14 update', CHE Research Paper 126, University of York, January.

Clements, B., Coady, D. and Gupta, S. (2012), 'The Economics of Public Health Care Reform in Advanced and Emerging Economies', International Monetary Fund, June.

Congressional Budget Office (2008), 'Technological Change and the Growth of Health Care Spending', January.

Congressional Budget Office (2016), 'The 2016 Long-Term Budget Outlook', July.

Cutler, D. (1995), 'Technology, Health Costs, and the NIH', National Institutes of Health Roundtable on the Economics of Biomedical Research, September.

Cutler, D. and Huckman, R. (2003), 'Technological Development and Medical Productivity: The Diffusion of Angioplasty in New York State', Journal of Health Economics 22(2): 187-217, April.

De la Maisonneuve, C. and Oliveira Martins, J. (2013), OECD Economics Department Working Papers No. 1048, June.

Dunn, P., McKenna, H. and Murray, R. (2016), 'Deficits in the NHS 2016', The King's Fund, July.

European Commission (2013), 'Public expenditure on health: its growing importance, drivers and policy reforms to curb growth', in: 2013 Report on Public finances in EMU, European Economy 4, July.

European Commission (2015), 'The 2015 Ageing Report: Economic and budgetary projections for the 28 EU Member States (2013-2060)', European Economy 3, May.

Getzen, T. (2000), 'Health care is an individual necessity and a national luxury: applying multilevel decision models to the analysis of health care expenditures', Journal of Health Economics 19(2): 259-270, March.

Howdon, D. and Rice, N. (2015), 'Health care expenditures, age, proximity to death and morbidity: implications for an ageing population', CHE Research Paper 107, University of York, January.

IMF (2010), 'Macro-Fiscal Implications of Health Care Reform in Advanced and Emerging Economies', December.

IMF (2014), 'Fiscal Monitor. Public Expenditure Reform: Making Difficult Choices', April.

Jagger, C. (2015), 'Trends in life expectancy and healthy life expectancy', Foresight, Government Office for Science, September.

Lafond, S., Charlesworth, A. and Roberts, A. (2016), 'A perfect storm: an impossible climate for NHS providers' finances?', The Health Foundation, March.

McCrone, P., Dhanasiri, S., Patel, A., Knapp, M. and Lawton-Smith, S. (2008), 'Paying the price: The cost of mental health care in England to 2026', The King's Fund, May.

McGuire, A., Raikou, M., Windmeijer, F. and Serra-Sastre, V. (2010), 'Technology diffusion and health care productivity: angioplasty in the UK', LSE Health working papers, 17/2010, June.

Newhouse, J. (1992), 'Medical Care Costs: How Much Welfare Loss?', Journal of Economic Perspectives, 6(3): 3-21.

NHS England (2013), 'The NHS belongs to the people: a call to action – The Technical Annex', December.

NHS England (2016), 'NHS Five Year Forward View: Recap briefing for the Health Select Committee', May.

OECD (2015), 'Fiscal Sustainability of Health Systems: Bridging Health and Finance Perspectives', OECD Publishing, September.

Oliver, A. (2005), 'The English National Health Service: 1979-2005', Health Economics, 14: S75-99, September.

ONS (2016), 'Mortality, 2014-based national population projections reference volume', March.

Productivity Commission (2005), 'Impacts of Advances in Medical Technology in Australia', Research Report, August.

Roberts, A., Marshall, L. and Charlesworth, A. (2012), 'A Decade of Austerity? The funding pressures facing the NHS from 2010/11 to 2021/22', Nuffield Trust, December.

Roberts, A., Thompson, S., Charlesworth, A., Gershlick, B. and Stirling, A. (2015), 'Filling the gap: Tax and fiscal options for a sustainable UK health and social care system', The Health Foundation, November.

Seshamani, M. and Gray, A. (2004), 'A longitudinal study of the effects of age and time to death on hospital costs', Journal of Health Economics, 23(2): 217-35, March.

Wanless, D. (2002), 'Securing our Future Health: Taking a Long-Term View. Final Report', April.

Zweifel, P., Felder, S. and Meiers, M. (1999), 'Ageing of population and health care expenditure: a red herring?', Health Economics, 8(6): 485-96, September.