Llywodraeth Cymru
Welsh Government

Not Welsh Government Policy

# Science Evidence Advice (SEA)

## NHS in 10+ years
## An examination of the projected impact of Long-Term Conditions and Risk Factors in Wales

SEPTEMBER 2023

gov.wales

**Science Evidence Advice (SEA)**

Providing evidence and advice for Health and Social Services Group on behalf of the Chief Scientific Advisor for Health

# Contents


| | | |
|---|---|---|
| 1. | Executive summary | 3 |
| 2. | Introduction | 7 |
| 3. | Population Projections | 12 |
| 4. | Long-Term Conditions | 21 |
| 5. | Risk Factors | 46 |
| 6. | Supply: NHS staff, beds, social care | 53 |
| 7. | Economic Considerations | 63 |
| 8. | New Technology, Genomics and Artificial Intelligence | 70 |
| 9. | Acknowledgements | 78 |
| Appendix A: Summary table of studies by condition and year of projection data by country | | 79 |
| Appendix B: Condition-age-group projections | | 94 |
| Appendix C: population projections, Long Term Conditions diagnoses, condition-age-group projections and ambulance callout projections | | 108 |

**Dr Rob Orford**
Chief Scientific Advisor for Health, Welsh Government

# Preface

I have the pleasure of being involved at the heart of scientific advice to policy on health matters relating to Wales and nothing is more pivotal than decisions that relate to the future of the NHS. We are so lucky to have such an excellent service available to us, no more so than in recent years when the NHS responded so expertly to the COVID-19 pandemic. This service is now 75 years old and like any long-standing organisation it needs to evolve to support the circumstances we now face, whilst also looking to the future and what might be coming down the track. The COVID-19 pandemic stretched resources including its staff to their capacity – beyond in some areas – and required tough decisions around the diversion of care to support more immediate needs. We are now dealing with the consequences of those decision in backlogs for NHS consultations and treatments against the backdrop of an organisation that was already showing the strains of an ever expanding and ageing population.

In thinking about the NHS going forward, we need to consider how we can preserve services at a level that will continue to reap benefits for our future generations whilst also supporting existing users. To do this, bold decisions need to be made around care pathways, the types and location of treatments and allocation of resources to ensure they are spent in areas that maximise benefit relative to population needs. In this paper we have aimed to bring together the evidence to support those decisions, to set out the scenarios going forward in relation to the long-term conditions and lifestyle risk factors that we know are likely to continue to grow in terms of burden of care unless drastic action is taken. With an ageing population some of what is coming down the track is inevitable; as people live longer into old age, so will the prevalence of certain conditions increase. However, much of what we project in this paper is avoidable if we switch our focus to prevention to support our existing and future generations to make better decisions around their health and health related behaviours. The continued persistence and growth of health inequalities underpins much of the evidence presented here and headway to reduce these inequalities must be made if other interventions to improve health and increase NHS efficiency are to succeed. These efficiencies will come from the pivoting of services to address and support patients with complex- and multi-morbidity –

rather than condition specific silos – and doing as much as can be done outside of secondary care. There will be wider benefits from this rationalisation of service provision if we also focus resources only on those treatments that have the best value in terms of investment and outcomes for patients.

There is so much opportunity available with new technology emerging almost daily. We should take an informed approach to its adoption but for those backed by evidence and assessment of value we should do so wholeheartedly both within the NHS itself, to improve the effectiveness and speed of treatment, but also among our population, to support them to maximise their own self-management of healthcare and engage in clinical trials as part of standard care. Lastly, we would not have any of this without the heartbeat of the NHS: the workforce who manages the system daily and delivers the much needed care day in, day out against the relentless demands. We must not therefore forget to invest wisely here too, to retain the huge base of talent we have here in Wales, to foster and attract new talent into Wales and to support our key workers to live innovative, happy, healthy and rewarding work lives.

Whilst this paper seeks to describe the complex problems and challenges the NHS is likely to face over the next 10 or more years, it also sets out the evidence-based recommendations that are most likely to create efficiencies where they are most needed. In presenting this advice, I would like to sincerely thank all of my colleagues who have helped to shape this paper and for their passion in science informed policy making.

# 1. Executive summary

Health outcomes are not simply determined by individual behaviours, genetics and medical care; many other factors such as housing, environment, education, income and employment have their own influences. Non health service related factors are important but are not part of the scope of this analysis. (Highly likely)

This paper aims to aid discussion about what the NHS in ten years will look like, and what the main non-communicable disease pressures will be. It looks at some diseases that are major causes of morbidity and mortality but there are many other diseases that could be further considered in more detail. This paper is not exhaustive for example for risk factors, the detail included is limited to poverty, obesity and smoking; however, identified risk factors to the main non-communicable diseases are included.

Wales has an older population than the rest of the UK nations. There is recognition that Wales faces challenges with regards to incidences of drinking, smoking, and obesity, and this impacts the health and wellbeing and demand for NHS services for the citizens of Wales. (Highly likely)

Wales has an ageing population with the proportion of those of State Pension age projected to increase faster than those of working age over the next ten years. The Office of National Statistics (ONS) projection of the Wales population in 2021 suggested that the number of working age people (16 to 65) was 1,929,152 and persons 66 or older were projected as 629,319. This compares to 2031 projected working age people (16 to 66) at 2,060,179 and people aged 67 or older projected at 698,314. Annual Population Survey data for Wales shows the economic inactivity rate has risen between end of December 2019 and December 2022 by 1.4 percentage points for those aged 16 to 24 years and 1.5 percentage points for those aged 50 to 64 years. In the 12 months to the end of December 2022 there were 466,000 people who were economically inactive in Wales aged 16 to 64, with long term sick cited as the most common reason for inactivity (159,000). Therefore, workplace adaptations to support workers to enjoy a longer healthy work life will be needed, alongside the promotion of health care. (Highly likely)

Diagnoses of several long-term conditions (LTCs) are projected to increase; some of this is a function of an ageing population for LTCs where age is a key risk factor such as dementia and some cancers, particularly among oldest age groups (85 years+). There will also be an increase in multimorbidity (patients with 2 or more LTCs) which brings additional complexity, and polypharmacy (multiple prescriptions) plus increased pressure on secondary care. Those with 4+ LTCs have an average of one outpatient appointment per month, around two thirds more than those with one LTC. (Highly likely)

Based on current trends, projections of some LTCs increase faster than demographic effects alone would predict. Considering all-ages rates, atrial fibrillation; dementia; heart failure; chronic obstructive pulmonary disease (COPD); osteoporosis; chronic heart

disease (CHD); inflammatory bowel disease; peripheral vascular disease (PVD); asthma; hypertension; anxiety disorders; and diabetes are projected to increase more quickly than demographic growth. (Likely)

For those LTCs with risk factors that are modifiable through individual lifestyle changes and public health interventions (as well as through wider policy interventions aimed at reducing inequalities and re-balancing wealth distribution), the projected trajectory of prevalence could be mitigated; this includes CHD, atrial fibrillation, stroke, some cancers and type 2 diabetes. (Highly likely)

Poverty and health inequalities need to be addressed if other interventions are to succeed. The average person in the most deprived decile (Wales index of multiple deprivation basis) spends an additional period of around 9 years in less than good health versus those in the least deprived decile (22.1 years versus 13.2 years). (Highly likely)

Switching the NHS focus to prevention and supporting the Welsh population to make significant changes to their behaviours and lifestyle to influence the future trajectory of LTCs will require the creation of health promoting environments underpinned by policy and legislation, including on wider determinants of health. For instance, creating a sustainable and joined up food system in Wales would support the population to make healthier food choices. (Highly likely) Prevention is often more cost effective than treatment. (Highly likely)

Earlier diagnosis of some LTCs will permit them to be managed with lifestyle changes or more cost-effective home care, allied to wider policies aimed at reducing inequality and poverty, thus reducing long-term NHS costs. (Highly likely)

New technology and treatments will likely reduce time in hospital for care, but there will still be significant increases in future needs for full-time equivalent NHS staff to provide existing levels of care. (Likely)

Making these reductions in time spent in hospital are also likely to require additional capacity in general practice, community care and adult social care; these areas therefore require investment and integration to ensure social care is well joined up with health care, including community, primary care, mental health, ophthalmology, dentistry and secondary care. Building strong primary care with improvements to access and the range of services, including diagnostics, available at convenient times is also required. (Highly likely)

Reductions in time spent in hospital over the life course may flow from non-health service factors. Integration and shared investment in community schemes such as job clubs to improve reemployment after job loss, car clubs to improve access to work and healthcare services, and community heating initiatives can reduce the risk of poor mental and physical health. To be effective community schemes need to be easily accessible (available at convenient times and locations). (Likely)

An ageing society does not necessarily lead to comparable increases in the number of people needing in hospital treatment and social care BUT where needs exist, they are likely to be more complex/costly. (Likely)

Making the NHS more efficient will require more investment in primary care and wider workforce (e.g. Allied Health Professionals), social care and public health, exploring patterns of expenditure to ensure emphasis is placed on high value interventions, increasing the NHS workforce, and adopting new technologies, but at the same time this investment could yield economic gains; for instance, addressing waiting times for elective treatments would likely result in increased productivity. (Highly likely)

and reduced future consumption of medical care (Likely). These efficiencies should include integrated and coordinated healthcare systems and services that meet individual needs rather than relying simply on hospital processes and flows to improve efficiency. (Highly likely)

Underpinning all considerations is the need for continued investment in digital healthcare technology, including in the areas of digital medicine and Artificial Intelligence to support developments in cost saving treatments and procedures, and to support people to proactively manage their own health. The workforce will need to be upskilled to realise these benefits. (Highly likely)

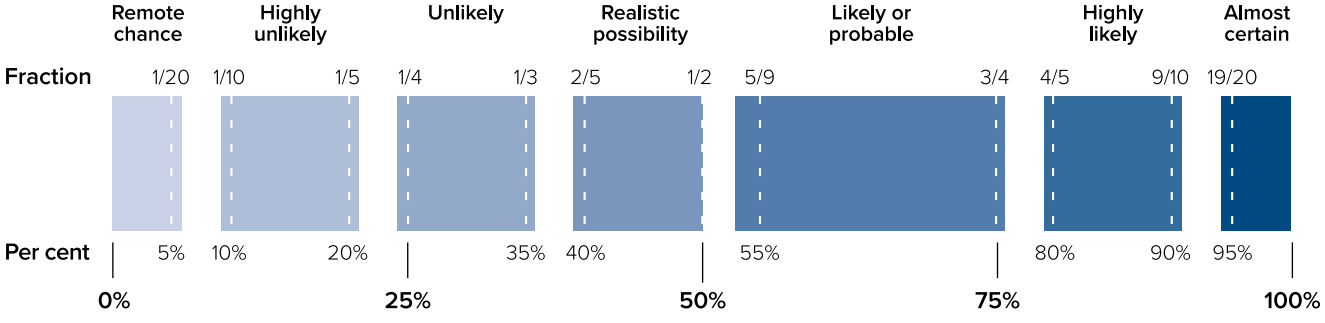
New genetic and genomic technologies have the potential to have a significant impact on medicine and public health but will require continued investment, a skilled workforce and a collaborative effort to build capability across all sectors to ultimately benefit patients in Wales. (Highly likely)

This paper highlights the continued need for robust data relating to NHS activity in Wales; gaps in intelligence for priority areas should be identified and remedial action taken. Data gathered should be joined up across the NHS in Wales to support monitoring by relevant executive and government functions. (Highly likely)

Any changes to approaches and new interventions should be carefully monitored to measure and evaluate effectiveness. It will be important to collect robust data for any participants AND a suitable control group so as to ascertain whether an intervention was cost-effective to the local health board versus spending the same funds on traditional health care. (Highly likely)

The statements above have been assessed in line with the Professional Head of Intelligence Assessment (PHIA) Probabilistic Yardstick as demonstrated by the diagram below.

**Figure 1:**




*Source: Professional Head Of Intelligence Assessment (2018) Professional Development Framework. Crown Copyright. © GOV,UK*

## Recommendations for Further Research

- Extend the scope of this paper to consider communicable disease and in detail the additional risk factors not included here to include patterns of alcohol consumption, physical inactivity, environmental harms and occupational risks in Wales.
- Consider the issues raised in this paper with a children and young person focus to examine the impacts on the population and NHS specific to our future generations, for example the impact of adverse childhood experiences (ACEs) on adult rates of mental illness, smoking and obesity, increased understanding of neurodivergence and the impact this will have on services.
- Consider the issues raised in this paper with a focus on frailty in a growing aging population and explore what potential interventions could be employed to encourage and assist people to maintain their healthy ageing. Rehabilitation and reablement are key to stopping the progression of frailty, but there also needs to be consideration of integration and linking of health and social care services, and services in the voluntary and third sector to enable this.
- Consider productivity and efficiency in the NHS in Wales – for instance understand trends in productivity and how these relate to changes in staffing and how they relate to length of stay.
- Consider staffing challenges of an older workforce, where competition for fewer staff might be higher.
- Consider the impact of private healthcare on NHS staffing and private versus NHS health service seeking trends.
- Consider the issues raised in this paper through an inequalities and intersectional lens to identify the likely projections and impacts on groups with protected characteristics which are likely to have a different trajectory than the general population, have increased risk of multi-morbidities and require specific, tailored public health interventions and services.
- Consider the (wider) determinants of health at a local level to identify impacts unique to rural/urban areas and areas of high/low deprivation in Wales to support health board planning and application of local level interventions.

# 2. Introduction

Having an ageing population is a marker of the success of public health and medical interventions. One hundred years ago, many people died from infectious diseases, often in childhood. Fifty years ago, many people died from strokes and heart attacks. Now, more people die from cancer and dementia. It is becoming apparent that the NHS will face many challenges in years to come due to the growth of the ageing population and increased dependency ratio, alongside the increase in multimorbidity and persistent health inequalities, particularly for preventable illness (*McKee et al. 2021*).[1] Increases in the older population will result in higher prevalence of age-related conditions and a subsequent increase in older people with care needs, estimated to be around 25%.[2] An ageing population and workforce has implications on how the NHS in Wales can deliver future healthcare within the current system. As such, it will need to adapt how it delivers its healthcare services to meet these increasing demands.

The Global Burden of Disease (GBD) project aims to produce comparable estimates of ill health and injury on a global level. Burden of disease estimates from the GBD report from 2016 for Wales illustrates that cancer as the greatest cause of disease burden in Wales, exceeding cardiovascular disease with the biggest risk factor contributing to current burden of disease being past smoking.[3] As the population in Wales live longer, chronic conditions such as heart disease are predicted to rise and the likelihood of additional illnesses will also increase with age.[4] In Wales in 2017, 60% of those over 75 years have two or more illnesses and this is projected to significantly increase by 2035. The conditions with greatest increases across all adults are likely to be for stroke, heart conditions and neurological conditions including dementia.[4]

The NHS in Wales has public health, primary care, mental health, community services and hospital services all under the umbrella of Health Boards so there should be an opportunity to have joined up, efficient care that seeks to tackle inequalities effectively. Addressing transformation policy through the lens of the Well Being of Future Generations (Wales) Act 2015 and, more recently, The Health and Social Care (Quality and Engagement) (Wales) Act 2020 also support the collaborative, integrated, and outcome focused approach needed. The NHS in England has recently moved to an Integrated Care System (ICS) model which is closer to the Wales model and should enable more learning to be shared. As noted in the 2016 OECD report[5] on the quality of healthcare within the UK the NHS in Wales was found to lack sufficient institutional and technical capacity to drive meaningful innovation and quality gains. The recently established NHS Executive will have a central role in developing a more prescriptive approach to guide the NHS in Wales through the transition needed to meet these future challenges.

Of course, health outcomes are not simply determined by individual behaviours, genetics and medical care; many other factors such as housing, experience of trauma, the environment, education, income and quality of employment have their own influences. It is important therefore to note that this paper does not explore these wider determinants of health in detail, nor does it take into account potential events of significant morbidity and mortality

such as a future pandemic, armed conflict or the impacts of climate change. Non-Health Service related factors will also be important but are not part of the scope of this analysis.

There is evidence for an equity-effectiveness hierarchy (Capewell & Capewell, 2018),[6] where structural, population level public health interventions are more effective, and more likely to reduce inequalities, than individual, agentic interventions; but this does not mean that targeted individual level interventions do not reduce inequalities either.

The Academy of Medical Sciences (AMS) reflect on these wider considerations going forward in their report 'Improving the health of the public by 2040'[7] which outlines how the UK will require strategies to improve the health of the public to address complex health challenges and opportunities. The report finds that there is a lack of evidence about the complex relationship between factors that influence public health, and about how to tackle the many health challenges. To solve these challenges, the AMS suggest that a shift towards a 'health of the public' approach is required.

Increasing investment in public health and prevention may increase the efficiency of health spending, however it may involve a longer payback time. Tackling inequalities in wider determinants like housing, income, education, and employment will also produce health benefits. Looking at the structures in which health is created is important alongside individual interventions, which often increase inequalities and risk blaming individuals for behaviours which may be a natural response to the precarious circumstances that they live in.

The UK NHS continues to face rising cost pressures that will erode the spending power of the existing and future funding settlements, and the unknown outcome of future pay negotiations adds further uncertainty around the cost pressures the health care sector will face. Wales faces public health challenges with regards to incidences of drinking, smoking and obesity.[8] Wales also has an older population that the rest of the UK nations, with mid-2021 **National level population estimates by year, age and UK country (gov.wales)** showing:

**Table 1 : Percentage aged under 65 and over 65 by UK nation in mid-2021**

| | Age 65 and over | Age under 65 |
|---|---|---|
| Northern Ireland | 16% | 84% |
| England | 18% | 82% |
| Scotland | 20% | 80% |
| Wales | 23% | 77% |

Spending on health care per person in Wales is similar to that in England, but less than the per person average spend of the EU-14 (Health Foundation, 2022).[9] Capital health spending (e.g. vital buildings, technology and equipment) is around 55% less in the UK compared to the EU-14 (Health Foundation, 2022).[10] A report by the Organisation for Economic Cooperation and Development (OECD) in 2016[11] stated the NHS in Wales appears to be performing no better or worse than the NHS in the rest of the UK; however, we acknowledge this source is dated. In the 2008 recession Wales chose to balance spending cuts more evenly between health and social care; conversely in England cuts were made mainly in social care. A well-developed health care sector is essential for enabling a healthy and positive work force (*Jagrič et al., 2021*).[12]

A report by the Institute for Public Policy Research (IPPR) (2023)[13] on health and prosperity found poor health negatively influenced individual and national economic prospects. Poor physical and/or mental health was associated with lower annual earnings. Lost earnings were shown to have a significant impact on UK Gross Domestic Product (GDP). There is a risk of a negative cycle of increased poor health leading to worklessness, lower tax revenues which then mean there is less to spend on the NHS.

To support the Welsh NHS there is an opportunity to explore patterns of expenditure to ensure emphasis is placed on high value procedures, opportunities to increase prevention and public health interventions. Increased integration of services is required to improve efficiency in the NHS, which includes looking for opportunities to manage more health problems within primary care and community services.

During the same time frame as the considerations mentioned we are also likely to see rapid technological advances including in genomics, artificial intelligence and precision medicine providing new therapies and ways of delivering NHS services that will soon become part of general care. In some instances, such as cell therapy for orthopaedics, liquid biopsies and mRNA cancer vaccines, this is already on the verge of happening and subject to the outcomes of clinical trials and validation could have significant impacts on healthcare in the coming years. But to best take advantage of these new technologies and create the much-needed efficiencies it is argued[14] that a more wholescale realignment of focus within NHS services is needed. Hospital services and care pathways are currently complex and costly. Arguably, the evidence-based medicine paradigm favours pharmaceutical therapies over a more holistic approach.

The new era of precision medicine signals a move away from reductionism in medicine to a more detailed, evidence-informed diagnostic and therapeutic paradigm. In part this is driven by our understanding of the human condition due to advances in diagnostics, data and alongside our ability to manipulate biomolecules and human tissue. Notwithstanding technological innovation, new ways of working guided by value-based metrics will invariably be required for service transformation and sustainability. Simplifying the system through more streamlined and targeted use of advanced therapies coupled with a switch in focus towards more investment in prevention and primary and community care, is likely to mitigate at least some of the effects of the current and projected growing demand on hospital services and bedspace. There is also precision public health, or what may be described as a hyperlocal approach, where public health interventions are tailored specifically to local circumstances and intersectional risks.

Diagnostic services are a fundamental aspect of modern healthcare delivery and underpin over 85% of all clinical diagnoses. In recent years, our NHS Wales diagnostic services have experienced growing pressures, and these have been acutely exacerbated by the COVID-19 pandemic. This post-pandemic landscape of increased waiting times and backlogs for diagnostics testing has further highlighted the crucial role of diagnostics across patient care pathways, and the rate limiting bottleneck to patient progression these services create when demand outstrips capacity.

The Minister of Health and Social Services described the need to prioritise improved patient outcomes in 'Our Plan for Transforming and Modernising Planned Care and Reducing Waiting Lists in Wales'.[15] This was reflected in the mandate to create a National Diagnostics Board that would report directly to the NHS Wales Leadership Board, and would be chaired by the Deputy Chief Executive, NHS Wales.

The National Diagnostics Board has been established to steer and decide upon key strategic matters related to diagnostics, and to have oversight of the existing National programmes in their capacity as diagnostic delivery boards. A key task for the National Diagnostic Board was to develop a diagnostics strategy for recovery and transformation, identifying the immediate actions necessary to recover and transform diagnostics services and bring about sustainable benefits for the Welsh population.

Wales is already progressing this agenda with several WG policies in place or in development that look to drive innovation and transformation in health and social care. These include:

A Healthier Wales,[16] Digital Strategy for Wales,[17] Diagnostics recovery and transformation strategy for Wales.[18] Genomics Delivery Plan for Wales,[19] Advanced Therapies Statement of Intent,[20] Allied Health Professions (AHP) and Healthcare Science (HCS) Frameworks,[21] [22] Innovation Strategy for Wales.[23] The direction of travel for innovation to inform health policies going forward will be influenced not only by the strategic direction provided by these and new policies but also political will and scientific reviews on effectiveness.

A Healthier Wales in 2018 recognised digital, innovation and data as a key enabler of transformational change. Two reviews were undertaken, and the Governance Review recommendations included: the establishment of a new Chief Digital Officer (CDO) for Health and Social Care; supported by an advisory structure and a small team, transitioning the NHS Wales Informatic Service to a statutory single organisation, emphasis on common technical standards; and new governance and decision-making structures and, a shared services approach to core digital services. With the establishment of Digital Health and Care Wales and the NHS Executive alongside the recent appointment of a Chief Digital Officer work is in train to address the significant challenges identified in the digital transformation space for health and social care in Wales.

## Methodology Used

To support the examination of these factors altogether, this paper seeks to describe the challenges the NHS in Wales will face over the next 10 to 25 years looking at projections in demographics and prevalence of key lifestyle risk factors and long-term conditions that are known to affect quality of life and life expectancy. The paper also briefly considers expected advances in technologies and therapies and how these could influence a broad strategy to optimise care pathways to support cross-NHS efficiency and reduce time spent in hospital. It is acknowledged that not all lifestyle risk factors and long-term conditions are considered in this paper; the approach has been to focus on the most prevalent and note areas for further consideration within the recommendations.

Projections are based on looking at trends in diagnosed long term conditions in primary care, by age group. These are our baseline projections where nothing else is available. We have augmented these projections with projections from the published research literature from the Health and Care Research Wales Evidence Centre (HCRW EC)[24] evidence mapping exercise, and modelling of specific diseases and services by Public Health Wales (PHW). These projections may be helpful in service planning considerations. The projections represent a 'no change' scenario and could be amended significantly and sustainably by a concerted focus in policy towards public health interventions and multimorbidity/frailty aware approaches, earlier diagnosis of amenable risk factors, active ageing, and person-centred care. The projections therefore may also be used as baseline modelling scenarios to compare policy interventions with; for example, if we have a healthier food system, what is the impact on future incidence of Cardio Vascular Disease (CVD).

# 3. Population Projections

## Topline Summary

- Wales has an ageing population. By 2038 almost one in five people in Wales projected to be aged 70 or over.
- Old age dependency (here approximated as the ratio between those aged 70 or over and those aged 20-69) will have changed from 1 to 5 to a projected almost 1 to 3 between 2000 and 2038.
- Life expectancy in the UK has grown at a slower rate than in similar countries over the past 70 years, lagging behind all G7 countries except the US.
- In recent years, differences in life expectancy are stark between poorer and more affluent groups: in Wales, life expectancy at birth is around 73.6 years for the most deprived decile, 75.5 years for the second most deprived decile and so on up to 82.0 years for the least deprived decile; this is thought to be due to health inequalities, with a slight declining trend in life expectancy amongst the second most deprived decile possibly suggesting widening health inequalities for some poorer groups.
- Differences in life expectancy among groups is potentially exacerbated by Britain's slow economic growth, meaning that living standards are declining for some at the same time as the tax base for public services is less than it could be.
- Causes of differences in life expectancy across groups may include widening health inequalities or living standards for the poorer falling, even though living standards for the whole of society are rising or reducing public services having more impact on the poorer relative to the whole of society.

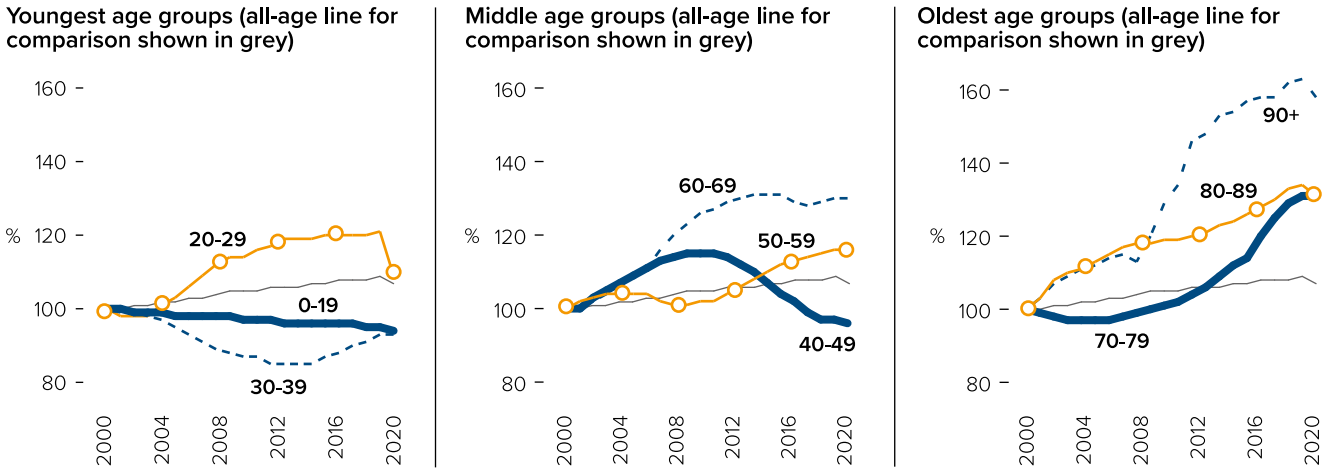
Data on the population of Wales, suitable to aggregate by age-group, is available from StatsWales.[25] Population projections for Wales are available from the ONS.[26] To improve these projections (which were carried out before the 2021 census data was available) they have been deflated to take account of the 2021 ONS census outturn.

**Note on Population Projections:**

The population projections employed in this analysis were deflated using 2021 UK Census data. This is because the 2020-based national population projections are based on mid-year estimate data rolled forward from Census 2011. The Office for National Statistics plans to rebase the mid-year estimates for the period between 2012 and 2020 based on the latest Census 2021 data. In general, the population estimates from Census 2021 are lower than the 2020 mid-year estimates for most areas in Wales. Therefore, it is possible that future projections based on Census 2021 data will be lower than the current projections. The mid-year estimates of the population for 2021, which are based on Census 2021 data, estimated that 5.6% of the population were aged 80 years or older. The population estimates for 2012-2020 are due to be rebased in September so this data is due to change. Projections using the 2020-based national population projections are available in Appendix C.

Wales has an ageing population. By 2038 almost one in five people in Wales will be aged 70 and over (actual 2000: 13%, projected 2038: 19% Source: ONS). The proportion of the population aged 80 and over will have doubled between 2000 and 2038 (actual 2000: 4%, projected 2038: 8% Source: ONS). Old age dependency can be approximated as a ratio between those 70 and over and those 20-69 (though state pension age is currently forecast to be 67 at the end of the period and working age 16 to 66). This ratio will have changed from 1 to 5 to almost 1 to 3 between 2000 and 2038 (actual 2000: 0.20, projected 2038: 0.31 Source: ONS).

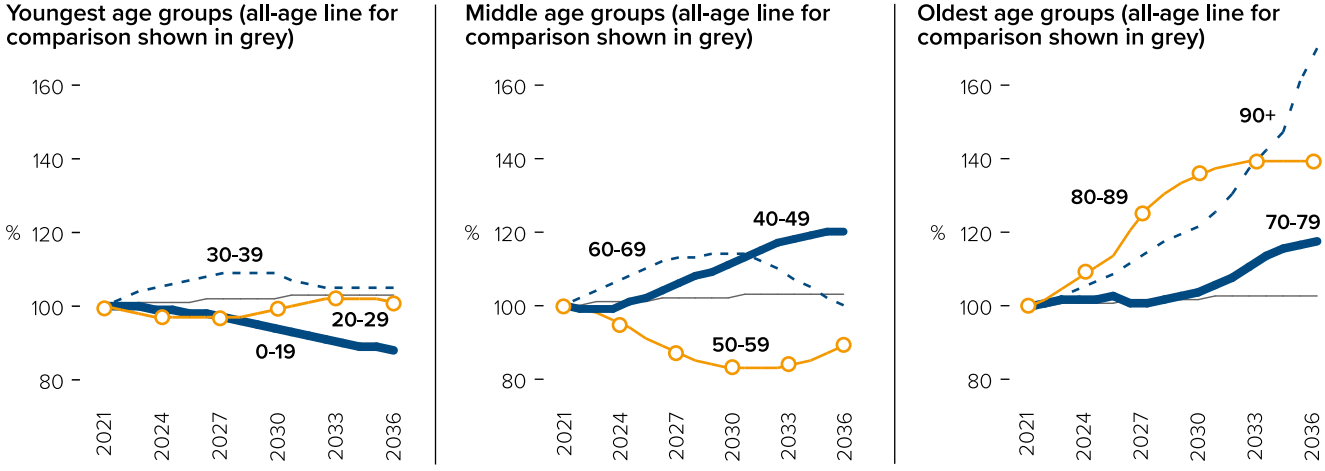
## Figures 2a, 2b, 2c How age-group population of Wales has changed 2000 to 2021




*Source: ONS, 2000=100%*

Description of Figures 2a, 2b, 2c: The youngest age group (0-19) saw a fall in population over the period, as did the 30-39 age group. The 40-49 age group rose in population in the early 2000s then fell back to end the period lower than at the start. The 70-79 age group fell in population in the early 2000s then rose strongly to end the period almost a third higher than at the start. Age groups 20-29 and 50-59 ended the period 9% and 16% higher than at the start, respectively. The remaining age groups 60-69, 80-89 and 90+ rose strongly to end the period 30%, 31% and 58% higher than at the start, respectively though 90+ was rising from a low initial population of around 19,000 (to around 30,000).

## Figures 3a, 3b, 3c How age-group population is projected to change 2021 to 2038




*Source: ONS, 2021=100%*

**Description of Figures 3a, 3b, 3c:** The youngest age group (0-19) projects a fall in population over the period. The 20-29 and 30-39 age groups project slight rises, similar to all-ages population growth. The 40-49 age group projects a rise in population after a slight fall in the early 2020s. The 50-59 age group projects a fall in population with the early 2030s the low point. The 60-69 age group projects an arc returning to its initial count over the period with the early 2030s the high point. The 70-79 age group projects flat to 2030 before rising to end the period 18% higher than at the start. The 80-89 age group projects to rise strongly, 40% by 2034 where it remains to the end of the period. The 90+ age group projects to rise strongly, 71% by the end of the period though 90+ rise from a lowish initial population of around 30,000 to around 51,000.

A Foresight report[27] looking at the challenges and opportunities of an ageing society describes how the proportion of the UK population aged between 50 and the state pension age (SPA) will increase from 26% in 2012 to 34% in 2050 (an increase of over 5.5million people). These forecasts take into account planned changes to the SPA[28] and describe how despite these increases, the number of pensioners is still increasing faster than the number of working age people (a growth of 37% (to 16.8 million) from 2012 to 2041, compared to 13% (to 44.6 million). By 2041 the report suggests the ratio of working age people to people eligible for state pension will have fallen back to 2.65 workers for every one person over SPA.

The report authors suggest therefore that the success of the UK will be increasingly tied to the productivity and success of its ageing workforce with a need to support an ageing population to lead fuller and longer working lives, make adaptations to the workplace (addressing negative attitudes, improving workplace design, encouraging new technologies, adapting HR policies etc), and ensure job-related training remains important in mid-life allowing for re-skilling opportunities.

The HCRW EC[29] have recently been commissioned to consider the evidence on interventions and innovations that could reduce people leaving the labour force and potentially bring people back to work.

**Life expectancy:** A recent analysis[30] of life expectancy in the UK reports that it has grown at a slower rate than in similar countries over the past 70 years, lagging behind all G7 countries except the US. In the 1950s, the UK ranked seventh in the world for life expectancy, but in 2021, the UK was 29th. Although there has been an overall increase in life expectancy in the UK, there has been a "stark" relative decline, and it has fallen amongst "poorer groups" in recent years thought to be due to widening health inequalities, exacerbated by Britain's slow relative economic growth over several decades meaning that living standards for some sometimes decline at the same time as the tax base for public services is less than it could be.

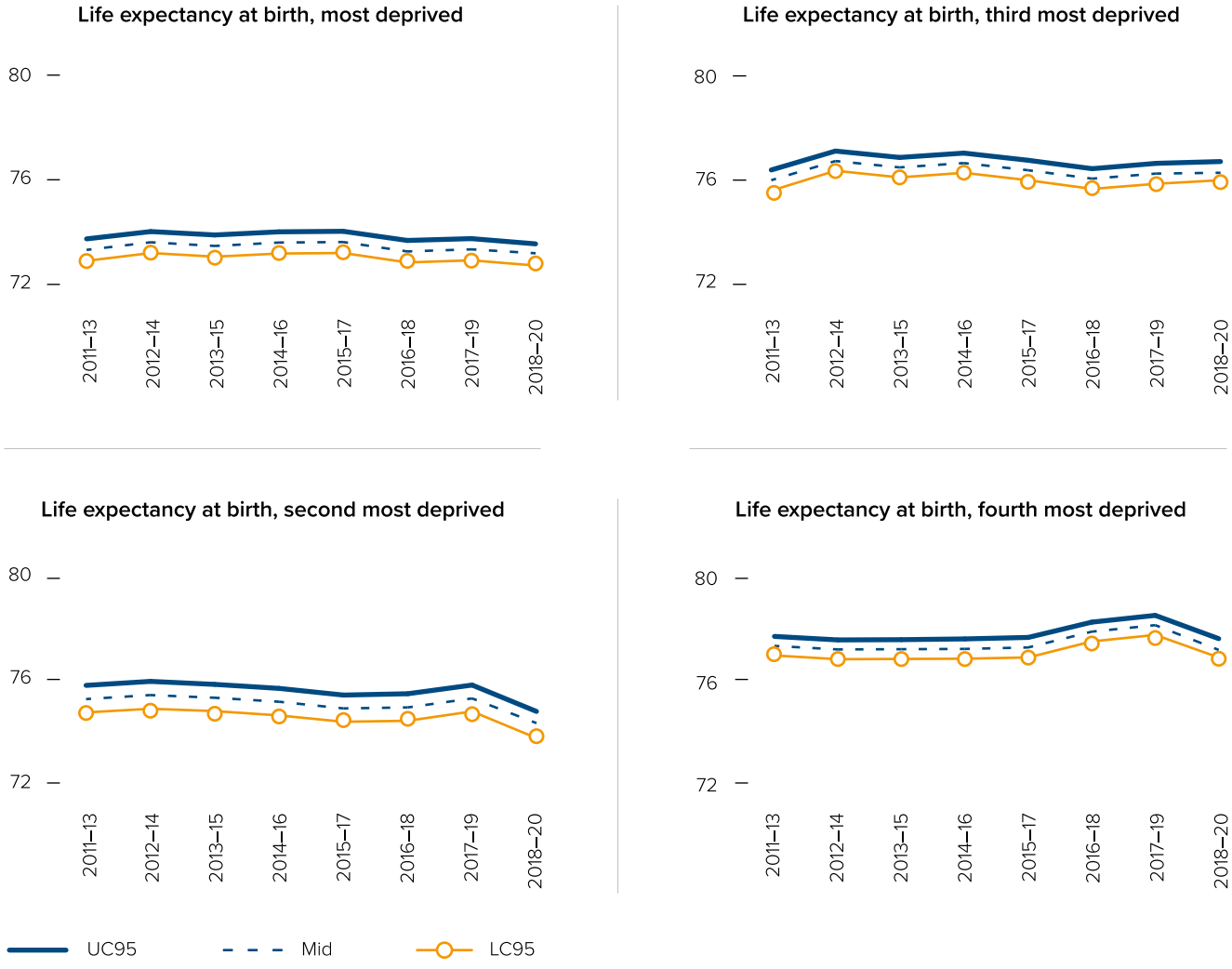
The ONS[31] trends in life expectancy identified only one decline in life expectancy at birth when comparing non-overlapping time periods since the series began in the early 1980s and that was for the 2018 to 2020 calculation, affected by the COVID-19 pandemic. Even that was ambiguous: at the UK level a fall of 7.0 weeks for males and almost no change for females, at the Wales level almost no change for males and a fall of 9.9 weeks for females.

A recent study investigated whether associations between area deprivation, urbanicity and elevated risk of severe mental illnesses (SMIs) is accounted for by social drift or social causation. The findings of this study suggest that the association between area deprivation, urbanicity and elevated risk of SMIs is likely due to social causation rather than social drift.

This means that people with SMIs are more likely to live in deprived areas due to the social and environmental factors that contribute to the development of SMIs, rather than moving to deprived areas after developing an SMI. These findings have implications for the allocation of resources, service configuration and access to services in deprived communities. The results suggest that it is important to ensure that people with SMIs have access to high-quality care, regardless of their socioeconomic status. Additionally, broader public health interventions addressing poverty, and social and environmental contexts are needed to reduce the risk of SMIs in the population[32].

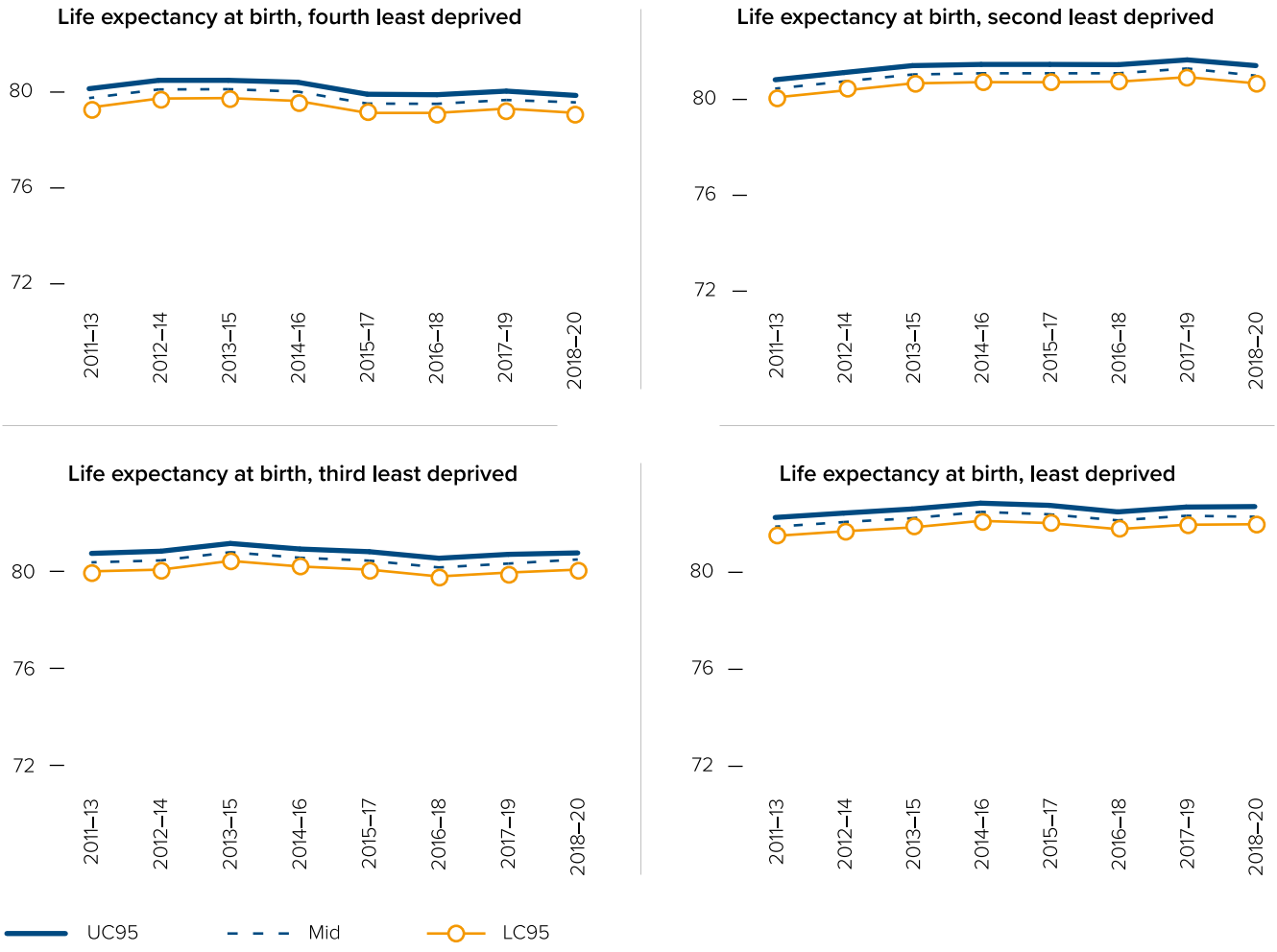
Life expectancy at birth using Wales index of multiple deprivation deciles[33] comparing time periods 2011-13; 2012-14 and so on up to 2018-20 shows much greater difference between the deciles than within a decile over time: life expectancy at birth (average of the time periods) is around 73.4 for the most deprived decile, 75.1 for the 2nd most deprived decile and so on up to 82.2 for the least deprived decile. The only decile with a declining trend averaging at least 0.05 from one period to the next and an R-squared significance statistic of at least 0.5 is the second most deprived decile (0.08 decline, 0.50 explicability). The only decile with an increasing trend averaging at least 0.05 from one period to the next and an R-squared significance statistic of at least 0.5 is the second least deprived decile (0.08 increase, 0.56 explicability).

**Figures 4a, Life expectancy at birth 2011-13 to 2018-20, most deprived (Thin lines show 95% confidence interval range. Middle deciles, which are very close to flat, are not shown)**




*Source:* ONS Health state life expectancies by deprivation quintiles, Wales

**Figures 4b, Life expectancy at birth 2011-13 to 2018-20, least deprived (Thin lines show 95% confidence interval range. Middle deciles, which are very close to flat, are not shown)**




*Source:* **ONS Health state life expectancies by deprivation quintiles, Wales**

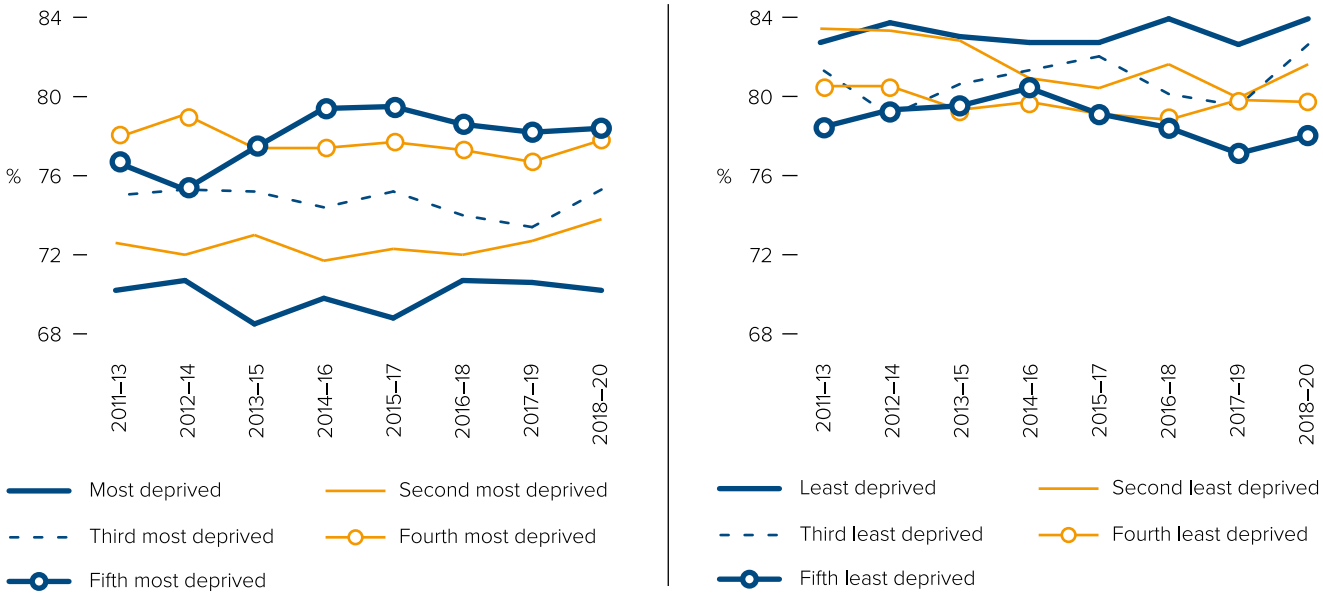
**Note:** Only quintile data was available for the last time period (2018-20) from which decile values have been imputed.

**Description of Figures 4a, 4b:** Life expectancy for the most deprived decile in Wales is around 73.4 years, for the second most deprived decile around 75.1 years, for the third most deprived decile around 76.3 years and for the fourth most deprived decile around 77.2 years. Only one of those deprived deciles has a clear gradient that is highly explanatory and that is the second most deprived decile which has a negative gradient of 0.08 – life expectancy declined in that decile over the period studied. Life expectancy for the fourth least deprived decile in Wales is around 79.8 years, for the third least deprived decile around 80.4 years, for the second least deprived decile around 81.0 years and for the least deprived decile around 82.2 years. Only one of those deciles has a clear gradient that is highly explanatory and that is the second least deprived decile which has a gradient of 0.08 – life expectancy increased in that decile over the period studied.

Life spent in good health is also important in this context, with again a considerable difference between the deciles.

Local health boards might cost-effectively reduce resource demands by direct provision of health-determining aspects of a least deprived decile lifestyle to those in the most deprived decile. Partnering with charities to directly pay £30 monthly to an electricity provider, £30 monthly seasonal fruit and vegetable box or other initiatives aimed at improving the health of those in the most deprived areas of Wales.

**Figure 5a, 5b Percentage of life spent in good health 2011-13 to 2018-20**




*Source:* **ONS Health state life expectancies by deprivation quintiles, Wales**

**Note:** Only quintile data was available for the last time period (2018-20) from which decile values have been imputed.

**Description of Figures 5a, 5b:** Less than seven-tenths of life in good health on average for Wales' most deprived decile (average 69.9%). For each successive less deprived decile the part of life spent in good health rises (averages 72.5%; 74.7%; 77.7%; 77.9%). 84% life in good health on average for Wales' least deprived decile. For each successive more deprived decile the part of life spent in good health falls (averages 82.5%; 81.6%; 80.5%; 79.6%).

## Policy Implications – Population Projections

- An ageing population will need support to lead fuller and longer working lives; this may require adaptations to the workplace (addressing negative attitudes, improving workplace design, encouraging new technologies, adapting Human Resource (HR) policies etc), and ensure job-related training remains important in mid-life allowing for re-skilling opportunities. This will be particularly true of the NHS in terms of the age profile of its available workforce.
- Policies to retain existing workers and young people entering the workforce in Wales and attract new talent will be needed to ensure sustainability given the ageing profile of the population.
- Consideration should be given to mitigating the drivers of poor health to optimise life expectancy, particularly among the most deprived groups, to support reductions in health inequalities.

# 4. Long-Term Conditions

## Topline summary

- Public Health Wales (PHW) are creating a portfolio of projections of the prevalence of disease out to 2035. The goals are to understand the latest trends in the prevalence of disease, develop projections of different scenarios for different diseases, and assess the trends in amenable risk factors. PHW will also set out evidence-based public health interventions, and assess the return on investment. The high-level analysis work will complete in autumn 2023, and will explore: diabetes, cardiovascular disease, hospital beds, cancer main sites and overall, smoking, respiratory disease, mental health, musculoskeletal disorders and obesity, where this is feasible with the data available. PHW's initial analysis on diabetes and hospital beds were available at the time of preparing this report and have been included.
- An ageing population will mean a higher proportion of the population living with long term conditions (LTC), including frailty, dementia, cancer, CHD, CVD, diabetes, hypertension and poor mental health. For many these will be co-morbid with other conditions; complex multimorbidity (4+ conditions) is expected to increase (almost double) by 2035. By then, the majority (two-thirds) of patients with complex multimorbidity will include mental ill-health.
- Old age is a risk factor for dementia, frailty and some cancers (breast, colorectal and prostate); therefore, an ageing population is likely to see increased incidence of these LTCs. For some age-groups the LTCs increase is a function of the population being projected to increase in that age group (i.e. demographic effects).
- People living with frailty will increase particularly in the oldest age groups (between 25% and 50% for those aged over 85 years old). Older people living with mild, moderate or severe frailty are more likely to access emergency secondary care and experience delayed transfers of care. NHS costs associated with supporting those living with frailty rise as the severity increases. GP costs per frailty category are also projected to increase significantly by 2047.
- For some age-group conditions increases in diagnoses in addition to demographic effects are projected. Considering all-ages rates, of the conditions listed in the Table in Appendix A, atrial fibrillation; dementia; heart failure; COPD; osteoporosis; CHD; inflammatory bowel disease; PVD; asthma; hypertension; anxiety disorders and diabetes are projected to have 2038 diagnosis rates at least 10% above those of 2021.

- Prevalence of stroke has increased over time and it is expected Welsh adults who have had a stroke will increase by 33% from 2015 to 2035. Projected UK costs directly attributable with stroke incidence show future costs will rise to £75.2bn in 2035.
- If current trends continue the number of people in Wales diagnosed with cancer in Wales will rise from the 19,800 diagnosed per year in 2017-2019, to 24,800 in 2040. Whilst cancer survival has improved over time for many cancer types, the average age of cancer patients will have risen in Wales by 2040 with more cases in people aged 70 and over. This means there will be more people with a higher risk of developing cancer, more cancer survivors requiring follow-up care and more patients with complex needs.
- Rates of people living with dementia in Wales are expected to rise by 2040, due to a growing aging population with increased life expectancy, with the largest increases expected to occur in those 80 years old and above.
- Prevalence of diabetes is expected to rise, partly driven by an ageing population; specific modelling for Wales suggests that if prevalence of diabetes remained at current levels, 260,000 people would be living with diabetes by 2035-36, a 22% increase.
- The projected increases outlined above could substantially increase health and social care costs. Patients with complex multimorbidity require, on average, two-thirds more outpatient appointments than those with one condition.
- Modifiable dietary and behavioural risk factors like smoking, obesity, low fruit and vegetable consumption, alcohol misuse and physical inactivity contribute to many LTCs (either their onset or progressive severity); therefore, tackling these risk factors could reverse the projected trends. For example, if trends in obesity and poor diet continue to increase then incidence in LTCs where these are risk factors will increase more quickly than demographic growth alone would predict.
- People living in disadvantaged areas are more likely to be living with multiple conditions and the likelihood of living with multiple conditions increases with age although almost a third of people living with complex multimorbidity are under 65 years of age.
- There has been an increase in the prevalence of musculoskeletal (MSK) conditions such as osteoarthritis and back pain, affecting an estimated 974,000 people (32% population) in Wales of whom 440,000 have long term MSK conditions (17% of the population). Rising levels of obesity and inactivity can be a causal factor and can exacerbate the impact of MSK conditions. MSK conditions can cause people to leave the workforce and/or retire early due to ill health, and has a major impact on individuals, health and care services and the economy.
- The number of people affected by sight and hearing loss is expected to increase. Increasing age is a risk factor for both sight and hearing loss and therefore an aging population will result in a greater burden on services. Disability and deprivation are also risk factors. With early intervention and appropriate management, much of sight and hearing loss can be prevented.

- There are several risk factors for depression and anxiety, including social demographic, age, sex, ethnicity, health, socio-economic and environmental factors (e.g., childhood adversity). The risk factors for severe mental illness are similar but also include broader factors including trauma, genes and substance misuse. Symptoms of depression and anxiety frequently co-exist, with the result that many people meet criteria for more than one common mental disorder (CMD). Their higher prevalence means the cumulative cost of CMDs to society is great.
- Adults with severe mental illness on average have a higher risk of dying prematurely from a range of physical illnesses, including respiratory disease, liver disease, CVD and cancer. The mortality gap between those living with severe mental illness and the rest of the population is widening.

An ageing population will probably increase the total amount of ill-health in the population. The offset of an increase in years lived in good health is unlikely to exceed the ageing population effect. In general, research suggests that if a population gain two years of life expectancy, they will gain roughly one year in good health and one year in poor health (e.g. PHE Health Profile for England, 2017).[34]

An ageing population will probably increase the total amount of disability in the population. The offset of an increase in years lived disability-free is unlikely to exceed the ageing population effect.

Frailty is an important condition to consider, while strongly related to ageing it is not solely a feature of ageing. Frailty is used to describe a particular state of health that is most commonly experienced by older people. It is a long-term condition in and of itself and describes a person's physical and mental resilience, and the reduction in the biological reserves.[35] It is generally characterised by issues like reduced muscle strength, reduced mental resilience and fatigue.[36] Around 10% of people aged over 65 years live with frailty, rising to between 25% and 50% for those aged over 85 years old. A person living with mild frailty has twice the mortality risk of a fit older person.[37] Older people living with mild, moderate or severe frailty are more likely to access emergency secondary care and experience longer stays in hospital.[37]

Data analysis conducted by Bash (2017) estimating the current and future health care costs of frailty using the Electronic Frailty Index (eFI) for those aged 65 years and older in the Kent Integrated Dataset found approximately 50% of 65 years and older individuals used in the 2016-17 sample were classified as 'Fit' by the eFI, with only 3.6% of the sample considered 'Severe Frail'.[38] The highest proportion of health care spending in the estimates were attributed to the 'Mild' (36%) and 'Moderate' (23%) categories.[39] The estimated NHS cost per patient for 'Mild' frailty is £1,668.94 increasing to £4,189.07 for 'Severe' frailty, compared to a cost of £975.62 for a patient categorised as 'Fit' using the eFI.[39] The future GP costs of frailty are expected to rise from just over £5 billion in 2017 to just over £9 billion in 2057.[39] Between 2017 and 2047 the percentage estimate increase for GP costs per frailty category was 40% for those in the 'Fit' category, 65% for those in the 'Mild' category, 93% for those in the 'Moderate' category and 144% for those in the 'Severe' category.[40]

Haji Ali Afzali *et al* (2019)[41] explored the need for a conceptual model of the progression and consequences of frailty to guide the development of a cost-effectiveness model to assess interventions that target and/or combat frailty. The authors argue previous cost-effectiveness analyses are too linked with the outcomes of the interventions and perhaps should be more generalised to frailty and

have a longer time-horizon. Through a Delphi study the authors identified a list of significant health states/events for which frailty is a strong independent risk factor these include hip fracture, hospital admission, delirium and death. They also identified a list of patient attributes that may influence disease progression such as age, gender, previous hospital admissions, polypharmacy, stroke, diabetes, depression, arthritis and smoking status. The authors concluded the most appropriate technique to model frailty progressions is an individual-based model that can account for health states/events (e.g., hospitalisation, fractures etc.) and patient attributes (e.g. age, gender etc.)

Rehabilitation and reablement are key to stopping the progression of frailty. It is also important to encourage and support people as much as possible to maintain healthy ageing[42] NHS England has proposed the NHS RightCare toolkit to support the delivery of the NHS Long Term Plan for frailty.[42] The NHS Long Term Plan sets out an evidence-based framework of care for older people with frailty to be delivered through the national Ageing Well programme. The NHS Long Term Plan focuses on delivering integrated personalised care in communities using three inter-related service models centred on clearly identifiable patient cohorts.[42] These service models are: 1) Community multidisciplinary teams to target the moderate frailty population who are considered the most suitable for targeted proactive interventions to reduce frailty progression and unwarranted secondary care utilisation. 2) Urgent Community Response to enable crisis response and community recovery for older people at risk unwarranted stays in hospital and whose needs could be met more effectively in a community setting. 3) Enhanced health in care homes by supporting commissioners and providers of acute and community health services, social care and the voluntary sector to work together.[42]

In May 2020, the Welsh Government produced a policy document 'Rehabilitation: a framework for continuity and recovery 2020 to 2021',[43] which includes the impact of multi-morbidity and need for community-based rehabilitation. In January 2023 an additional £5million in funding was announced to increase the number of allied health professionals in Wales and increase access to community-based care to help people remain active and independent,[44] which links to the Strategic Programme for Primary Care,[45] the Allied Health Professions Framework for Wales[46] and recent Further Faster initiative led by Welsh Government Social Services & Integration policy colleagues.

The 20th century saw an epidemiological shift from infectious diseases to non-communicable diseases being the major causes of ill health and death, but the COVID-19 pandemic has brought infectious diseases back into focus, as well as the links between infectious diseases and risk of other diseases like cardiovascular events and cancers. We don't know yet if the pandemic represents a change point where infectious diseases will start to have a greater impact than over the last 30 years. Over the next 25 years there may be a continuing relative shift away from acute illness towards chronic conditions, multi-morbidities, cognitive impairments and long-term frailty. Future health and care costs can be reduced and resources better used by interventions which prevent and manage chronic conditions and provide individuals with the tools to take more responsibility for their health.[47]

The total LTC diagnosis count had fallen (2011) then risen in parts (2021) and was projected to rise:

**Table 2: Wales LTC diagnoses (17 conditions, Diabetes included only once)**

Percentages shown are versus 2001. Note that the counts are NOT counts of persons diagnosed – some people will be diagnosed with more than one LTC during the year.

2a: Actuals shown for years 2001, 2011, 2021

| | 2001 | 2011 | 2021 | 2011 (%) | 2021 (%) |
|---|---|---|---|---|---|
| Under 60s | 113,565 | 93,600 | 98,954 | 82 | 87 |
| 60-69 | 39,429 | 37,711 | 33,029 | 96 | 84 |
| 70+ | 87,218 | 83,177 | 85,391 | 95 | 98 |
| **Total** | **240,212** | **214,488** | **217,374** | **89** | **90** |

2b: Projected for years 2024 2031 2038, Low

| LOW | 2024 | 2031 | 2038 | 2024 (%) | 2031 (%) | 2038 (%) |
|---|---|---|---|---|---|---|
| Under 60s | 116,769 | 114,323 | 119,776 | 103 | 101 | 105 |
| 60-69 | 42,426 | 48,283 | 42,215 | 108 | 122 | 107 |
| 70+ | 106,536 | 142,028 | 155,580 | 122 | 163 | 178 |
| **Total** | **265,732** | **304,634** | **317,571** | **111** | **127** | **132** |

2c: Projected for years 2024 2031 2038, High

| HIGH | 2024 | 2031 | 2038 | 2024 (%) | 2031 (%) | 2038 (%) |
|---|---|---|---|---|---|---|
| Under 60s | 129,697 | 161,141 | 174,529 | 114 | 142 | 154 |
| 60-69 | 44,620 | 55,296 | 49,156 | 113 | 140 | 125 |
| 70+ | 109,267 | 151,686 | 168,586 | 125 | 174 | 193 |
| **Total** | **283,584** | **368,122** | **392,271** | **118** | **153** | **163** |

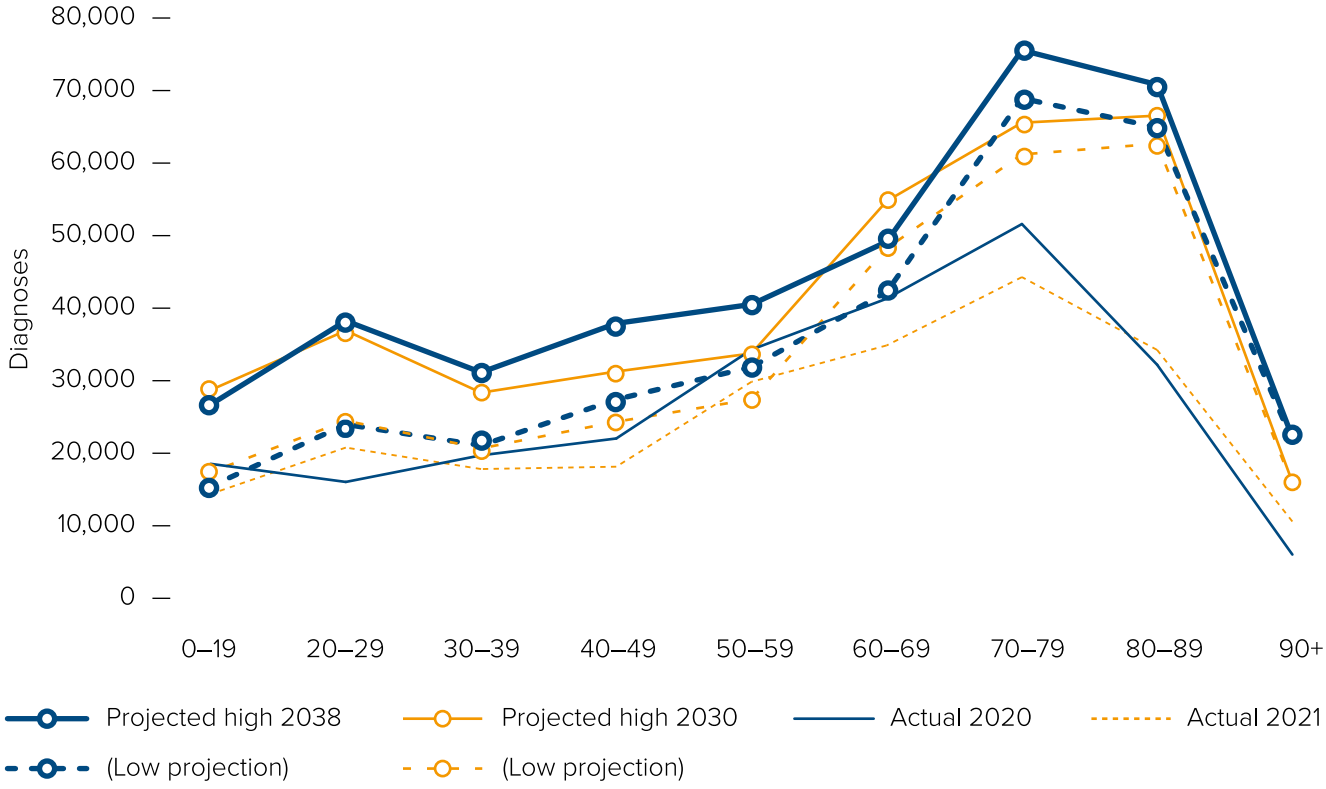
The following analysis is based on the UK Census Population for Census years (2001, 2011, 2021) and mid year population estimates or population projections for non-Census years. There is uncertainty whether increases in chronic conditions since the COVID-19 pandemic are a one-off correction of dampened diagnoses during the pandemic, or a new trend. In 2021 the population of Wales (number of people) aged under 60 has changed by less than 500 since 2001. The proportion of the population aged under 60 has decreased (77.3% in 2001 to 72.3% in 2021) due to an increase in the number of people over 60. The under-60 population of Wales (number of people) is projected to fall by around 34,000 over the 2021 to 2038 period. The proportion of the population under 60 is projected to decrease (72.3% in 2021, 68.9% in 2038). This will mostly be due to an increase in the number of people over 60, with the 34,000 fall in those under 60 contributing only a small part of the proportion fall. The population of Wales aged 60-69 in 2021 has increased since 2001 (by 29%) and is projected to peak at almost one-and-a-half times that of 2001 in 2031 before returning to 29% higher than 2001 in 2038. So rising 60-69 diagnosed incidence projections represent a decreasing rate once population is taken into account. The lower scenario for 70+s projects a rise in diagnoses versus 2001, with 2024 projected to reach 122% of 2001 and 2031 projected to reach 163% of 2001 and 2038 projected to reach 178% of 2001. The population of Wales aged 70 and over in 2021 has increased since 2001 (by 32%) and is projected at over one-and-a-half times that of 2001 in 2031 and projected to reach 69% higher than 2001 in 2038. So lower scenario 70+ diagnosed incidence projections are rising, but those projected rises are small once population is taken into account.

The 'High' scenario will be relevant if upticks after the COVID-19 pandemic translate into higher diagnoses over a long period, COVID-19 infection having permanently exacerbated certain conditions.

In the 'High' scenario for under 60s the projected rise in diagnoses versus 2001 is large, with 2024 diagnoses projected to reach 114% of 2001 and 2031 diagnoses projected to reach 142% of 2001 and 2038 diagnoses projected to reach 154% of 2001. The High scenario for 60-69s projects a rise in diagnoses versus 2001, with 2024 diagnoses projected to reach 113% of 2001 and 2031 diagnoses projected to reach 140% of 2001 and 2038 diagnoses projected to reach 125% of 2001. The 60-69 population of Wales has increased since 2001 (29%) and is projected to peak at almost one-and-a-half times that of 2001 in 2031 before returning to 29% higher than 2001 in 2038. Such rising 60-69 diagnosis projections represent a decreasing incidence rate once population is taken into account. The High scenario for 70+s projects a rise in diagnoses versus 2001, with 2024 diagnoses projected to reach 125% of 2001 and 2031 diagnoses projected to reach 174% of 2001 and 2038 diagnoses projected to reach 193% of 2001. The 70+ population of Wales has increased since 2001 (32%) and is projected at over one-and-a-half times that of 2001 in 2031, reaching 69% higher than 2001 in 2038. But the rising 70+ diagnosis projections remain rising even after population is taken into account.

Different long-term conditions will have different costs and cause different types of healthcare demand (for instance stroke survivors will have much higher costs than someone with hypertension) but looking at the total like this is still useful in understanding how overall demand for care for LTCs may change. In future it may be possible to work with the NHS Finance Delivery Unit to project costs of conditions and multimorbidity.

**Figure 6 Age profile of Wales diagnoses, years 2000, 2021, 2030, 2038, 17 long-term conditions (Source: SEA analysis paper 'LTC per capita')**




**Note:** that these counts are NOT counts of persons diagnosed – some people will be diagnosed with more than one LTC during the year.

**Description of Figure 6:** In the years for which actual counts were available there were less diagnoses in younger age groups 0-19, 20-29, 30-39, 40-49 (around 20,000 per year) and more in the 70-79 age group (around 40-50,000 per year). In projected years diagnoses rise in younger age groups 0-19, 20-29, 30-39, 40-49 (to around 30-40,000 per year) and rise in the 70-79 age group (to between 60- and 80,000 per year). In the years for which actual counts were available diagnoses in the 80-89 age group were somewhere between younger age groups and the 70-79 age group at a time when the 80-89 age group accounted for a relatively small part of Wales' population. In projected years the 80-89 age group will form a larger part of the population and so their diagnoses move closer to the 70-79 age group (to around 60-70,000 per year).

Projections for each age-group condition appear as Appendix B. We cannot be certain about the numbers but can be more certain about the direction of travel for these projections.

## Long Term Conditions Evidence from Published Literature

We asked the HCRW EC to look for evidence on projections on some groups of long-term conditions (CVD, diabetes, dementia, cancer (focusing initially on four common cancers – lung, breast, colorectal, and prostate), mental health). The HCRW EC provided a Rapid Evidence Map of the available evidence for forecasted prevalence and incidence of chronic and long-term conditions in Wales. In future, HCRW EC or SEA can look for evidence on other conditions of interest but this was used as a starting point to look for conditions that cause a significant burden of disease in the time available.

The following paragraphs summarise the evidence that the HCRW EC found plus projections from PHW and any other references identified.

**Multimorbidity:** As stated in the UK Government's Health and Care White Paper (2021): "One in three patients admitted to hospital as an emergency has five or more health conditions, up from one in ten a decade ago." Multimorbidities may make people more vulnerable to some conditions (such as stroke). Alternatively, surviving some conditions (such as stroke) may result in the survivor living with several comorbidities.

A study by Kingston *et al*. (2018)[48] using data for England found that over the 20 years to 2035 there would be an expansion of morbidity, particularly complex multi-morbidity (4+ diseases).

The proportion with 4+ diseases was projected to almost double (2015:9.8%; 2035:17.0%). Two-thirds of those with 4+ diseases will include mental ill-health (dementia, depression, cognitive impairment no dementia). During the increased years of life predicted over that period (men 3.6 years, women: 2.9 years) increased prevalence of conditions (rather than longer survival with existing multi-morbidities) will mean that, on average, most of the extra years of life will be spent living with comorbidities (for men almost two-thirds of the extra years of life, for women over five-sixths of the extra years of life).

Appropriate responses would be:

- focus on prevention of complex multi-morbidities
- appropriate and efficient service provision for those with complex multi-morbidities.

An analysis of UK Biobank data by Zemedikun *et al*. 2018[49] identified three core comorbidity clusters (in people aged 40 to 69 years):

- only myocardial infarction and angina (with a strong association: the co-occurrence of these two conditions was 13 times higher than in isolation)
- diabetes' strong associations with heart failure, chronic kidney disease, liver failure, and stroke
- hypertension, asthma, depression, and cancer.

The authors also stated certain mental health disorders commonly appear together:

- anxiety disorders such as panic disorder or social phobia may appear alongside Generalised Anxiety Disorder.
- bipolar disorder with anxiety disorder, personality disorder, attention-deficit disorder.

Head *et al*., 2021[50] found that there are well-evidenced prevention strategies for many of the component diseases of multiple condition clusters:

- Tobacco cessation to prevent cardiovascular, respiratory and several neoplastic diseases.
- A reduction in blood pressure to prevent coronary disease, ischaemic stroke, cerebral haemorrhage, congestive heart failure and chronic kidney disease.
- LDL-cholesterol lowering to prevent coronary heart disease and ischaemic stroke.

The increased risk of multimorbidity is impacted by several factors across the population including deprivation and age. Those living in disadvantaged areas are more likely to be living with multiple conditions. Stafford *et al*. found that around 28% of people in the most deprived fifth of England have 4+ conditions, compared with 16% in the least-deprived fifth. The same research identified the likelihood of living with multiple conditions increases with age however the number of people under 65 years of age with 2+ conditions is higher than the number aged 65 and over. Almost a third of people with 4+ conditions are under 65 years of age.[51]

A large-scale study using data from people in the UK biobank from Chudasama *et al*.[52] has found that healthy lifestyles can improve life expectancy irrespective of the presence of multiple long-term medical conditions. The research also suggested that public health recommendations for a healthy lifestyle to reduce the risk of developing chronic long-term conditions also applies to those who already have multimorbidity. If this is the case there could be the potential to reduce the number of conditions people have through public messaging, therefore improving the pressure of services and the population as a result of multimorbidity. Those with 4+ conditions have an average of one outpatient appointment per month, around two thirds more than those with one condition.

**Musculoskeletal Conditions:** Versus Arthritis[53 54] reports an increase in the prevalence of musculoskeletal (MSK) conditions in the UK. MSK conditions such as osteoarthritis or back pain affect an estimated 974,000 people (32% population) in Wales, causing pain, stiffness, loss of mobility and dexterity, and depression. 440,000 of these have long term MSK conditions (17% population). MSK conditions are the most common cause and make up 4 of the Top 10 causes of Years Lived with Disability (YLDs). One in ten working-age people in the UK have a long-term MSK condition. MSK conditions were the second most common reason for working days lost for the last decade. The cost of working days lost due to osteoarthritis and rheumatoid arthritis was estimated at £2.58 billion in 2017 rising to £3.43 billion by 2030. It is now common for people to live with two or more long-term conditions. This multimorbidity reduces quality of life, worsens health outcomes, and increases mortality. People with multimorbidity rely more heavily on health and care services.

People living with multimorbidity often have a musculoskeletal condition as one of their health problems, and the onset, or worsening, of arthritis or back pain can undermine their ability to cope with those health problems.

Population trends and surveys identify rising levels of obesity and inactivity both of which can be a causal factor and exacerbate the impact of some musculoskeletal conditions. MSK conditions can be painful and distressing, causing a loss of confidence, dignity, and independence. In some cases, it can have quite severe consequences to the life chances of an individual through the loss of work, dependence on the state, family, and friends. An ageing population that is forced to retire early due to ill health will increasingly affect the economic status of individuals and society. Therefore, MSK has a major impact on individuals, health and care services and the economy.

Conditions of the musculoskeletal system (MSK) may warrant particular attention due to the condition's large, estimated population prevalence (17.2%). Office for Health Improvements and Disparities analysis suggests that those with chronic MSK conditions have over three times the odds of reporting poor health than those without.[55]

Versus Arthritis assert the need to recognise musculoskeletal health as a component of multimorbidity, and for a collaborative effort to reduce the burden of MSK and act early to prevent, detect, treat, and target public health interventions across the life course. This should include increased effort in the identification and measurement of MSK conditions, further research to understand the impact on individuals and society and campaigns to raise awareness. Long term sickness is the biggest reason for economic inactivity in Wales and it is increasing; interventions to prevent and treat MSK would have social and economic benefits as well as improving the health and quality of life of individuals.

**Cardiovascular disease:** Cardiovascular disease (CVD) incidence has plateaued in the UK in recent years after age-standardised incidence had decreased in the 30 years from 1980-2010. Collins *et al*.[56] identified that 'this slowdown could substantially increase health and social care costs in England and Wales over the next ten years, and cumulatively cost approximately £54 billion by 2029. The additional £22 billion in health, social and informal care costs, would represent about a 1.6% increased demand on NHS and social care budgets, which are already strained.'[57] The paper also suggests 'the biggest costs would be the value of approximately 540,000 lost QALYs (reflecting worse quality-of-life from higher rates of CVD and disability, and more life-years being lost through increased mortality)'.

Research by Guzman-Castillo *et al*.[58] presents the modelled percentage of CVD-related disability cases from 2015 to 2025 in England and Wales. They projected CVD to decrease by -10.3% for those aged under 65 years and -16.9% for those aged 65 to 84 years. In contrast the research suggests there could be a 6.0% increase in the 85 years and over group.[58]

An English national guidance in 2014, recommended that patients with high cholesterol be prescribed "high-intensity" statins, which reduce low-density lipoprotein (LDL) cholesterol by at least 40%. A retrospective cohort study found that the proportion of statins prescribed at a dose below the recommended 40% LDL-lowering threshold has gradually decreased from 80% in 2011-2012 to 45% in 2019. The study also found that there was wide variation in the prescribing of statins between practices, with some practices prescribing significantly more low-/medium-intensity statins than others. The authors concluded that breaches of guidance on the choice of statin remain common, with substantial variation between practices. However, they also noted that some practices

have implemented rapid changes towards greater guideline compliance, indicating the feasibility of rapid prescribing behaviour change. The authors suggest that a national strategic approach could be used to optimise care, including targeted education alongside audit and feedback to outliers.[59]

An upcoming NICE guidance suggests that people with a 10-year risk of cardiovascular disease less than 10% might consider statin therapy if that is their preference. The guidance advises that before physicians prescribe statins to these lower-risk people, there needs to be a discussion about the benefits of lifestyle changes and an attempt to modify all other cardiovascular risk factors.[60]

Dietary and behavioural risk factors like smoking, obesity, low fruit and vegetable consumption contribute to 90% of CVD[61] therefore tackling these risk factors could reverse the current plateau being experienced in the UK into a decrease in the condition. Many of these risk factors are related to social conditions like poverty. There is also an additional risk of more CVD due to the links between COVID-19 infections and CVD. This could increase demand for services in this area beyond what we are seeing now with ongoing COVID-19 infections.

**Coronary Heart Disease (CHD):** The SEA projections estimate that rates of diagnosis of CHD may rise following the COVID-19 pandemic and further exacerbated by the underuse of statins.[59] The SEA projections also estimate that diagnosis of heart failure suggest that rates per 100,000 may flatten for older groups but will plateau above current rates.

**Heart failure:** The Health and Care Research Wales Evidence Centre did not find any modelling studies or grey literature reports for the projected prevalence or incidence of heart failure (HF). A lot of HF is related to other heart disease like CHD, and COPD, so may show a delayed relationship to prevalence of these diseases.

**Stroke and Transient ischaemic attack (TIA):** There are over 12.2 million new strokes each year worldwide and one in four people over age 25 will have a stroke in their lifetime (World Stroke Organisation 2022).[62] The numbers of stroke survivors in the population are increasing over time (Office for Health Improvement & Disparities 2022).[63] From the national dataset the percentage of adults over 18 years living in Wales who have had a stroke is estimated to increase to 33% by 2035 (Public Health Wales Observatory 2018).[64]

A study conducted in Wales found that the prevalence of atrial fibrillation (AF) increased from 1.75% to 2.22% between 2012 and 2018. The rate of hospitalisation for stroke and systemic embolism (SSE) decreased by 18% during the same period. The study's model predicts that improving anticoagulation (AC) coverage to 90% over the next 9 years could reduce annual SSE rates by 9%. These findings highlight the importance of timely implementation of AC in patients with AF. By increasing AC coverage, we can help to reduce the risk of stroke and systemic embolism and improve clinical outcomes for patients with AF.[65]

Globally high systolic blood pressure is the largest single risk for stroke (World Stroke Organisation 2022).[66] Atrial fibrillation is found in a third of all ischaemic strokes, even more after post-stroke atrial fibrillation monitoring. Data from stroke registries show that both unknown and untreated or under treated atrial

fibrillation is responsible for most of these strokes, which are often fatal or debilitating. Most could be prevented if efforts were directed towards detection of atrial fibrillation before stroke occurs, through screening or case finding, and treatment of all patients with atrial fibrillation at increased risk of stroke with well-controlled vitamin K antagonists or non-vitamin K antagonist anticoagulants.[67]

Reducing the amount of sodium in processed foods is one policy that can reduce high blood pressure. Diagnosing and treating high blood pressure early can also prevent strokes. Risk factors for stroke and TIA include modifiable lifestyle factors such as smoking, alcohol misuse and drug abuse, physical inactivity and poor diet (NICE 2022)[68] Better diagnosis and treatment of atrial fibrillation can prevent strokes – atrial fibrillation is present in around one third of ischemic strokes.

King *et al*.[69] presented projections for the future number of incidence of strokes of people aged 45 years and over in the UK from 2015 to 2025 and 2035 of 117,600, 148,700, 186,900 respectively (a 59% increase). The research also looked at the projections for the cost of these strokes including healthcare, public and private social care, unpaid care and lost productivity. The projections showed future cost to rise from £25.5bn in 2015, £42.6bn in 2025 and £75.2bn in 2035, an increase of 195% over the 20 years. The costs included in this projection includes costs attributable to stroke. The research notes that people who have a stroke and survive can live with several comorbidities, therefore making it difficult to distinguish costs attributable to stroke and those of concurrent comorbidities.[69]

**Atrial fibrillation:** Two modelling studies were identified that provided estimates for the projected prevalence of atrial fibrillation (Lane *et al*. 2017[70]) and atrial fibrillation-related embolic vascular events (Yiin *et al*. 2014[71]). The data sources included prospective cohort studies (for example Oxford Vascular Study (OXVASC) population-based administration datasets (for example ONS population estimates) and primary care databases (Clinical Practice Research Datalink). Both of the studies did not provide specific information other than the data sources used. There are also some concerns around the undertreatment of atrial fibrillation.[72]

Yiin *et al*. 2014[71] concluded that incidence in those aged 80 or over would increase between 2010 and 2050 by those aged 80 or over's demographic change between 2010 to 2050. ONS population aged 80 or over in Wales in 2010 was 152,669. The population aged 80 or over in Wales in 2050 using ONS projection but corrected for 2021 census (following the method used in SEA paper 'LTC per capita') was projected to be 313,574 – over double in ratio (2.05). On that basis, Wales' atrial fibrillation diagnoses of those aged 80 or over which were 5,308 in 2010 would double to around 10,000 or 11,000. Projections using the 2020-based national population projections are available in Appendix C.

**Peripheral Vascular Disease (PVD):** It is estimated that over 200 million people have PVD worldwide, and although it is uncommon in younger people, prevalence rises with age and affects a substantial proportion of elderly people (20% over people over 80). Many people have no symptoms – the most common symptoms are leg cramping but more rarely PVD is associated with changes in the skin, numbness, muscle weakness, pain and can lead to problems with wounds healing or gangrene. The Office for Health Improvement

and Disparities states that data from the QOF prevalence for PVD (all ages) for 2021-22 for England demonstrates a decreasing trend over time, which is also supported by a NICE UK cohort study which found a decreasing incidence and prevalence of symptomatic PVD diagnoses in primary care. The British Heart Foundation estimates 361,833 (0.6%) of people live with PVD in England, and reports that incidence rates for PVD in 2017 for 100,000 of adult population aged 15+ was 58.4%, and higher in men (79.8%) compared to women (38.5%). No modelling studies were found which estimated the projected prevalence of PVD in Wales or in the UK. PVD risk factors include smoking, diabetes, advanced age and hypertension.

**Hypertension:** One modelling study was identified for projecting prevalence of hypertension (high blood pressure), although this only included data for England (Kingston *et al.* 2018[73]). This study used the PACSim microsimulation model to make projections for hypertension up to 2035. This study estimated that hypertension prevalence in England would increase by 69.5% from 2015 to 2035.

**Cancer:** According to analysis undertaken by Cancer Research UK (CRUK)[74] with data (PHW Welsh Cancer Intelligence and Surveillance Unit (WCISU) registry data up to 2018 and 2019) and analyst input from WCISU, if current trends continue the number of people in Wales diagnosed with cancer in Wales will rise from the 19,800 diagnosed per year in 2017-2019, to 24,800 in 2040. In total, there could be 420,600 new cases of cancer and 177,000 cancer deaths in Wales between 2023 and 2040. The majority of these cases and deaths will be in people aged 70 and over (63% of cases and 77% of deaths).

Whilst cancer survival has improved over time for many cancer types, the average age of cancer patients is projected to rise in Wales by 2040 – 6 in 10 cases will be in people aged 70 and over (up from around 5 in 10 currently). This means there will be more people with a higher risk of developing cancer, more cancer survivors requiring follow-up care and more patients with complex needs. The projections were built using an age period cohort model and there are a couple of caveats to note: the model was very sensitive to recent trends and the model is much less reliable for small numbers. Additional work is currently being done by the Data Science team at PHW to produce new projections based on real observed cancer registry data up to and including the pandemic years, population age projection data, as well as scenarios of different prevalence of cancer risk factors in the population with their relative risks.

Five modelling studies were identified by the Health and Care Research Wales Evidence Centre that provided estimates for the projected prevalence (Macmillan Cancer Support 2020,[75] Maddams *et al*. 2012)[76] or incidence of breast, colorectal, lung and/prostate cancer (Smittenaar *et al*. 2016,[77] Donnelly *et al.* 2020,[78] Borras *et al*. 2016).[79] Two further modelling studies that provided estimates for the projected incidence for colorectal (Tsoi *et al*. 2017),[80] and prostate cancer (Teoh *et al*. 2019).[81] Only one study provided projected prevalence estimates for Wales for 2025, 2030 and 2040 (Macmillan Cancer Support 2020).[75] The data source for the Welsh modelling study conducted by Macmillan Cancer Support (2020)[75] was cancer registry data and growth rates from Maddams *et al*. (2012) who used a discrete time model in their prevalence projections. Macmillan Cancer Support (2020) did not provide any further detail about the modelling methods used. Furthermore, work conducted in Wales shows a substantial decrease in cases of common cancers diagnosed during COVID-19 which may adversely affect survival later (Greene *et al*.).[82] Impact of the SARS-CoV-2 pandemic on the female breast, colorectal and non-small cell lung cancer incidence, stage and healthcare pathway to diagnosis during 2020 in Wales, UK using a national cancer clinical record system.

It was estimated that there will be 61,000 females living with a breast cancer diagnosis in Wales by 2030 and this number is projected to increase to approximately 85,000 by 2040 (Macmillan Cancer Support 2020).[75] It was estimated that there will be 27,000 (16,000 males and 11,000 females) people living with a colorectal cancer diagnosis in Wales by 2030 and this number is projected to increase to approximately 36,000 (22,000 males and 14,000 females) by 2040 (Macmillan Cancer Support 2020).[75]

It was estimated that there would be 7,000 (2,300 males and 4,410 females) living with a lung cancer diagnosis in Wales by 2030 and this number is projected to increase to approximately 9,000 (2,320 males and 6,610 females) by 2040 (Macmillan Cancer Support 2020).[75] It was estimated that there would be 42,000 males living with a prostate cancer diagnosis in Wales by 2030 and this number is projected to increase to approximately 56,000 by 2040 (Macmillan Cancer Support 2020).[75]

Older age is one of the main risk factors of being diagnosed with breast cancer (Cancer Research UK 2018b).[83] Biological processes and exposure to risk factors can both contribute to the development of breast cancer (Cancer Research UK 2018). It is estimated that about 23% of breast cancer cases in UK might be preventable (Cancer Research UK 2018b); risk factors with 'sufficient' or 'convincing' evidence include alcohol consumption, hormone replacement therapy (HRT) (oestrogen-progestogen), oestrogen-progestogen contraceptives, diethylstilbestrol, exposure to ionising radiation, body fat levels (for post-menopausal breast cancer only), adult attained height or weight gain (Cancer Research UK 2018.

Older persons are more likely to have colorectal cancer: in the UK, adults 75 and older account for more then 40% of new cases of colorectal cancer (Cancer Research UK 2018a).[84] It is estimated that 54% of colorectal cancer cases in the UK are preventable; risk factors with 'sufficient' or 'convincing' evidence of increasing the risk of colorectal cancers include alcoholic drinks, tobacco smoking, X-radiation, gamma-radiation, processed meat, body fatness and adult attained height. There is also convincing evidence that physical activity decreases the risk of colon but not rectal cancer.

It is estimated that 79 percent of lung cancer cases in the UK may be avoided by reducing exposure to risk factors (Cancer Research UK 2018c);[85] which include tobacco, industrial processes and air pollution.[86]

Prostate cancer is not clearly linked to any modifiable risk factor (Cancer Research UK 2018d).[87] Increasing age, black ethnicity, family history of prostate cancer and genetics are all non-modifiable risk factors associated with prostate cancer (NICE 2022g).[88]

Cases of non-melanoma skin cancer rose from 13,368 cases in 2016 to 15,102 cases in 2019, a 7% increase after adjusting for age. Non-melanoma and melanoma skin cancer combined accounted for 46% of all cancers in Wales in 2019. The main risk factor for non-melanoma skin cancer is exposure to UV light. As this is potentially preventable, public messaging around the related risks could prevent a future rise in cases as seen between 2016 and 2019.[89] Research focusing on keratinocyte cancers (a group of non-melanoma skin cancers (NMSC) that include basal cell carcinomas (BCC) and cutaneous squamous cell carcinomas (cSCC)) found the incidence of BCC increased from 2016 to 2018. The European Age Standardised Rate of cSCC in Wales was 27% higher than English

rate for the same period. The incidence of both BCC and cSCC shows an inverse relationship with deprivation. On average, the incidence of BCC and cSCC was 179% and 155% higher in the least deprived areas compared to most deprived areas.[90]

The focus on high prevalence cancers in this paper should not detract from the likelihood of other cancers increasing over the coming years, bringing with it demand for services across all cancer care.

**Dementia:** diagnosis rates per 100,000 in older age-groups had increased though with some signs of flattening most recently. Increases may recommence following the COVID-19 pandemic. A high proportion of dementia cases are vascular dementias (damaged blood vessels in the brain) which have similar risk factors to other cardiovascular disease; and Alzheimer's disease (amyloid plaques forming in the brain) which has more of a genetic component but has some shared risk factors with vascular dementia. Individuals can have both of these forms of dementia.

One of the conditions they looked at was dementia. They found eight modelling studies which projected prevalence of dementia (Ahmadi-Abhari *et al.* 2017,[91] Bandosz *et al.* 2020,[92] Guzman-Castillo *et al.* 2017,[93] Kingston *et al.* 2018,[94] Li *et al.* 2021,[95] Prince *et al.* 2014,[96] Wittenberg *et al.* 2019,[97] Wittenberg *et al.* 2020).[98] Only a study by Wittenberg *et al.* 2020 provided projected prevalence estimates separated by each of the four UK nations, providing separate estimates for Wales. Data used in the modelling studies comes for various sources including cohort studies, population-based datasets (e.g., ONS population estimates Public Health Wales Observatory health its determinants), the Personal Social Services Research Unit (PSSRU) aggregate long-term care model and the PSSRU dementia care model.

Findings from the evidence map states that globally around 55.2 million people have dementia and there are 10 million new cases each year (Alzheimer's Research UK 2023).[99] (Wittenberg *et al.* 2019)[100] estimate in the UK there were approximately 885,000 older people (aged 65 years and over) living with dementia in 2019. In Wales, this was estimated at approximately 46,800 older people (aged 65 years and over) living with dementia. It is estimated by 2030 the number of people living with dementia in the UK would increase to 1,233,400 people, and by 2040 and this number is projected to increase to approximately 1,590,100 people. This equates to 64,200 people living with dementia in the Wales by 2030 and approximately 79,700 people by 2040. This is a projected rise of 70% between 2019 to 2040, due to a growing aging population with increased life expectancy, with the largest increases expected to occur in those 80 years old and above.

Evidence from NICE (2022)[101] states older age is the strongest risk factor for dementia, followed by genes (Alzheimer's Society 2021).[102] Other risk factors include; lower educational attainment, hypertension, hearing impairment, smoking, obesity, depression, physical activity, diabetes, low social engagement and support, alcohol consumption, traumatic brain injury, and air pollution (Alzheimer's Society 2021). Reducing these risk factors can prevent or delay the onset of dementia up to 40% (Alzheimer's Society 2021).[102] Certain long-term health conditions that create problems with a person's thinking and memory (e.g., multiple sclerosis, HIV, rheumatoid arthritis, and kidney disease) can evolve into dementia in severe instances (Alzheimer's Society 2021).

**Diabetes:** Public Health Wales have conducted analysis into the future trend in diabetes in Wales, using data[103] from the Quality Assurance and Improvement Framework (QAIF) and the Quality and Outcome Framework (QOF). The number of patients aged 17 and over with diabetes in Wales has risen by almost 60,000 people in 13 years, to 212,716 in 2021-22. If prevalence remained at current level, 218,000 people would be living with diabetes by 2035-36, a 2.5% increase. If current trends in diabetes prevalence are maintained, then this would be 260,000 and a high scenario where the rate of increase in diabetes continues at current trends would mean over 280,000 people. The main risk factor for type 2 diabetes is obesity and poor diet and if this continues to increase then incidence will increase more quickly than demographic growth alone would predict.

Research in Wales suggests that around 90% of diagnosed diabetes cases are type 2 diabetes. The risk of developing type 2 diabetes can be reduced through lifestyle factors such as diet and physical activity. This differs from type 1 diabetes which is largely unrelated to these factors. Gestational diabetes is also a risk factor for future type 2 diabetes.

Papers including diabetes projections for England and the UK also suggests that there will be an increase in the number of people with diabetes in the future. There is some fluctuation in the modelled increase with one study suggesting there will be an increase of 5.2% in people over the age of 18 with diabetes from 2014 to 2030 in the UK.[104]

Looking more specifically at diabetic retinopathy Haider *et al.*[105] include projections in their research to suggest this specific complication of diabetes will increase in the UK by 23.3% from 2019 to 2030.[106]

Focusing on the 65 years and over age group Kingston *et al.*[107] present a model which shows an increase of 118.1% from 2015 to 2035. This indicates that an ageing population will contribute to the increased number of people with diabetes.

The way in which diabetes is medicated continues to evolve over time with devices such as a fully closed loop (artificial pancreas) being increasingly used. An emphasis on good self-management of the condition would also be beneficial. Diabetes is a driver of other chronic diseases including cardiovascular disease and heart failure, stroke, kidney diseases and liver disease amongst others. Any way in which the declining progression of this conditions can be reduced through behaviours and effective medication would be beneficial for patient's quality of life and the health service.

Early screening may also be beneficial, in the UK around 25% of those with type 1 diabetes present with diabetic ketoacidosis (DKA), with higher rate in the very young (30% in those age under 5 years) and in ethnic minority groups. Early detection in children has been shown to reduce DKA by 90%.[108]

**Liver disease:** Incidence of liver disease is on the rise and is one of the leading causes of premature death in the UK. Most people with liver disease die aged between 18 to 65 years. This makes liver disease the third biggest cause of premature death in working age, with 62,000 years of working life lost every year. 90% of liver disease in the UK is due to alcohol, obesity and viral hepatitis and is therefore preventable. The Welsh Government has committed to the elimination of hepatitis C by 2030; action here should influence the future trajectory of the prevalence of liver disease in Wales.

**Sight loss:** In Wales, an estimated 3.5% of the population are living with sight loss that impacts their daily lives. An estimated 111,000 in Wales are identified as having sight loss and this is expected to increase 35% to 146,000 by 2030 (Royal National Institute of Blind People 2021,[109] Pezzullo *et al.* 2018).[110] There are 12,137 registered blind or partially sighted in Wales. In the UK, the main causes of sight loss are: (RNIB 2021,[109] Pezzullo, L 2018 and Access Economics Pty Limited for RNIB 2009)[111] Uncorrected refracted error – 39%, Age-related Macular Degeneration – 23%, Cataract – 19%, Glaucoma – 7%, Diabetic eye disease – 5%. With early intervention and appropriate management, much of sight loss caused by these conditions can be prevented.

Other risk factors include disability and deprivation, improving access to services for vulnerable groups could improve eye care in these groups. Planning for future eye care services needs to anticipate an increased burden and ensure the provision of eye care services can increase to meet this demand. Preventative measures should also be encouraged to support a reduction in sight loss.

There are plans within Welsh Government to improve access for patients to specialist eye care, by utilising optometrists in primary care to manage, monitor and treat more eye conditions in the high street in order to free up capacity in secondary care for complex cases.

**Hearing Loss:** Hearing loss affects a significant number of people globally, with approximately 466 million individuals affected. This number is projected to increase due to demographic changes and longer life expectancy, with the World Health Organisation predicting that over 900 million people worldwide will have hearing impairment by 2050. The social implications of hearing loss are substantial, leading to social marginalisation and decreased productivity due to communication difficulties. However, since hearing loss often develops gradually and goes unnoticed, many individuals remain untreated.[112]

A 2014 publication reports that the impact of hearing loss in adulthood is often overlooked, yet it has profound consequences. The authors suggest that hearing loss is associated with higher unemployment, poor health, depression, dementia, and increased mortality. Hearing loss affects various aspects of people's lives, spanning health, social care, and education. While today's hearing technologies offer significant opportunities to mitigate these impacts, there is growing pressure on health, social care, and support systems to improve efficiency and cut costs. The substantial additional costs incurred by not addressing hearing loss are rarely considered, treating it more as a lifestyle concern than a serious health issue with substantial burdens on individuals and society. The report focuses on the UK but with worldwide implications, provides a comprehensive assessment of the cost of hearing loss, estimating it to be over £30 billion per year.[113] These costs encompass both the direct expenses of treating hearing loss, which are relatively low, and the much larger costs associated with addressing the health and social consequences of hearing loss. More recently the association between hearing loss and dementia has been recognised; hearing loss is the greatest modifiable risk factor for dementia.

Implementing value-based healthcare involves prioritising interventions that effectively mitigate the impact of major health conditions on individuals and reduce the associated costs. An example of this is the provision of hearing aids, which not only address hearing difficulties but also have the potential to reduce the risk of dementia and delay its onset.[114] By investing in hearing aid provision, healthcare systems can promote better health outcomes, improve quality of life for individuals, and potentially alleviate the burden on long-term care services.

A recent study in Wales investigates hearing health inequalities among different socioeconomic groups. The findings indicate that individuals from more deprived backgrounds have higher utilisation of audiology services, particularly among younger age groups. Furthermore, the severity of hearing impairment at the time of receiving hearing aids is more pronounced among the most deprived individuals. The study suggests that these inequalities may be underestimated since affluent individuals tend to access specialist outpatient services more frequently, and individuals from lower socioeconomic status backgrounds tend to underreport health conditions, including hearing loss.[115]

The study highlights the need for comprehensive national strategies and legislation involving audiologists and public health policymakers to address health inequalities and improve hearing levels as it is more prevalent among individuals from deprived backgrounds. It suggests encouraging individuals in deprived areas to recognise hearing impairment at a younger age and report symptoms sooner. Improving accessibility and equity in health screening programs, such as internet-based testing or providing hearing services in primary care settings, could help address hearing health inequalities. Collaboration between health boards and broader representation in audiology studies would provide further insights into the hearing health needs of underrepresented populations.

**Mental Health – Common mental disorders:** The Health and Care Research Wales Evidence Centre provided a Rapid Evidence Map of the available evidence for forecasted prevalence and incidence of Common Mental Disorders (CMDs). Symptoms of depression and anxiety frequently co-exist, with the result that many people meet criteria for more than one CMD. Their higher prevalence means the cumulative cost of CMDs to society is great (Stansfeld *et al*. 2016).[116]

Three modelling studies were identified that provided estimates for the projected prevalence of CMDs (World Health Organisation 2022,[117] NICE 2023c,[118] NICE 2022d).[119] Data on prevalence of depression shows an increasing trend over time (Office for Health Improvement & Disparities 2022c).[120] Data from Public Health England estimates that 9.2% of the population have mixed anxiety and depressive disorder (Office for Health Improvement & Disparities 2022f)[121]. Data from the Adult Psychiatric Morbidity Survey (APMS) conducted in 2014 reported that 17.5% of working-age adults had symptoms of CMD. The prevalence of general anxiety disorder (GAD) and depression increased from 2007 to 2014. The latest data from the National Survey for Wales (2019-2020) reports that the prevalence of CMD in Wales for adults aged over 16 years was 16% and this equates to approximately 493,000 people. HCRW EC did not find any modelling studies that estimated the projected prevalence of CMDs in Wales. However, projected prevalence rates by local authorities in Wales for CMDs are available from the Social Care Wales Dataset.[122]

There are several risk factors for depression, including social demographic, health, socio-economic and environmental factors (e.g., childhood adversity).

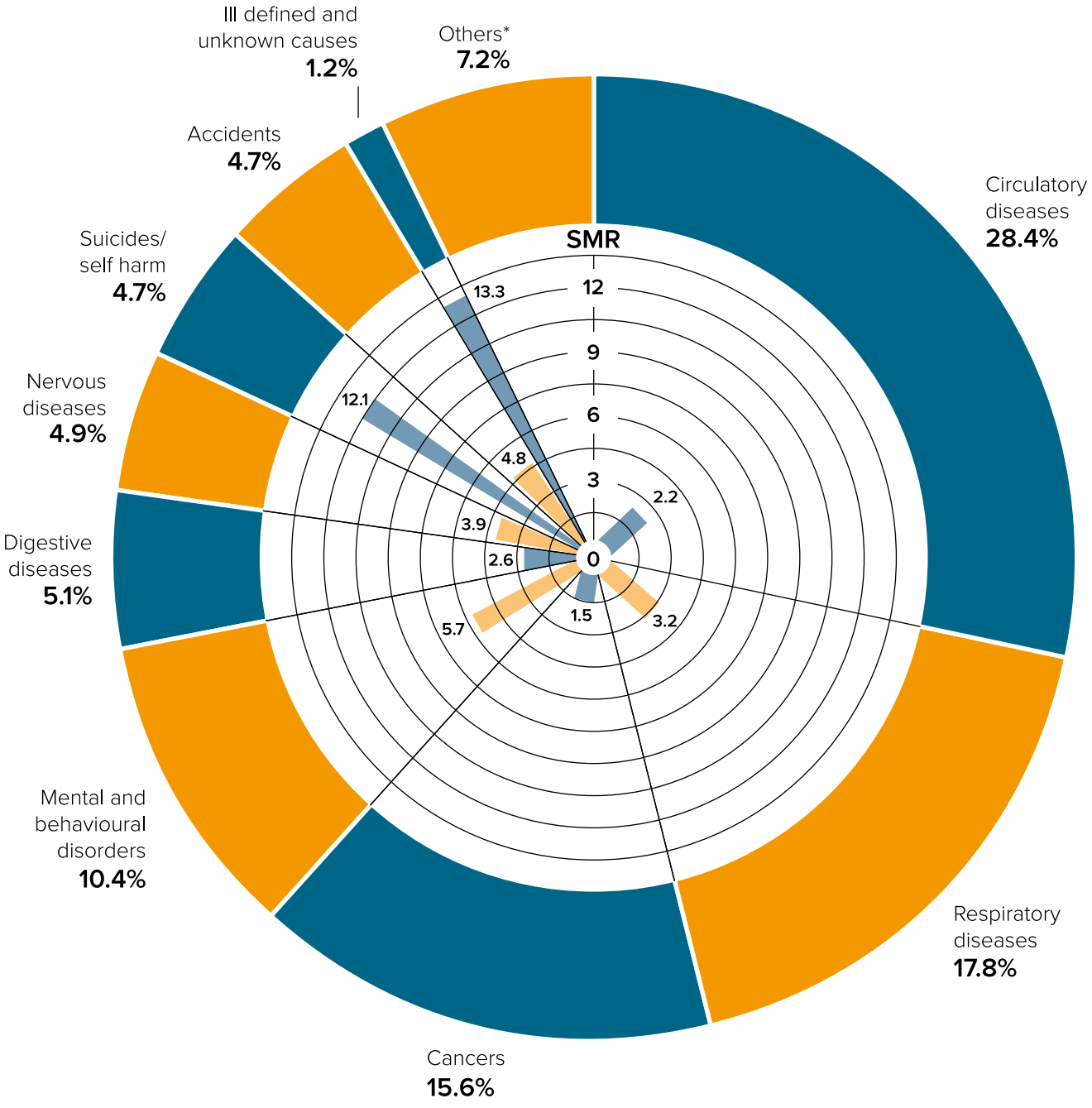
Anxiety disorders have increased in middle aged people and are common in certain groups of the population including Black women, adults under the age of 60 who lived alone, women who lived in large households, adults not in employment, those in receipt of benefits and those who smoked cigarettes (Stansfeld *et al.* 2014).[123] Multiple factors contribute to the development of GAD, with both genetic and environmental causes identified (NICE 2023d).[124]

Family history of anxiety disorders, depression or other psychiatric disorders can lead to increased risk of developing GAD. People with comorbid anxiety disorder, such as panic disorder, or social phobia, are more likely to experience GAD. Female sex is also associated with GAD, as women are twice as likely to experience GAD than men. In addition, people with chronic physical conditions, such as a CVD, cancer, respiratory disease, diabetes or arthritis, are more likely to experience GAD (NICE 2023d).[125]

**Bipolar disorder:** Globally, bipolar disorder global prevalence rates have been produced by NICE 2022a,[126] World Health Organisation 2022.[127] The World Mental Health Survey Initiative and Merikangas *et al.* 2011.[128] In the UK, Data from the APMS reported that approximately 2% of the UK adult population screened positive for bipolar disorder in 2014 with similar rates between men and women (Marwaha *et al.* 2016). Younger age groups were more affected with 3.4% of young people aged 16-24 years diagnosed with bipolar disorder.[129] In comparison, bipolar disorder affected 0.4% of 65-74-year-olds.[129]

A recent study was conducted to estimate standardised mortality ratios (SMRs) for all-cause and cause-specific mortality in people with severe mental illness (SMI) drawn from linked primary and secondary care populations compared to the general population. The study found that people with SMI had a higher risk of death than the general population, with the highest risks being for ill-defined and unknown causes, suicide, substance abuse, Parkinson's disease, accidents, dementia, infections and respiratory disorders (particularly pneumonia), and Alzheimer's disease. The study also found that the risk of death was higher for people with SMI who were identified from secondary care hospital admissions than from primary care. The findings suggest that people with SMI are at a higher risk of death than the general population, and that this risk is particularly high for certain causes of death. The study's findings also suggest that the risk of death is higher for people with SMI who are identified from secondary care hospital admissions than from primary care. The figure below illustrates the proportion of deaths by underlying causes (the outermost ring) and the corresponding SMR (polar bar chart with labelled values) in persons diagnosed with SMI in the combined cohort. "Others" includes genitourinary, symptoms, signs and abnormal clinical findings (except ill-defined and unknown causes), infections, endocrine, nutritional and metabolic diseases plus a small number of other rarer causes. Note that SMR for "Others" are not shown for clarity.[130]

**Figure 7: Proportions and SMRs of deaths categorised by causes**




*Source:* Premature mortality among people with severe mental illness — New evidence from linked primary care data

The HCRW EC were unable to find any national survey data for Wales on bipolar disorder, or projected UK/Wales prevalence modelling for Wales. However, projected prevalence rates by local authorities in Wales for bipolar disorders are available from the Social Care Wales Dataset.[131]

Risk factors for bipolar disorder include the interplay of genetical and environmental factors (e.g., early life stress, maternal death before the age of five, childhood trauma or abuse, emotional neglect, Toxoplasma gondii exposure, cannabis/cocaine use or exposure). People with a first-degree relative diagnosed with bipolar disorder have a lifetime risk of the condition which is approximately five times greater than that of the general population (NICE 2022b).[132] The likelihood of screening positive for bipolar disorder varied with employment status with unemployed or economically inactive 16-64-year-olds more likely to screen positive than those in employment. Bipolar disorder is comorbid with other disorders including substance misuse, anxiety disorders, personality disorders and attention-deficit/ hyperactivity disorder (Marwaha *et al.* 2016).

**Psychotic disorders – psychosis and schizophrenia:** Psychotic disorders are a group of mental health conditions that are characterised by a range of symptoms, including hallucinations, delusions, disorganised thinking, and abnormal behaviour that are severe enough to distort perception of reality. The main types of psychotic disorders are schizophrenia and affective psychosis (Bebbington *et al.* 2016). One data set which estimates global prevalence of schizophrenia was identified (World Health Organisation 2022), and one UK dataset was also found (Bebbington *et al.* 2016).[133] The latest data from the National Survey for Wales (2019-2020) reports that the prevalence of psychotic disorders in Wales for adults aged over 16 years was 16%.

One data source was identified which projected prevalence in England (McDonald *et al.* 2021).[134] The HCRW EC did not find any modelling studies that estimated the projected prevalence of psychotic disorders in Wales. However, projected prevalence rates by local authorities in Wales for psychotic disorders are available from the Social Care Wales Dataset.[135]

Rates of psychotic disorder have been found to be higher in men from ethnic groups and higher in black men (3.2%) than men from other ethnic groups. In the 2014 APMS survey it was more common in people who live alone, socioeconomic factors were strongly linked with psychotic disorder (Bebbington *et al* 2016).[136] Interactions between several genetic, social and environmental risk factors appear to be involved, including heritability, family heritage, stressful life events, migration, urban living, cannabis use, other substance use, medication use, early life factors, parental age (>40 years and <under 20 years) and exposure to the protozoan parasite-Toxoplasma gondii (NICE 2021).[137]

**Premature death with severe mental illness:** According to analysis by the Royal College of Psychiatrists Society,[138] more than 26,000 adults with severe mental health illness die prematurely from physical illness each year in England. This would equate to around 1,500 in Wales, not taking into account demographic variation. The report found that adults with severe mental illness are more likely to engage in unhealthy behaviours like smoking and drinking alcohol excessively, they are also less likely to access screening and treatment for a range of reasons including stigma associated with having a mental illness. While cancer is the leading cause of premature death among those with a severe mental illness, it also

significantly increases the risk of dying before the age of 75 across a range of physical health conditions. Adults with severe mental illness are on average:

- 6.6 times more likely to die prematurely from respiratory disease.
- 6.5 times more likely to die prematurely from liver disease.
- 4.1 times more likely to die prematurely from cardiovascular disease.
- 2.3 times more likely to die prematurely from cancer.

The report also found that the mortality gap between those living with severe mental illness and the rest of the population is widening. Over a three-year period from 2015 to 2017, these adults were 4.6 times more likely to die before the age of 75 than those without a severe mental illness. This increased to 4.9 times in the following three years from 2018 to 2020. The College recommends the provision of full annual health checks to everyone with a severe mental illness, comprising blood pressure, blood glucose and blood lipids tests plus BMI weight, alcohol status and smoking assessments.

This will be realised further with targeted therapeutics, tackling the full complexity and multifactorial nature of neurological diseases. Early interventions to prevent disease manifestation and/or progression are also a significant area of interest. Interdisciplinary approaches are also key to the continued advancement of neuroscience. However, more funding directed toward these endeavours is needed to increase the number of successful therapies for the treatment of nervous system disorders.[139]

**Mortality projections:** For the 2020-based ONS interim national population projections (NPPs), annual rates of mortality improvement are assumed to converge to 1.2% for ages 0 to 90 years by 2045 and remain constant thereafter. Annual improvement rates are set to decline linearly from 1.2% to 0% between ages 91 and 109 years. For ages above 110 years, a 0% improvement rate is assumed, as there is little historical evidence of past mortality improvements at the oldest ages. ONS' have produced a prospective new method for setting mortality assumptions for national population projections.[140]

The following table illustrates where there are projected modelled incidence estimates for LTCs in Wales from the Science, Evidence Advice team in Welsh Government and compares this to projected prevalence/incidence from published literature.

**Table 3**

| Long term condition | Projected prevalence/incidence from published literature | SEA incidence projection for Wales |
|---|---|---|
| Coronary heart disease | Uncertain | Increasing |
| Stroke/TIA | Increasing | Falling |
| Atrial Fibrillation | Increasing | Increasing |
| Heart Failure | No evidence found | Increasing |
| Hypertension | Increasing | Increasing |
| Cancer (all cancers) | Increasing | Increasing |
| Bowel Cancer | Increasing | Not produced |
| Lung Cancer | Increasing | Not produced |
| Breast Cancer | Increasing | Not produced |
| Prostate Cancer | Increasing | Not produced |
| Dementia | Increasing | Increasing |
| Type 2 Diabetes | Increasing | Increasing |
| Depression | Uncertain | Increasing |
| Anxiety | No evidence found | Increasing |
| Severe Mental Illness | No evidence found | Not produced |
| Multimorbidity | Increasing | Increasing |
| Asthma | No evidence search undertaken on these conditions | Increasing |
| Rheumatoid Arthritis | | Falling slightly |
| COPD | | Increasing |
| Epilepsy | | Falling |
| Inflammatory Bowel Disease | | Increasing |
| Peripheral Vascular Disease | | Increasing |
| Chronic Kidney Disease | | Increasing slightly |
| **Risk factor** | | |
| Obesity | Increasing | Increasing |
| Smoking | Falling | Falling |

**Note:** Some of the estimates from published literature were for incidence, some were for prevalence, but there were no examples where they diverged, e.g. incidence falling but prevalence increasing or vice versa. However, stroke prevalence may be increasing at the same time as incidence is falling due to increased survival and increased diagnosis of strokes and TIAs.
For many of these conditions annual data is produced through the QAIF disease register publications (**GMS contract (gov.wales)**)

## Policy Implications – Long-Term Conditions (LTCs)

- Services should be developed to support efficiency in treating those with multi- and complex- morbidity, using evidence on morbidity clusters to align service provision. Priority should be given to public health interventions that have been shown to achieve improvements in multiple conditions.
- Use of an Electronic Frailty Index in Wales would support the identification of service needs to support frail patients and allocation of NHS resources. Focussing investment in rehabilitation and reablement services through integrated personalised care in the community as well as broader efforts to support people to maintain healthy ageing would reduce the progression of frailty.
- Investigate what, if any, circumstances earlier in life may lead to diagnoses of CHD, dementia and hypertension years or even decades later, to inform primordial prevention. Any countervailing measures identified may take a similarly long time to produce results, pushing benefits beyond the NHS in 10 years timeframe.
- Many LTCs (including CHD, atrial fibrillation, stroke, some cancers and type 2 diabetes) are modifiable through structural measures and individual lifestyle changes; emphasis on prevention including the value of exercise could impact on the trajectory of projected prevalence. Having an affordable healthy food system will also make a big difference.
- Implementation of targeted awareness campaigns, specific prevention drives, and health board collaboration will likely strengthen early detection, intervention, and accessibility to a range of hearing healthcare services, promoting equitable outcomes for individuals from deprived backgrounds. For instance, increasing use of statins and antihypertensives to prevent heart disease, or encouragement/provision of eyesight/hearing tests in areas of lower deprivation would potentially lead to lower future incidence.
- Earlier diagnosis of osteoporosis, peripheral vascular disease, chronic obstructive pulmonary disease, heart failure, atrial fibrillation, chronic kidney disease, stroke and transient ischaemic attack and diabetes may permit the condition to be managed with lifestyle changes or cheaper home care, reducing long-term NHS costs. This could reduce the progression or even reverse certain LTCs, but over-medicalisation of conditions (for instance, creating new definitions of prediabetes) is also a risk.
- Initiatives and research to identify, measure and reduce the impact of MSK conditions for individuals would have broader societal and economic benefits in Wales. MSK should be considered as a major cause of disability and an important component of multimorbidity to reduce the overall burden of MSK and improve the quality of (working) life of individuals.
- The conditions epilepsy, inflammatory bowel disease and rheumatoid arthritis are not diagnosed very often due to difficulties in detection and symptoms being similar to other conditions (in comparison to the other conditions studied). Investigate the average cost per year living with a diagnosis and average years of life remaining at time of diagnosis to inform the cost-effectiveness of interventions for these conditions.

- The conditions asthma, depression, anxiety disorders are associated with diagnosis at young age. Investigate causes of the fall in asthma diagnoses in the period from 2000 to 2020. If the same circumstances could be brought about again then that fall might be repeated. Understanding more about genuine prevalence of anxiety and depression and how much increased diagnoses are related to increased screening and reduced stigma.
- Improve access to public health and treatment services for adults with severe mental health to reduce preventative premature death across a range of physical illness.
- Compare risk factors (e.g. blood pressure control, smoking, obesity) pre- and post- pandemic to identify pandemic-changed behaviours that may affected future diagnosis rates.

# 5. Risk Factors

## Topline Summary

- Nearly a quarter (21%) of all people in Wales are living in relative income poverty. This is lower than earlier years: for the period 2001 to 2021 the percentage varied in the range 22% to 25%.
- The ongoing cost of living crisis is likely to deepen existing inequalities in health. This is likely to worsen in colder months when increased energy bills take up a greater proportion of household incomes.
- Low socioeconomic status, unhealthy diet, physical inactivity, social and psychological factors such as low self-esteem or depression are influential factors for obesity.
- The ability of lower-income households to access (nutritional) food and wider cost of living impacts on mental health therefore has the potential to drive further increases in the proportion of the Welsh population who are classed as overweight or obese.
- Obesity estimates vary across studies however an increase in obesity in Wales is projected by 2025 and 2035. Obesity in the UK is expected to reach maximum levels between 2032 and 2038 among men, and between 2031 and 2037 among women. In 2060, obesity prevalence is expected to decline.
- Obesity is a risk factor for many long-term conditions including diabetes, dementia and hypertension.
- Adult smoking rates in Wales demonstrate a decreasing trend over time but this is still a major cause of ill health.
- Smoking is a risk factor for many long-term conditions including many cancers, CVDs and dementia and this may be exacerbated by occupational exposures to smoke and dust.
- There is a strong case for investment in prevention activity, to prevent premature death from some LTCs, to reduce the intergenerational impact of risk factors and support continued healthy and independent living in later years.

**Poverty:** According to surveys and modelling conducted by the Resolution Foundation[141] in November 2022, 45 per cent of respondents, or 24 million people, are quite worried or very worried about their energy bills over the winter months, but this rises to 63 per cent of workers in the bottom income quintile, and 62 per cent of those paying their energy bills using a pre-payment meter (PPM) (compared with 43 per cent of people who pay energy bills using direct debit). 28 per cent (up from 9 per cent pre-pandemic) of adults say that they could not afford to eat balanced meals, and 11 per cent or 6 million adults (up from 5 per cent pre-pandemic) reported being hungry in the past month because they lacked enough money to buy food. 23 per cent of those receiving means-tested or disability benefits are severely food insecure this winter, up from 4 per cent pre-pandemic. Similarly, rates of food insecurity are much higher among families with three or more children, single parent families, and among certain non-white ethnic groups. The percentage of people facing emotional distress has increased from 40 per cent in October 2021 to 47 per cent in November 2022. Those receiving state benefits (excluding Child Benefit or the state pension) are increasingly in emotional distress, with 64 per cent affected, compared to 42 per cent for those who do not receive any benefits.

In summary, they found that especially lower-income households have had to cut back on overall spending, and there are large increases in people who are unable to afford essentials. Rising costs are expected to have long-term impacts on health and finances, as people are increasing their debts, and mental health has worsened since the pandemic. The crisis is expected to continue and deepen for now, but to ease by 2024. The cost-of-living crisis may have a lasting impact on the UK economy.

The latest data[142] on relative income poverty in Wales for the period up to March 2022 found that:

- Between financial year ending (FYE) 2020 and FYE 2022, 21% of all people in Wales were living in relative income poverty. This is an improvement on earlier years: for the period 2001 to 2021 the percentage varied in the range 22% to 25%.
- Caution is advised when looking at year on year changes: changes in a short timeframe are unlikely to be statistically significant.
- Relative income poverty relates to people (whether children, working-age adults or pensioners) living in households that have a household income below 60 per cent of the UK median household income before and after housing costs are paid.

Future advice papers from PHW include:

- Housing warmth and health & wellbeing in Wales survey The impact of cold homes on people's health in Wales: Results from lived experience engagement.
- Cost of Living Survey results: a population survey focused on the rising cost of living in Wales.

**Obesity:** The Health and Care Research Wales Evidence Centre provided a Rapid Evidence Map of the available evidence for forecasted prevalence and incidence of chronic and long-term conditions in Wales, including obesity. Nine modelling studies were identified that provided estimates for the projected prevalence of obesity[143] and/or morbid obesity. Three studies provided projections for Wales, one of these included Wales as part of a wider European study (Pineda *et al.* 2018).[144] The data sources included National Heath Surveys (HSE, Welsh

Health Survey) and population-based administration datasets (WHO Global Health Observatory data, NCD-RisC 2017 data, WHO BMI database). Additionally, one national (Wales) dataset was identified that provided projected prevalence estimates for obesity (self-reported height and weight which was used to calculate BMI and overweight as a BMI of 25+ and obese as a BMI of 30+) (Public Health Wales Observatory 2018b).[145]

The evidence mapping found that obesity rates across the UK have been rising steadily in recent years; between 1993 and 2011, obesity rates in the UK rose from 13% to 24% in men and from 16% to 26% in women (NICE 2023h).[146] Also that the projected trend in prevalence of obesity will continue to rise in the UK with 46% of adults predicted to be obese by 2035 (World Obesity Federation 2023).[147]

In 2020 it was reported that 61% of adults in Wales were classified as overweight or obese; including 36% who were overweight, 22% who were obese and 3% who were morbidly obese.[148] This rising trend will continue; by 2025, it is estimated that the percentage of adults in Wales who are overweight or obese will increase to approximately 62.2% (Public Health Wales Observatory 2018a).[149] Obesity estimates vary across studies however an increase in obesity in Wales is projected by 2025 and 2035. Obesity in the UK is expected to reach maximum levels between 2032 and 2038 among men, and between 2031 and 2037 among women. In 2060, obesity prevalence is expected to decline Janssen *et al.* 2020).[150]

According to NICE, Obesity can be influenced by lifestyle factors such as food and drink consumption, physical inactivity, social and psychological factors such as low self-esteem or depression, obesity-related genes including the gene which controls the production of leptin, medical conditions and certain medications. Other risk factors include age, menopause, prior pregnancy, sleep deprivation, less formal education and low socioeconomic status (NICE 2023i).[151]

**Smoking:** The Health and Care Research Wales Evidence Centre provided a Rapid Evidence Map of the available evidence for forecasted prevalence and incidence of chronic and long-term conditions in Wales, including smoking. One modelling study was identified that provided estimates for the projected prevalence of smoking.[152] Additionally, one national (Wales) dataset was identified that provided projected prevalence estimates for smoking (estimated smoking prevalence projection based on 15 year olds already smoking, 16+ year old starting to smoke and the 16+ population that quit each year. (Public Health Wales Observatory 2018b).[153] The data sources were provided by the Welsh Health Survey, Welsh Government and the ONS.

The evidence map found that smoking rates across the UK demonstrate a decreasing trend over time. In 2018, using data from the Welsh Government's Welsh Health Survey and the ONS, PHW Observatory estimated that smoking prevalence of all persons aged over 16 years in Wales will be 13.3% by 2039 assuming no change in the numbers of people starting or quitting smoking (Public Health Wales Observatory 2018).[154] More recent analysis carried out by PHW using the National Survey for Wales has found the declining trend has meant smoking prevalence in Wales is currently lower than the previous smoking prevalence projection of 13.3% by 2039. Updated projections suggest by 2030-31 smoking prevalence in Wales could be around 8% and less than 5% by 2035-26 if the trend continues to decline at the current rate.

Some caution is required when interpreting smoking data as self-reported smoking rates are usually slightly lower than the actual number due to people not always being truthful in their responses. However, the downward trend is likely to be correct. It is also important to note that the data included here is not related to smoking e-cigarettes and vaping. More research is required to identify whether e-cigarettes are replacing cigarette smoking, particularly in younger smokers.

**The case for Prevention:** There are strong health and economic arguments for investment in interventions that would prevent the development or progression of some long-term conditions and risk factors. Around 5% of total UK Government healthcare expenditure is attributed to 'preventive healthcare'.[155] Internationally, this figure is in the range of 12%.[156] According to the WHO, around 80% of premature death is from four non-communicable diseases (NCD) (cardiovascular diseases, cancers, chronic respiratory diseases and diabetes) much of which is preventable through the modification of lifestyle factors (tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets) that increase the risk of dying from an NCD.[157] A 2017 systematic review by Masters *et al.* suggested that local public health interventions are cost-saving, and offer substantial returns on investment, nationwide programmes even more so. The review found that for every pound invested in public health interventions at a local level averaged a return on investment of £4 plus the original investment back.

However, 'upstream' interventions delivered on a national scale generally achieve even greater returns on investment, particularly legislation.[158] A review of the cost effectiveness of public health interventions examined by the National Institute for Health and Care Excellence (NICE) found that 75% have a cost per QALY below the payer threshold used for new drugs (£20,000 per QALY[159]).[160]

Interventions during children's earliest years can yield powerful benefits. A 2020 study[161] found that adverse childhood experiences (ACEs) impose a substantial societal burden in England and Wales. The greatest ACE-attributable costs were for mental illness (anxiety, depression and other mental illness; England and Wales, £11.2 billion) and cancer (£7.9 billion). The majority of costs related to exposures to multiple rather than a single ACE (ranging from 71.9% for high body mass index to 98.3% for cancer). Policies and practices that prevent ACEs, build resilience and develop trauma-informed services are needed to reduce burden of disease and avoidable service use and financial costs across health and other sectors.

Two reports by the Centre for Health Economics and Medicines Evaluation at Bangor University make recommendations for investment in prevention activity in early years and in our older populations much later in life. With regards to early years,[162] it is noted that interventions are by their nature long-term commitments but can address or eliminate the damaging social problems later in life, which have substantial costs associated with them. The report suggests that based on international evidence, investment that focuses on the critical window of the first few years of life is likely to provide the most efficient use of public resources, yielding returns over and

above other forms of financial investment and investment at other points of the life course. The authors recommend a joined-up approach to public services that should adopt a long-term focus with a shift from treatment to prevention, making the best use of technology, by sharing data, addressing problems to be more efficient and save money.

Welsh higher education institutions should continue to be supported to make a significant contribution to the international evidence on the effectiveness and cost effectiveness of programmes and practice relating to early years.

For our older population, the report[163] recommends Wales needs to focus attention and investment on several areas:

- Fully integrated health and care services;
- Maintaining physical and mental wellbeing in older age, with a focus on reducing social isolation and loneliness;
- Maintaining services to promote prevention (particularly falls prevention), rehabilitation and reablement;
- Investment in sustainable homes, transport and communities; and
- Support for informal carers.

The authors suggest that programmes that enable working for longer, facilitating volunteering, promote exercise and improve balance can be cost-effective in terms of improving physical and psychological wellbeing therefore reducing falls and associated need for hospital and community care, supporting working parents through care of grandchildren, reducing loneliness, and supporting formal and wider community services. Many older people are themselves informal (unpaid) carers and can be a key factor that can keep someone at home or prevent admission to hospital or residential care therefore reducing NHS costs.

There is an economic case for making support for older carers a priority in Wales as there are more unpaid older carers in Wales than in any other part of the UK. Additionally, local transport systems that can support active travel, including walking and cycling, provide wider economic benefits such as grandparents able to actively take part in the care of dispersed grandchildren. Maintaining funding across prevention, rehabilitation and reablement, for example by adapting the homes of older people ensuring warm and safe homes, can provide economic benefits by promoting independent living; reducing the need for hospital admissions; facilitating earlier discharge from hospital, and reducing demands on health and social care services.

It is also worth considering the impact the allied health professional workforce can have on preventing long-term conditions. The UK faces recruitment shortages of nurses and high demands and workforce pressures on GPs.[164] There is great potential to provide opportunities for a growing allied health professional workforce to take on additional responsibilities in primary care. It has been proposed that the use of non-medical health professionals and allied health professionals in primary care could potentially enhance efficiency, increase service capacity and improve access to care by reducing GP workload allowing GPs to focus on more complex or difficult cases.[165] There is evidence that the use of allied health professionals can positively impact health inequalities, albeit indirectly.[166]

In 2019, the UK government committed to increasing the number of other staff providing patient care in general practice (e.g., pharmacists, social prescribing link workers and physiotherapists) by 26,000 by 2024.[167] In England, staff are being recruited to Primary Care Networks through funding via the Additional Roles Reimbursement Scheme (ARRS).[168] In Wales, an additional £5 million in funding was announced in January 2023 to increase the number of allied health professionals in Wales and increase access to community-based care to help people remain active and independent.[169] There is also the Strategic Programme for Primary Care[170] which includes the development of allied health professional collaboratives across Wales and links with the Allied Health Professions Framework for Wales, which aims to increase the range of professions in primary care (e.g., dietetics, speech and language therapy and arts therapy), improve access and increase visibility of allied health professionals.[171]

Given the breadth of skills and knowledge available from allied health professionals working in primary care settings it is imperative that the health and care system is viewed as a whole. The All-Wales Primary and Community Care Allied Health Professions (AHP) Workforce Guidance: Organising principles to optimise utilisation[172] provides the organising principles and actions required for the whole health and social care system to achieve the ambition for well-integrated services, rooted in the community, with the full range of practitioner levels and prudent optimisation of allied health profession skill set and skills mix. It is also crucial that psychological services and therapies are included in this future vision. In England, Improving Access to Psychological Therapies (IaPT) for long-term conditions was shown reduced costs and readmissions.[173] In Wales, the Trauma Informed Wales Framework takes account of the impact of adverse events in clinical histories of those with long-term conditions.[174]

## Policy implications – Risk Factors

- Focus on structural interventions that change the environment in which health is created, and reduce the risk of unhealthy behaviours like smoking, poor diet, drug and alcohol use, and lack of physical activity.
- A more population segmentation approach to NHS delivery and monitoring, and investment in primary and community care, especially in deprived areas would support most affected groups and tackle health inequalities.
- Focus on prevention informed by social and behavioural science to reduce the influence of lifestyle risk factors on healthy outcomes.
- Develop or adapt existing evidence-informed interventions that seek to address the lifestyle factors identified that influence healthy weight outcomes, targeting approaches to specific population groups.
- Continue to develop smoking cessation programmes sensitive to the needs of specific population segments to support continued decreases in smoking prevalence. Updated modelling to understand future trends in smoking based on more recent data would help to inform targeted approaches.
- Consider cost of living impacts within all health promoting policies and approaches, developing means to support lower socio-economic groups to reduce the impact of risk factors to reduce the risk of developing longer term conditions.
- The impacts of extreme weather on at risk population groups should be explored and policies developed to mitigate these impacts.
- Investment in prevention activity is likely to yield long-term financial gains where they are evidenced to support healthier outcomes over the life course of individuals, particularly in early years.
- Look for opportunities to include the allied health profession workforce in the prevention of poor health and increase access and efficiency in primary care services.

# 6. Supply: NHS staff, beds, social care

## Topline Summary

- Despite reductions in the time spent in hospital, there will be significant increases in needs for full-time equivalent NHS staff in 2030-31 relative to 2021-22 to deliver 2018-19 rates of care although changes in technology and workforce composition may mitigate some of these increased needs.
- Reductions in the average length of hospital stay are also likely to require additional capacity in general practice, community care and adult social care.
- An overall workforce supply gap already exists for registered nurses and general practice patient care staff. This is likely to increase until 2024-25 before declining gradually by 2030-31; demonstrating a persistent shortfall of FTE GPs and general practice nurses.
- The rate at which people develop social care needs by age can change therefore an ageing society does not necessarily lead to comparable increases in the number of people with social care needs.
- However, individuals with a social care need typically also have several long-term conditions with neurological conditions associated with the highest levels of social care need and dementia being the most prevalent.
- The number of people aged 65 and over requiring unpaid care is growing.
- The COVID-19 pandemic has highlighted the fragility of the NHS, and it is crucial to address underlying issues relating to waiting lists to ensure the sustainability of the service in the future.
- Addressing waiting times for elective treatments will reduce patient-years and could also result in significant economic benefits due to increased productivity and reduced consumption of medical care. The most impacted group by reduced waiting times is estimated to be those aged 55-74.
- Exercise, education, smoking cessation, and psychological interventions can benefit patients awaiting elective surgery. However, the response to preoperative interventions may vary between different patient subgroups.

**Workforce:** There was an increase in Wales NHS staff per 100,000 population (Wales NHS organisation staff, full-time equivalent, General Medical and Dental Practitioners excluded) in the period 2011 to 2022 (Source: SEA analysis associated with SEA paper 'NHS staff per capita'). 'Doctors' (medical and dental staff) rose from 191 per 100,000 to 244 per 100,000; 'Nurses' (nursing, midwifery and health visiting staff) rose from 1,013 per 100,000 to 1,160 per 100,000. The upward trend was smooth, with only a slight temporary nursing rise associated with COVID-19 in June 2020 before returning to the whole-period upward trend. This upward trend makes sense in the context of the age-group trends shown in Figures 1a, 1b, 1c: treatment requirements increase as populations trend older. Some of the staff counted were employed at all-Wales bodies (such as Public Health Wales, Health Education and Improvement Wales, Digital Health & Care Wales, NHS Wales Shared Services Partnership) rather than at local health boards.

Going forward, workforce shortages are the biggest single challenge facing the NHS and adult social care even if Official Statistics[175] show that there are nearly 20,000 more staff directly employed in the NHS in Wales now than 10 years ago and this upward trend has continued in recent years. The Health Foundation[176] projects that in a scenario that assumes continued, but slower, reductions in the time spent in hospital, NHS England would need around 314,000 more full-time equivalent NHS staff in 2030-31 relative to 2021-22 to deliver 2018-19 rates of care. This equates to 17,000 for Wales, scaling by population numbers. This projection accounts for potential improvements in productivity from reductions in average length of hospital stay and higher rates of day case procedures as these could make a substantial difference to the number of additional staff that the NHS will need over the coming decade. The projections do not account for other variables that could influence productivity, such as changes in technology and workforce composition. Delivering lower average length of stay and higher day case rates without affecting quality and safety will be challenging and will rely on having effective integrated care, rather than simply a focus on hospital processes and flows. Further reductions in the average length of hospital stay are also likely to require additional capacity in general practice, community care and adult social care.[177]

A more in-depth analysis of workforce supply and demand in England up to 2030-31 by the REAL Centre[178] focused on two staff groups: registered nurses (across all sectors by focussing on the Hospital and Community Health Service (HCHS)) and general practice patient care staff. The findings point to an overall workforce supply-demand gap of around 103,000 FTE across the NHS HCHS and general practice in 2021-22 (around 7% of estimated FTE workforce demand). This gap is projected to increase to around 179,000 FTE by 2024-25 before declining gradually to a still substantial 156,000 FTE in 2030-31 (around 9% of projected demand).[179] If we apply this England based analysis to Wales, this equates to 6,000 in 2021-22, 10,000 by 2024-25 and 9,000 in 2030-31. In all scenarios, the projections report a persistent shortfall of FTE GPs and general practice nurses. In the pessimistic case, the GP supply-demand gap grows to around 18,900 FTE by 2030-31 – nearly 1 in 2 GP posts (48%) based on projected demand. This equates to 1,000 in Wales.

The Wachter paper[180] reports that the workforce is critical to the successful implementation and use of health information technology (HIT). HIT can be complex and difficult to use, so clinicians and other healthcare workers need to be trained on how to use it effectively. The workforce also needs to be prepared for the changes that HIT will bring to healthcare. HIT can automate tasks, change the way care is delivered, and create new opportunities for collaboration. The workforce needs to be able to adapt to these changes and to use HIT in a way that improves the quality and efficiency of care. The paper identifies a number of workforce challenges that need to be addressed in order to achieve the full potential of HIT.

These challenges include:

- A shortage of skilled clinicians and other healthcare workers.
- A lack of training on how to use HIT effectively.
- Resistance to change.
- The need for new roles and responsibilities.

The paper makes a number of recommendations to address these workforce challenges. These recommendations include:

- Investing in workforce development.
- Providing training on how to use HIT effectively.
- Creating a culture of change.
- Developing new roles and responsibilities.

The paper concludes by stating that the workforce is essential to the successful implementation and use of HIT. By addressing the workforce challenges identified in the paper, ensures that HIT is used to improve the quality and efficiency of care. Digital literacy for health and care staff is a priority, as they not only need these skills for their own work but also to advocate for digital health with patients and service users. If staff lack knowledge and confidence in using digital health resources, they may not promote digital tools to patients effectively, hindering digital inclusion.

The Digital Inclusion and Health in Wales[181] reports that the NHS has a great opportunity to use health IT to improve the quality, safety, and efficiency of healthcare. However, the report also warns that the NHS must be prepared to invest in the development of a skilled workforce, interoperable and secure systems. The report emphasises the importance of ensuring that health IT systems are easy to use and aligned with the needs of patients and clinicians.

Digital literacy for health and care staff is a priority, as they not only need these skills for their own work but also to advocate for digital health with patients and service users. If staff lack knowledge and confidence in using digital health resources, they may not promote digital tools to patients effectively, hindering digital inclusion. In addition to frontline staff, there is a need to develop digital leaders who can drive the information and technology transformation in the NHS. There is a need to evaluate the impact of health IT on the quality, safety, and efficiency of healthcare, and to share the lessons learned with other organisations.

**Social Care:** A paper by the Health Foundation[182] illustrates the complexities of predicting future demand for health and social care services in England. In the next 25 years, the number of people older than 85 in England will double to 2.6 million; this would equate to 0.1 million in Wales. An ageing population has caused an increased need for health and social care services overall but an ageing society does not necessarily lead to comparable increases in the number of people with social care needs. This is because the rate at which people develop social care needs by age can change. The proportion of people aged 85 and older with a social care need fell from 49% in 2006 to 43% in 2018. However, people with the highest needs have seen their needs become increasingly complex – an individual with a social care need typically also has several long-term conditions with neurological conditions associated with the highest levels of social care need and dementia being the most prevalent. National trends are patterns and trends are likely to vary for different population groups and in different areas of the country. The paper goes on to say that to ensure people receive coordinated services that meet their needs, integrated care systems will need a sophisticated understanding of need in their populations, based on evidence and analysis of joined-up datasets. To be able to plan future service delivery effectively, policymakers will need to understand how changes in population structure will impact overall demand.

Between 2007 and 2032, the number of people aged 65 and over in the UK who require unpaid care is projected to have grown by more than one million. Supporting these unpaid carers to balance other competing responsibilities, particularly work, will help meet the increasing demand for unpaid carers.[183]

**Beds:** Public Health Wales have analysed hospital beds data from the early 2000s to financial year 2018-19. As the data included do not include the COVID-19 pandemic period the trends presented in the work are based on pre-pandemic scenarios. As a result, the scenarios would likely result in a worsened outlook if more recent data was used. ONS population projections were used to calculate the projections. These projections do not account for the Census 2021 which fell below the projection trend therefore the projections included in the research may benefit from revisions once the updated population projections are available.

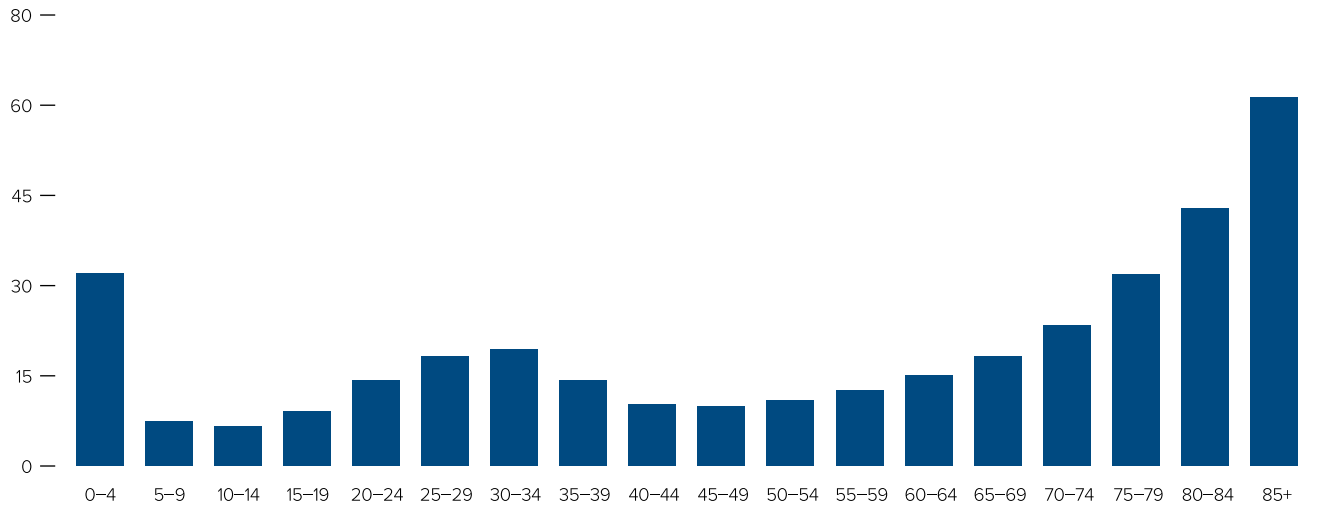
Occupancy has risen in Wales from around 83% in 2003-04 to 87% in 2018-19, According to NICE, occupancies above 90% should be avoided to minimise associated risks.[184] The fall in beds has been most marked for non-acute beds.

For episodes ending in 2018-19 there were 3.46 million inpatient bed days. Of these, 2.58 million resulted from emergency admissions, and 0.89 million from non-emergency admissions. Emergency admissions have risen substantially and fairly consistently over the period analysed. Within non-emergency admissions, inpatient non-emergency admissions have fallen while day-case admissions have risen, reflecting a shift towards treating elective patients as day-cases. For stays with a discharge episode in 2018-19 the mean length of inpatient stay was 6.6 days.

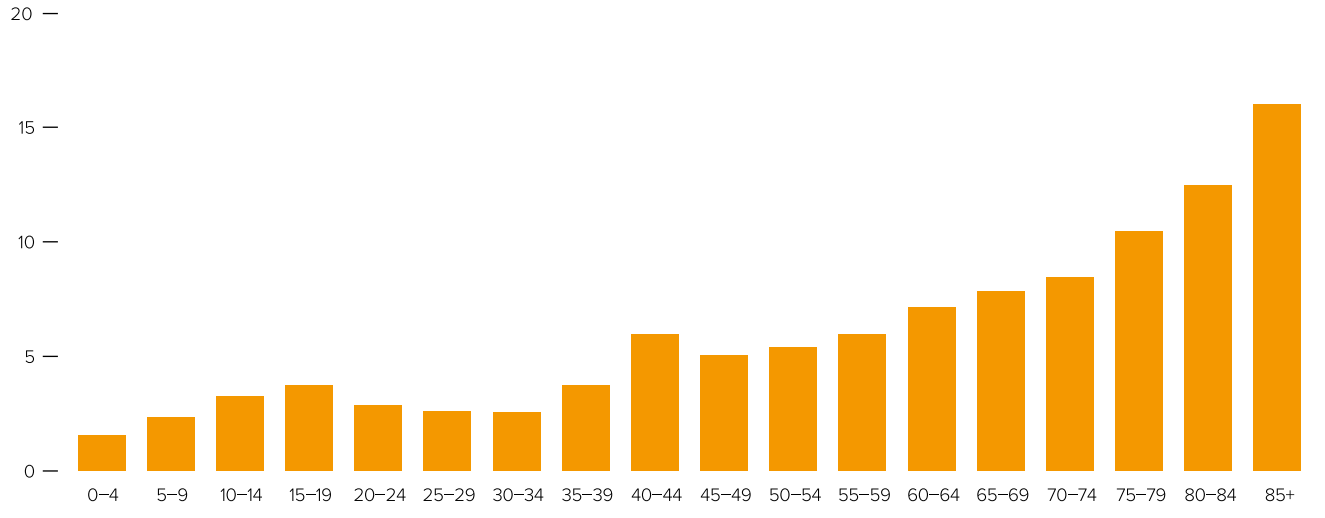
Older people are more likely to be admitted as inpatients than younger people and stay for longer when they are admitted. With an ageing population the pressure on services could be increased in the coming years. This is however just one aspect of the population profile, the demand for services may also be impacted by other factors such as morbidity rates.

## Figure 8

### Inpatient admissions per 100




### Mean length of inpatient stay (days)




*Based on calculations using data from Patient Episode Database for Wales and ONS population estimates.*

PHW used two different approaches to project inpatient bed demand:

The first approach suggests an 18% rise in inpatient bed days by 2030-31 relative to 2018-19 (~2,000 inpatient beds at 87% occupancy). Using the second approach inpatient bed days are projected to remain broadly stable. This represents an optimistic scenario, where it is assumed that it is possible to build further on gains in efficiency achieved over 2000s-2010s e.g., more elective inpatient treatment transferred to day-case; length of stay falls further. This may not be possible (e.g., if "low-hanging fruit" for day-case procedures already transferred). Projecting possible future scenarios is inherently uncertain, and this modelling has important caveats (e.g., around measurement of hospital activity, and non-incorporation of changing morbidity rates).

All data included in the analysis conducted by PHW is based on annual averages, therefore not accounting for within-year variation. Due to this it could mean that occupancy reaches critical occupancy levels are regularly reached at certain times of the year which are balanced out by lower occupancy periods when averaged.

In the years analysed the use of inpatient care, including a shift of elective treatment from inpatient to day-case and falls in length of stay have mitigated issues faced by an ageing population but there is uncertainty around whether this can be maintained with the pace of the ageing. Inpatient activity is just one branch of the hospital activity which interplays with other activities such as procedures and outpatient appointments.

**Ambulance callouts:** In total, there are currently over 300 response vehicles (including an air ambulance helicopter) based in 90 ambulance stations across Wales. (Source: **Welsh Ambulance Services NHS Trust**).

Considering the years 2016-17 to 2022-23 (April to March), 2021-22 had the highest emergency calls at 481,294. The highest month for emergency calls was December 2017 with 44,946 (December 2019 was similar with 44,645). (Source: **Emergency ambulance calls StatsWales**).

Since 1 October 2015, calls were categorised by type – red, amber, and green. Red calls are deemed as immediately life-threatening, amber calls often need treatment at the scene and may need to be taken to hospital, whereas green calls are non-urgent and clinical telephone assessment.

Considering the years 2016-17 to 2022-23 (April to March) the highest month for red emergency calls was December 2022 with 5,949. (Source: **Emergency ambulance calls StatsWales**).

Red calls have been increasing, whereas green calls have been following a decreasing trend over time. It is expected that there is an overall positive correlation between population and number of emergency ambulance calls; extending the overall trend in calls to mid-2033 using a population growth estimate from ONS that was rebased to 2021, the number of red and amber calls would be estimated between 344,000 and 413,000 for the year. It is estimated that the total number of red, amber and green calls during the year 2033 could be between 454,000 and 489,000 (compared with 446,832 in the year 2022), or an increase of around 6%.

Note that there could be a bigger increase in emergency calls over all in future than that estimated due to the distribution of population being weighted more towards the elderly, for example there could be an increase in calls due to elderly falls, but perhaps future funding in falls prevention services would be a more appropriate way to tackle this potential issue than the use of emergency calls for an ambulance.

For comparison, the projected emergency call numbers using population growth figures that were not rebased to 2021 have been included in Appendix C.

**Waiting lists:** The COVID-19 pandemic has caused a significant delay in surgical waiting times, leading to negative impacts on patient health outcomes. A paper by the Commission on Health and Prosperity[185] describes how the COVID-19 pandemic has caused disruptions to routine healthcare services and that an estimated 7.8 million people have not accessed healthcare services in England. The number of people waiting for elective healthcare in England is at a record high, with around 1 in 8 people waiting for elective care, resulting in a substantial amount of unmet need. The paper argues there is a moral and economic case to reduce NHS waiting lists, as those waiting for treatment are experiencing a poorer quality of life and may suffer from mental health problems. The NHS Delivery Plan for tackling the COVID-19 backlog of elective care was introduced to minimise all waits of over 12 months and deliver 30% more elective activity by 2025. The modelling presented in this paper suggested that this will not be achievable without further policy intervention, requiring sustained Government effort across the NHS, adult social and community care.

The modelling suggests that if the plan is implemented successfully, waiting times for elective treatments will reduce by a total of 17m patient-years between 2023 and 2027. This could also result in an economic benefit of around £80bn over the same period due to increased productivity and reduced consumption of medical care. The most impacted group is estimated to be those aged 55-74 who make up a large proportion of the waiting list. The report offers ideas and recommendations to accelerate recovery, which policymakers can consider to progress on the immediate health crisis.

The Institute for Fiscal Studies (IFS)[186] has published a report on the backlog of NHS waiting lists caused by the COVID-19 pandemic in the UK. The report highlights that the number of people waiting for treatment has risen to unprecedented levels, and even with the government's funding and measures to tackle the issue, it could take years to clear the backlog. The IFS recommends that the government should set out a long-term plan for the NHS that addresses the root causes of waiting lists, rather than just focusing on the backlog. They suggest that this could include more investment in social care and public health, increasing the NHS workforce, and adopting new technologies to improve efficiency. The report also warns that the COVID-19 pandemic has highlighted the fragility of the NHS, and that it is crucial to address these underlying issues to ensure the sustainability of the service in the future.

The table below sets out the scenarios for waiting list treatment volumes.

**Table 4 – Scenarios for waiting list treatment volumes**

| Scenario | Annual Growth | Level in 2024-25 relative to 2019-20 | Level in 2024-25 relative to 2019-20, including NHS-E advice and guidance target |
|---|---|---|---|
| Achieve target | 10.3% | 120.9% | 128.8% |
| Medium growth | 5.9% | 112.0% | 120.0% |
| Sluggish growth | 2.9% | 106.2% | 114.2% |

A rapid review[187] was conducted in order to address the backlog in elective surgeries in Wales and to identify innovative approaches to support patients on surgical waiting lists. The review focused on existing systematic reviews from 2014 to 2021, with most evidence coming from orthopaedic surgery reviews. The findings suggest that exercise, education, smoking cessation, and psychological interventions can benefit patients awaiting elective surgery. However, further research is needed to understand how different patient subgroups respond to preoperative interventions, especially those from underserved and minority ethnic groups, more deprived groups, and those with lower educational attainments. Additionally, the impact of the pandemic on the effectiveness of these interventions remains unclear.

A rapid review[188] on the effectiveness of service delivery interventions for adult orthopaedic patients on a surgical waiting list found that none had specifically addressed the impact of the COVID-19 pandemic on surgical waiting lists or initiatives like Getting it Right First Time (GIRFT). The review focused on identifying supply-side service delivery innovations to help reduce the backlog of adult orthopaedic patients on surgical waiting lists in Wales. Seventeen primary studies were identified, conducted between 1991 and 2017, from various countries that mainly used before-and-after study designs to measure outcomes related to waiting times, frequency of surgical procedures, cancellation rates, and throughput proxies.

The Welsh Government is developing plans to keep people well while they wait through cluster working in primary and community care combining GP, dental and optometry services. However, we also need to look to opportunities to invest in preventative and early-stage approaches so people do not enter the waiting list at all.

Future advice papers from PHW include:

- Education Prehabilitation Interventions for patients on surgical waiting lists.
- Maximising uptake of prehabilitation interventions.

**Palliative Care:** An analysis of mortality statistics for England and Wales from 2006 to 2014 estimated that by 2040 approximately 75% of people approaching the end-of-life may benefit from palliative care.[189] This would equate to 160,000 more people in England and Wales needing palliative care. The study built on previous diagnosis-based approaches, calculating age- and sex-specific proportions of deaths from defined chronic progressive illnesses to estimate the prevalence of palliative care need in the population, with separate projections for dementia, cancer and organ failure. If age- and sex-specific proportions with palliative care needs remain the same as in 2014, the number of people requiring palliative care will grow by 25.0% (from 375,398 to 469,305 people/year). However, if the upward trend observed from 2006 to 2014 continues, the increase will be of 42.4% (161,842 more people/year, total 537,240). In addition, disease-specific projections show that dementia (increase from 59,199 to 219,409 deaths/year by 2040) and cancer (increase from 143,638 to 208,636 deaths by 2040) will be the main drivers of increased need. The authors recommend that healthcare systems must now start to adapt to the age-related growth in deaths from chronic illness, by focusing on integration and boosting of palliative care across health and social care disciplines.

The location in which palliative care is required also requires consideration. For the period week 1 2020 to week 14 2023, 29% (35,600) of all registered deaths in Wales have occurred in private homes (Source: **ONS Deaths registered weekly in England and Wales, provisional superceded 25 April 2023**). In 2023 up to 7 April (weeks 1 to 14) the number of deaths which occurred in private homes in England and Wales was 21% above the five-year average. Above average death in private homes has been a consistent trend since the start of the pandemic.

## Policy Implications – NHS supply

- Healthcare systems need to adapt to the age-related growth in chronic illness, by focusing on integrated and coordinated services that meet individual needs rather than simply on hospital processes and flows. This will require a shift in the development of care pathways, with more emphasis placed on prevention, primary, community and social care and a deep understanding of how changes in population structure will impact overall demand.
- Achieving reductions in the average length of hospital stay is likely to require additional capacity in general practice, community care and adult social care. Overall NHS workforce gaps are projected to persist; the potential value of a volunteer workforce (especially the older population) should be considered, also providing wider societal benefits to the volunteer.
- Increased needs for palliative care will require the boosting of these services across health and social care disciplines.
- The location of palliative care services should be considered, as more people may be managed at home therefore increasing needs in primary care and access to specialised services.
- Planners should seek to address the root causes of waiting lists, rather than just focusing on the backlog; this could include more investment in social care and public health, increasing the NHS workforce, and adopting new technologies to improve efficiency.
- Any changes to NHS service approaches could yield economic benefits due to increased productivity and reduced consumption of medical care.
- Consider increasing capacity to respond to the projected increase in ambulance callouts.
- Planning for future increased NHS bedspace should be considered but this need could be mitigated through public health interventions that reduce demand in younger age groups and increased use of treatments that can be administered in community and primary care.

# 7. Economic Considerations

## Topline summary

- The NHS Wales is under significant pressure from restricted capacity, increasing patient needs and a growing older population.
- There is a recognised funding gap in Wales. Spending on health care per person in Wales similar to that in England, but is less than the per person average spend of the EU-14.
- The UK also spend approx. 55% less on capital health spending (e.g., vital buildings, technology and equipment) than the EU-14.
- The health of the population impacts prosperity, both individually and at a national level. Poor physical and mental health was associated with a drop in annual earnings pre and post-pandemic.
- The onset of physical or mental ill health was shown to increase the likelihood of employment exit across all working ages. The exit from employment was more significant for lower earners and women.

The Health and Care Research Wales Evidence Centre (HCRW EC)[190] included economic evidence in their evidence mapping exercise, which highlighted the following.

Mental Health problems cost the Welsh economy £4.8 billion per annum. 72% of these incurred costs are attributed to productivity losses of people living with mental health conditions and costs experienced by unpaid informal carers (McDaid *et al.* 2022).[191]

** CVD costs the Welsh economy £800 million per annum. 33% of these incurred costs are attributed to healthcare costs [£260 million], 20% to informal care costs [£150 million] and 6% to social care costs [£50 million] (Collins et al. 2022).[192]

** Dementia costs the Welsh economy £700 million per annum. 35% of these incurred costs are attributed to social care costs [£260 million], 24% to informal care costs [£180 million] and 12% to healthcare costs [£90 million] (Collins *et al.* 2022).[192]

** These figures have been calculated pro rata using **ONS 2021 population figures for England and Wales**. With Wales representing 5.2% of the population of England and Wales as a combined entity.

Increased levels of deprivation are associated with increased risks of multimorbidity (Pathirana & Jackson, 2018).[193] Individuals living with multimorbidity have higher total healthcare costs, including higher hospital and care transition costs (Soley-Bori *et al.* 2021).[194]

People living in the most deprived areas in Wales face considerably reduced healthy life expectancy when compared to the least deprived areas. The difference in healthy life expectancy between those living in the least and most deprived areas of Wales is 18 years for women. The difference is 17 years in men (The Health Foundation, 2022).[195] Living in the most deprived areas in Wales is also strongly correlated with reduced labour market participation (Murray *et al.* 2022).[196]

In order to set health care policy, one must not only consider the benefits that interventions will bring, but also what resources are required to deliver these interventions, going beyond financial cost of resources to also include economic costs (e.g., cost-effectiveness, cost-benefits, cost-efficiency).[197] This is particularly relevant in a UK tax-based health care system where there is a limited budget to meet society's' health demand, Trade-offs are required due to the scarcity of resources and budget.[197] One course of action means the resources are unavailable for an alternative approach, this is a key concept of health economics known as 'opportunity cost'. Opportunity cost is the value of the benefits forgone from those resources not being used in their next best alternative (i.e., the lost benefits from what the money could have been used for instead).

## Funding of the Wales NHS

The Health Foundation's[198] analysis of UK health funding following the 2022 Autumn Statement outlined that the UK NHS would receive an extra £3.3bn in 2023-24 and 2024-25, and £1.4bn for capital investment. In real terms, after accounting for inflation, core day-to-day spending on the NHS would rise by 2% a year by 2024-25, while capital spending would grow by 0.2%. The chancellor's statement affected NHS England directly and NHS Wales indirectly through Barnett consequentials. Persistently high inflation in the time since that statement is likely to have adversely affected that real terms analysis. The NHS continues to face rising cost pressures that will erode the spending power of this settlement, and the unknown outcome of future pay negotiations add future uncertainty around the cost pressures the health care sector will face.

The money available to fund the Welsh NHS, is mostly distributed by the Barnett formula. The Nuffield Trust state Wales gets far more funding per person than England – around 15% more, or £1,325 per person more in 2019-20 – but less than Scotland or Northern Ireland.[199] In the year immediately before COVID-19, Wales spent around 5% more than England. This smaller difference is because the Welsh Government prioritised health care slightly less aggressively and spent more on other services – including social care, where spending was 30% higher than in England.[199]

The Health Foundation[200] in 2022 estimated over the decade before the COVID-19 pandemic, the UK spent around 18% less on average than the EU-14 on day-to-day health care, based on spend per person living in the country. Between 2010 and 2019 the UK's total health care budget was £187 billion per year, on average. However, if UK health care spending

per person had matched the average across the EU-14 for the years 2010-2019, then the total UK spend would have increased to £227 billion per year, a difference of £40 billion. The UK was also found to spend around 55% less on capital health spending such as vital buildings, technology and equipment compared to the EU-14.

When comparing by specific countries, in every year between 2010 and 2019 the UK would have needed to spend an additional £73 billion per year to match Germany's spending per person and an additional £40 billion per year to match France's spending. However, the UK spent more per person than Spain, Portugal, Italy and Greece over the decade 2010 to 2019.

The authors note that the UK had the highest increase in health spending in 2020 relative to 2019 compared to European countries. The UK increased spending by 14%, compared to the EU-14 average of just below 6%. However, post-pandemic the UK health care is facing significant pressure. The NHS's own analysis suggests there is a funding gap of between £6 and 7 billion for current funding and the immediate pressures on the service. The authors also state the difference is UK health care spending compared to EU has had a cumulative impact on the NHS, with less capacity than the EU to assist with post COVID-19 recovery. Tough decisions may be required in future to balance the harms caused by a lack of capacity in the NHS and increase efficiency where possible.

A report by Nuffield Trust[201] published in 2014 projected spending pressures facing the Welsh NHS up to financial year 2025-26. They state that in 2015-16 the total budget for the Welsh NHS was expected to be 3.6% lower in real terms compared to the budget in 2010-11.

The Nuffield Trust state that the decrease in budget against a backdrop of rising demand and an ever-growing ageing population will mean that the NHS in Wales will face significant pressure over the next decade. Their findings estimated spending pressures will grow by 3.2% resulting in a funding gap of £3.6 billion in 2025-26 compared to 2010-11. The rise in NHS spending is attributed to the combined effect of increasing pressures across acute service, prescribing and general medical service. The Nuffield Trust suggest the funding gap could be reduced by £0.9 billion through releasing additional cash savings from acute sector efficiencies, and the management of inpatient admissions with chronic conditions.

A report by the Organisation for Economic Cooperation and Development[202] (**OECD**) comparing health in Wales to the rest of the UK found the NHS in Wales appears to be performing no better or worse than the NHS in the rest of the UK. The report states in 2015-16 Wales spent 48% of its budget on health and social care, following financial pressures in 2008 Wales and England took different approaches to respond. Wales balanced spending cuts more evenly between health and social care; however, in England social services bore the brunt. Between 2010-11 and 2014-15 health spending in England increased by 4.3%, but social services spending fell by 11.5%. However, in Wales, health spending fell by 2% but social services spending fell by only 0.8% (source: **IFS 2015**). There are multiple estimates for health and social care spending between 2010-11 and 2012-13 from different sources; these figures from the OECD are only one of the estimates.

The Health Foundation (2016)[203] stated that England and Wales spent similar amounts per head on health care in 2013-14: £2,026 per head in Wales, £2,028 in England (at 2015-16 prices). Northern Ireland and Scotland spend in 2013-14 were slightly higher at £2,158 and £2,187 respectively (at 2015-16 prices). The authors of the report warn that comparing purely by spending may not be indicative of quality. It is not a forgone conclusion that more spend equates to better care. Poor quality care can be very costly.

The authors state there is a limited number of indicators to compare patients across the UK nations. Based on available information such as breast cancer screening, flu vaccine take-up, MRSA mortality rates, life expectancy and GP satisfaction no one health systems consistently outperforms the others. However, when comparing Wales with England it may be more appropriate to compare Wales with a region like the northeast of England, which is more socio-economically similar.

This section described the historic published evidence base of NHS Wales funding, which informs future challenges and themes. Unlike in previous sections that consider service demands and workforce considerations for the future we have not forecast or modelled potential financial demands – this would require further analysis and review.

There is recognition that Wales faces challenges with regards to incidences of drinking, smoking, and obesity, and this "likely impacts" the health and wellbeing and demand for NHS services for the citizens of Wales.

## Policy Implications

- There is a need in Wales for increased efficiency in the NHS, which includes looking for opportunities to manage more health problems with primary care and community services.
- Wales chose previously not to drastically reduce spending in social care at a time of economic crisis; however, more is required to integrate services. This includes integration of social care along with health care such as community, primary, mental health, ophthalmology, dentistry and secondary care.
- There is recognition that Wales faces challenges with regards to incidences of drinking, smoking, and obesity. There is potential to explore resources and opportunities to increase prevention and public health interventions.
- There is a need to improve efficiency and integration of services in the Welsh NHS to assist in earlier diagnoses, tackling the waiting list for elective procedures post COVID-19 and promoting positive behaviours to keep the population well.

## Wider benefits of the Welsh NHS

Prof. Timotej Jagrič from the Institute for Finance and Artificial Intelligence at the University of Maribor conducted an analysis of the health care sector on the economy in Wales,[204] based on methodology used in a previously published paper of 19 European economies (Jagrič et al. 2021).[205]

Input-output tables for the Welsh economy were generated using modified data from the single UK national table used in the published paper.[204] Official data on the UK and Welsh economy from 2007 to 2017 was used in the analysis, for example, employment by industry, national household final consumption expenditure by COICOP commodities, approximate gross value added at basic prices (aGVA), gross domestic product (GDP) at current market prices and GDP per head at current market prices.[204]

Results showed on average for each additionally spend pound for the health care sector‘s services (final demand increases for £1), the overall output of the Welsh economy increases for approx. £2.5 (direct, indirect and induced effects are taken into account.[204]

On average for each additionally spend pound for the health care sector‘s services (final demand increases for £1) on average, the income in all sectors of Welsh economy will increase by approx. £0.6 (direct, indirect and induced effects are taken into account).[204]

On average for each additionally spend pound for the health care sector‘s services (final demand increases for £1) on average the value-added in all sectors of Welsh economy will increase by approx. £0.91 pound (direct, indirect and induced effects are taken into account).[204]

The analysis showed that the health care sector was not a key sector in the Welsh economy. Among top ten industries of the Welsh economy only service sectors can be found. The health care sector was reported as being ranked at 30 out of 79 sectors in Wales, considering the effect on the economy‘s output change caused by the same economic stimulus. From the economic perspective, Jagrič argues that there are prevailing positive effects on the local economy if the spending for health care sectors’ products and services rises, especially when compared with the impact of the same changes in other sectors. A well-developed health care sector is a precondition for enabling a healthy and productive work force.[204]

A report by the Institute for Public Policy Research (IPPR) (2023) on health and prosperity states that good health has its own value with regards to living a meaningful and enjoyable life, but it is also a crucial determinant of our individual and national economic prospects.[206] The IPPR conducted a multi-year data analysis using data from the UK Household Longitudinal Study (UKHLS) and exploring the impacts over time in two separate periods, pre and post-pandemic.[206] The pre pandemic period covers the five years running up to the pandemic (2015-19) and the COVID-19 pandemic (2020-21). The time periods were selected to determine if the pandemic has altered relationships observed in the pre-pandemic period, or where relationships remain unchanged.

The analyses found poor health harms prosperity. Across both pre-pandemic and post-pandemic experiencing a physical health condition was associated with a drop in annual earnings of £1,800 (in 2014-19) and £1,700 (in 2020-21). Experiencing a mental illness was associated with a drop in annual earnings of £2200 (in 2014-19) and £1,700 (in 2020-2021). Both pre and post-pandemic, the onset of physical or mental ill health increased the likelihood of employment exit across all working ages. For those not in employment, people with

the onset of physical or mental ill health were 14% and 53%, respectively less likely to start employment.[206]

Lost earnings were shown to have a significant impact on Gross Domestic Product (GDP). The report estimates that long-term-sickness-determined loss of earnings cost the UK economy £43 billion in 2021, around 2% of GDP. This doesn't include impacts to the economy from lower staff productivity from short-term sickness. People leaving employment because of ill health is a key factor to earnings loss and overall impact on the economy. Poor health was associated with over half (56%) of the 3.3 million exits from paid employment pre-pandemic. The exit from employment was more significant for lower earners and women, particularly during the pandemic.[206]

Mental health was shown to have an impact on productivity. Almost half of the whole population in 2021 reported that their mental health impacts how much they accomplish at work, at least some of the time. Among respondents with mental ill health, the number reporting in 2021 that their mental health negatively impacts their work at least some of the time rose to 90%.[207]

Illness is unequally distributed across geography, class, gender and ethnicity. The IPPR demonstrate better health could help tackle health inequalities and economic disadvantage by exploring the impact of a 10 percentage-point reduction in the incidence of physical and mental health illness among a range of sociodemographic groups. This health improvement would increase women's earnings at the twice the rate of men's, with both groups experiencing an average increase in earnings. Those with the lowest current incomes would see the sharpest in income from health improvement. Individuals in Wales would experience the highest rise in average earnings, around a 1.8% increase on average. Individuals in the West Midlands and North East would also see average earnings per person increase by around 1.7%.

Annual Population Survey data shows in the 12 months to the end of December 2022 there were 466,000 people (24.4 per cent of the 16 to 64 population) who were economically inactive in Wales aged 16 to 64.[207] These are people who are not in employment and not seeking work (this includes full time students).[209]

Of the 466,000 economically inactive aged 16 to 64, the most common reason was long term sick (159,000), student (112,000) and looking after family/home (79,000).[209] In Wales, there has been a rise of 31,000 (24.7%) between the 12 months to the end of December 2019 and December 2022 of people who report long-term illness as the main reason for economic inactivity.[209]

There has been an increase in the number of economically inactive people in Wales since COVID-19 has occurred, increasing by 15,400 (3.4%) between the 12 months to the end of December 2019 and December 2022. The economic inactivity rate increased by 0.8 percentage points over the same period.[209]

The economic inactivity rate has risen between the 12 months to the end of December 2019 and December 2022 in the age group 16 to 24 (rise of 1.4 percentage points) and the age group 50 to 64 (rise of 1.5 percentage points.[209]

The IPPR argue that the UK is at a crossroads, if population health continues to worsen then it could undermine the UK economy, and a weak economy could supress health in return.[208] The IPPR argue the UK could become healthier and therefore more prosperous. They suggest

policy makers look to more prevention, better treatment, faster access to care, and more effective employment support services and workplace interventions for people with existing long-term conditions, mental health problems or other impairments. The IPPR acknowledge there is a wealth of evidence on interventions that could support better health in the UK and suggest that they look to examples such as climate change where the establishment of the Climate Change Act 2008 led to sustained cross-government, cross-society progress. The IPPR propose the UK government introduce a new Health and Prosperity Act to ensure health is integral across we do. They suggest a single piece of primary legislation with three core components.[210]

1. Set the mission – increasing the health of the UK over a 30-year period so the UK becomes the healthiest nation in the world and increasing health life expectancy to at least the UK state retirement age across all regions.

2. Design the institutions – Firstly, the Committee on Health and Prosperity, which is modelled on the Climate Change Committee (CCC). The committee would independently advise on the above mission and hold all government accountable to it). Secondly, a centre to rapidly expand the evidence base on interventions that support the health of the public, including evidence of cost-effectiveness and cost-efficiency.

3. Create the right investment – Develop a health creation fund to put evidence identified into practice and tackle health inequalities. Establish a health investment bank to provide a reliable source of low-cost long-term capital for health creating innovations.

The proposal of a new Health and Prosperity Act, is not intended as a silver bullet, it is intended to move the UK Government into pro-actively pursuing good health linking policy implementation, innovation and strategic investment.[209]

## Policy Implications

- There is a need to promote health care in order to enable a healthy and productive workforce.
- There is a need to build strong primary health care in local environments, by expanding services (e.g., mental health in the community), improving access and the range of services through convenient appointment times for patients (e.g., outside of working hours).
- In order to increase population health and prosperity, policy makers should increase prevention, provide better treatment, faster access to care, and more effective employment support services and workplace interventions for people with existing long-term conditions, mental health problems or other impairments.
- The UK Government should look for opportunities to pro-actively pursue good health as part of the nations' wider prosperity linking policy implementation, innovation and strategic investment.

# 8. New Technology, Genomics and Artificial Intelligence

## Topline summary

- Future developments in technology are expected to continue to evolve and become more sophisticated; this could have significant implications for prolonged life expectancy, maintaining physical ability for older people and the range of conditions that can be managed at home.
- The future of health surveillance is likely to involve increasing use of digital and technological advancements to improve monitoring, modelling and management of public health issues. This includes wearable devices that could support early diagnosis, treatment and personalised interventions as well as increased focus on preventative measures.
- New genetic and genomic technologies have the potential to significantly impact medicine and public health but will require a collaborative effort to build capability across all sectors to ultimately benefit patients in Wales.
- The future of a proficient workforce will highly likely utilise technological advancements to improve the well-being of both patients and staff.
- Encouraging the implementation of standardised digital healthcare technologies, will likely enable patients to take an active role in their own care, prioritise preventive measures and mitigate the growing demands and financial pressures faced by the NHS.
- The adoption of AI will highly likely drive innovation in healthcare, education, the economy and other key sectors, as long as the use of AI is regulated, ethical and transparent, in order to help build public trust and ensure safety.

Future developments in health technology are expected to continue to evolve rapidly and become more sophisticated, potentially increasing their usability, utility and end-user acceptability. Technological change can be both evolutionary and revolutionary, and it is difficult to predict which emerging technologies will have a disruptive effect on society. McKinsey Global Institute has identified twelve disruptive technologies that they believe will have significant economic and social impact by 2025. Some of these technologies, such as autonomous or near-autonomous vehicles and advances in materials, could have significant implications for older people, improving their ability to travel and offering new possibilities for joint and organ replacements.[210]

Advances in genomics, materials, and robotic surgery technology are expected to prolong life expectancy and maintain physical capability in older age. Advances in mobile internet, the Internet of Things, and cloud technology will make ICT more pervasive and 'invisible,' leading to new developments that are expected to improve the management of chronic conditions, extend the range of conditions managed at home, and allow management while outside the home. Mobile internet technology, in particular, holds significant promise for the healthcare sector, potentially cutting more than $2 trillion a year in the projected cost of care by 2025.[211]

The future of health surveillance is likely to involve increasing use of digital and technological advancements to improve monitoring, modelling and management of public health issues. This includes the use of big data analytics, machine learning, artificial intelligence and other emerging technologies to identify and track health trends, outbreaks and emerging diseases. One potential area of growth is the use of wearable devices and sensors to collect and transmit real time patient health status to healthcare providers. This could potentially enable early diagnosis and treatment as well as personalised and targeted interventions. The use of predictive analytics and modelling can provide an early warning to healthcare providers. They can anticipate health trends and take proactive measures to prevent outbreaks and other health issues before they occur. This can also be an enabler for more efficient allocation of resources and improved healthcare decision-making. However, there are concerns around data privacy and security, as well as the potential for technology to exacerbate health inequalities and biases in healthcare. Therefore, it is important to approach the future of health surveillance with careful consideration of these ethical and social implications.

To address existing and projected challenges around increasing demand and financial constraints, digital healthcare technologies such as genomics, digital medicine, artificial intelligence (AI) and robotics can be used to empower patients to participate actively in their own care and focus on preventive measures. Patients are embracing new technology in their daily lives and they expect their healthcare to be supported and facilitated by it. However, to realise the potential of these new technologies, they need to meet a clear user need, by being user friendly, supported by standards where relevant and be endorsed by healthcare professionals. The recent Topol Review addresses the education and training needs of the current and future workforce and presents a set of recommendations to enable the NHS to harness technological innovation for the benefit of patients and staff. The Topol review emphasises the need for the NHS to adapt and embrace these technological innovations to meet the growing demand and financial constraints it is facing.[212]

New genetic and genomic technologies have the potential to revolutionise medicine and public health. In March 2016, the Welsh Government published a Statement of Intent[213] (SoI) outlining the key principles that would underpin the development of a Genomics for Precision Medicine Strategy.[214] This Strategy sets out the Welsh Government's plan to create a sustainable, internationally competitive environment for genetics and genomics to improve health and healthcare provision for Wales. A number of aims and recommendations proposed support data sharing and governance, workforce development and public engagement. The strategy also emphasised the need for collaboration between healthcare providers, researchers, and industry partners.[215]

The "Life Sciences Vision"[216] is a recent report by the UK government that outlines their strategic vision for the life sciences sector. The report covers areas such as research and development, manufacturing, regulation and has the aim of improving the health and wellbeing of citizens and driving economic growth. The UK government has set out a series of ambitious targets and priorities, including increasing investment in research and development, improving patient access to innovative therapies, and promoting the UK as a world-leading destination for life sciences companies. The report also emphasises the need for collaboration between government, industry, and academia to achieve these goals. Adoption of digital healthcare technologies has the potential to revolutionise healthcare and improve patient outcomes, however it also brings significant ethical challenges. The report suggests that it is important that the identified challenges are recognised and addressed through the development of robust, transparent and effective policies and practices that ensure that these technologies are secure, considerate and equitable for all patients.[217]

Whilst there are a great many ongoing technological innovations in NHS Wales such as in Clinical Engineering (e.g. Gait analysis and rehabilitation), Medical Physics (e.g. AI in cancer planning, PET-CT, Proton Beam therapy, molecular radiotherapy), Life Sciences (e.g. AI in digital pathology) which will invariably lead to improvements in diagnostics and therapeutics in NHS Wales, the sections below consider two areas (genomics and AI) that are likely to have a profound impact on healthcare in the coming years.

## Genomics

The publication of the UK's ten-year genomics strategy "Genome UK: The Future of Healthcare",[218] and set of shared commitments agreed by the 4 UK nations, outlines an ambitious vision for using genomics to transform healthcare in the UK. Genomics offers the potential to improve health outcomes, reduce healthcare costs and enable both precision healthcare, and precision public health. Genome UK recognises the significant progress that has already been made in the field of genomics, and leading position occupied by the UK more generally in the genomics space. The strategy envisages several key areas where genomics can have a transformative impact on healthcare, including personalised medicine, chronic disease diagnosis and treatment (e.g. rare diseases and cancer), and infectious disease control. Collaboration across sectors and with the public is required to ensure that the benefits of genomics are realised in a responsible and ethical manner. Genome UK builds on pre-existing activities in Wales and the wider UK, providing key recommendations including increasing investment in genomics research and infrastructure, expanding access to genomic testing and analysis, building a skilled workforce to support the development

and implementation of genomics and ensuring that ethics, data privacy and security are robustly implemented.[219]

As genomics continues to advance, it is important to acknowledge its diverse applications and the potential for generating data for various purposes. While the current focus is on using genomic data for patient management and individual-level diagnostics, it is crucial to recognise the growing significance of genomics as a tool for generating public health data. It is likely that in the future, there will be a shift towards generating data specifically for public health reasons, rather than solely for diagnostic purposes, with the subsequent use of this data as a by-product for public health insights and actions. This highlights the evolving role of genomics in generating data specifically tailored to address public health challenges.

Any shortcomings or inadequacies in the digital aspects of genomics could hinder the realisation of its full potential. Therefore, it would be beneficial to prioritise the development of robust and efficient digital infrastructure to support delivery of genomics clinical services, research, academia and healthcare.

In Wales, genomics has played an increasingly significant role in the delivery of healthcare services. Genomics capability was fundamental in the response to the COVID-19 pandemic in Wales, with the Public Health Wales Pathogen Genomics Unit sequencing and sharing over 200,000 viral genomes between 2020 and 2023 – genomes which were used to support and enable outbreak investigations, pandemic planning and research efforts.

The genomics ecosystem in Wales through Genomics Partnership Wales aims to be inclusive of all genomics strengths in Wales while also seeking exciting collaborations.

The Welsh Government's Genomics Delivery Plan for Wales 2022-2025 sets out an ambition to build on our established strengths to use genomics to transform healthcare delivery and public health action in the future. This will include the evolution of existing services, the development of new capabilities, and work to create enabling opportunities across all relevant sectors, ultimately benefiting patients and the population of Wales. It is important to continue investing in genomics and supporting collaborations to ensure that Wales remains at the forefront of genomics and can use this knowledge to improve healthcare delivery and public health action.[220]

There are a range of areas where the likely impact of genomics can be predicted, including:

- **One Health** in genomics unlocks the potential of ONE health is an approach that recognises that the health of people, animals, and the environment are interconnected. By working together across these sectors we can better prevent, detect, and respond to health threats. The UKG Genomics Beyond Health emphasises the potential of genomics to have a significant impact on key sectors beyond healthcare, including agriculture, energy and the environment. In a changing world, impacted by challenges such as food security and climate change, genomics offers a key tool to understand population health in a more holistic way, that recognises that factors such as environmental exposure to chemicals and pollutants, the food that we eat, and the jobs that we do can all have an impact on our health, which needs to be understood through the lens of our genes. The use of genomics to deliver ONE health is challenging, but the importance of collaboration across sectors and with the public are cornerstones of realising the potential of ONE health.

- **Lung cancer** is the fourth most common cancer in Wales and the leading cause of cancer deaths. Genomics offers opportunities to increase the use of non-invasive liquid biopsy (blood sample) at an earlier stage of the cancer pathway. This would in turn enable targeted treatments to be decided and administered more quickly, potentially improving patient outcomes and survival rates. An example of collaboration between industry, third sector, NHS and academia is QuicDNA, a new study examining the use of liquid biopsy to potentially provide a means of detecting multiple cancer markers without needing an invasive tissue biopsy. This work will provide key evidence about the value of using liquid biopsies for lung cancer diagnosis, which could potentially change how some services are delivered in Wales.[221]
- **Congenital heart disease** (CHD) using established methods and evaluating the process of returning genetic results to research participants. The study evaluated 295 candidate CHD genes using an established framework. The study results highlight the importance of collecting consent for return of results at the time of original consent and ongoing engagement with research participants. The results suggest that returning clinically confirmed genetic results helps translate research advancements to clinical care and is respectful of participants' contributions to research.[222]
- Wales Infants' and Children's Genome Service (WINGS) is the first in the UK to routinely provide screening for all cancer patients being treated with certain types of chemotherapy to identify their risk of severe side effects with thousands of patients tested, and those identified at risk given alternative treatments.

Collectively, genomics poses challenges in the sense that it requires investment in research, infrastructure, and education to support its development and implementation. Work is also required with respect to the ethical use of this technology and patient and public engagement.[223] Over the course of the last 200 years, we have seen a range of technologies and capabilities coming into existence that have revolutionised the way that healthcare is delivered. From the discovery of antibiotics through to the development of imaging technologies such as X-ray and NMR machines, new technology has the potential to catapult healthcare forward. Genomics is one such technology, and while potentially expensive in the short term, it provides opportunities across multiple areas – from prevention to health protection, through to supporting acute care and patient management; also likely moving closer to patients with genomic developments in Point of Care Testing (PoCT). Wales is well placed to make genomics a core part of 'business as usual' activity in the NHS, with a maturing genomics ecosystem, and world leading genomics capabilities in a number of areas.

## Artificial Intelligence

Artificial Intelligence (AI) is a rapidly advancing field of computer science that focuses on creating intelligent machines capable of performing tasks that typically require human intelligence such as decision-making, visual perception, speech recognition to name a few. With the help of AI, machines can now learn from large amounts of data, adapt to new situations and make predictions or decisions based on complex algorithms. AI has the potential to revolutionise various industries, including healthcare, finance, transportation, and entertainment, by making processes more efficient, effective and accurate.

The recent "National AI Strategy"[224] outlines the UK government's vision and plan for developing and using AI to drive economic growth, improve public services, and address societal challenges. The report acknowledges the potential benefits of AI, such as increased productivity, improved decision-making, and enhanced public services. However, it also recognises the potential risks and challenges associated with AI, such as bias, job displacement, and ethical considerations. It is worth mentioning that UK businesses providing AI services into EU countries will come under the EU AI Act due to its extra-territorial nature. To address these issues and maximise the benefits of AI, the National AI Strategy outlines several key areas of focus, including research and development, investing in AI research and development to foster innovation and advance AI technologies. The government aims to develop a skilled workforce that can drive AI innovation and implementation across all sectors supporting and developing the adoption and diffusion of AI technologies across all sectors, including public-private partnerships and collaboration whilst developing a framework for the ethical and responsible development and use of AI.[225]

The European Commission's proposed Artificial Intelligence Act aims to establish a framework for the development, deployment, and use of AI in the European Union. The act outlines specific requirements and obligations for different types of AI systems, based on the potential risk they pose to health, safety, and fundamental rights. For example, high-risk AI systems, such as those used in critical infrastructure or in law enforcement, must undergo strict conformity assessments and comply with certain transparency and accountability requirements. The aim of the proposed act is to foster innovation and trust in AI while ensuring that it is developed and used in a way that aligns with European values and fundamental rights.[226]

The "AI and Public Trust" paper published by the Centre for Data Ethics and Innovation (CDEI) in the UK government, focuses on the relationship between AI and public trust. The report discusses the ethical and regulatory challenges that need to be addressed to ensure that AI is developed and deployed in a way that benefits society and commands public trust. The paper highlights the importance of transparency, accountability and public engagement in the development and deployment of AI systems and calls for the establishment of clear ethical and legal frameworks to govern AI use. It also makes a number of recommendations for policymakers, regulators, and industry stakeholders, including the need for greater collaboration and information sharing, the establishment of oversight mechanisms, and the development of robust standards for AI safety, security, and performance.[227]

A recent white paper titled "AI Regulation: A Pro-Innovation Approach"[228] outlines the UK's approach to regulating artificial intelligence (AI) in order to encourage innovation while also ensuring public trust and safety. The white paper proposes different regulatory approaches for each category.

- High-risk AI systems, such as those used in healthcare and transportation, would be subject to the highest level of regulation, including mandatory testing and certification.
- Medium-risk systems, such as those used in education and finance, would be subject to less stringent regulation.
- Low-risk systems, such as those used in games and social media, would be largely unregulated.

Additionally, the paper calls for increased transparency and accountability in the development and deployment of AI systems and outlines a number of measures to ensure that AI systems are fair, explainable, and non-discriminatory.

Overall, the paper advocates for a flexible and adaptive regulatory framework that can keep pace with the rapid evolution of AI technology, while also promoting innovation and protecting public trust and safety.[229]

AI and Digital Regulation Service (ADRS) is a program under the NHS AI Lab in England. ADRS aims to provide support and guidance for the development and deployment of safe AI and digital technologies in health and care. ADRS works with regulators, industry, and academia to develop and implement a regulatory framework for AI and digital technologies in health and care. This includes developing guidance and standards for the design, development, and use of AI and digital technologies, as well as providing support for regulatory compliance. ADRS also works to foster innovation and collaboration in the development of AI and digital technologies in health and care. This includes running workshops, hackathons, and other events to bring together developers, clinicians, patients, and other stakeholders to develop and test new ideas and solutions. Overall, the ADRS aims to ensure that AI and digital technologies in health and care are developed and used in a way that is safe, effective, and trustworthy, and that aligns with the values and needs of patients and clinicians.[230]

## Artificial Intelligence limitations

- **Security and safety:** AI systems can pose security and safety risks, especially when they are used in critical systems such as transportation, healthcare, or energy.
- **Employment and labour:** AI systems have the potential to disrupt labour markets and change the nature of people's work. The benefits of AI need to be distributed fairly and that people are not unfairly displaced or exploited by AI systems.
- **Privacy:** AI systems require access to large amounts of data, which raises concerns about people's privacy and data protection.
- **Transparency and accountability:** AI systems can be difficult to understand and interpret, which makes it challenging to hold them accountable for their decisions.
- **Regulation and governance:** AI systems need to be developed and used in a way that aligns with societal values and priorities.
- **Bias and fairness:** AI systems can exhibit bias, which can result in unfair outcomes for certain demographic groups of people.

Assistive technologies, AI, home-based health monitoring equipment and smart use of big data all have the potential to change care in the home and community, reducing national health and care spending and improving wellbeing. Capitalising on these opportunities will require action to address the barriers to uptake of these technologies, and sensitivity to public concerns on privacy.

## Policy Implications

- Wales needs to promote the uptake of technologies that have been shown to work in terms of improving outcomes or service efficiency or equality. Digital healthcare technologies, such as genomics, digital medicine, and Artificial Intelligence (AI) have the potential to empower patients to participate actively in their own care, focus on preventive measures and alleviate the increasing demand and financial constraints faced by the NHS.
- There is a need to encourage collaboration between healthcare providers, researchers, third and fourth sector and industry partners, securing the development of sustainable, internationally competitive environments for genomics, improving health and healthcare provision and ensuring that the workforce is trained to harness technological innovation for the benefit of patients and staff.
- It is important to continue to invest in genomics research and infrastructure, building a skilled workforce to support the development and implementation of genomics, ensuring that ethics, data privacy and security are robustly implemented, ensuring that Wales remains at the forefront.
- There is a need to develop a skilled workforce and implement frameworks that can drive AI innovation in healthcare, education, economy and other major sectors, ensuring regulated, ethical and transparent use of AI, promoting public trust and safety.

# 9. Acknowledgements

The Science Evidence Advice Division would like to extend their gratitude to all who have contributed to the development of this paper. In particular the Health and Care Research Wales Evidence Centre team who rapidly undertook an evidence mapping exercise to summarise projections on long term conditions and risk factors to inform this advice paper. Thanks also to colleagues at PHW for sharing their modelling on specific diseases and services, and in Knowledge and Analytical Services for support on population projections and use of official statistics. Additionally, to experts in Welsh Government advisory, technical and policy groups and NHS clinical networks for their peer review and support.

# Appendix A

## Summary table of studies by condition and year of projection data by country

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Atrial fibrillation** | | | | | | | | | | |
| Lane *et al.* 2017 Modelling study | UK | 2010 | 2040<br>2060 | Prevalence | 1,085,078[a]<br>1,322,694[b] | – | – | >18 | Increase | |
| Lane *et al.* 2017 Modelling study | UK | 2010 | 2040<br>2060 | Prevalence | 20.5 per 1000[a]<br>25.4 per 1000[b] | 18.7 per 1000[a]<br>23.9 per 1000[b] | 22.3 per 1000[a]<br>26.9 per 1000[b] | >18 | Increase | |
| Lane *et al.* 2017 Modelling study | UK | 2010 | 2040<br>2060 | Prevalence | 1,258,705[a]<br>1,846,960[b] | – | – | >18 | Increase | |
| Lane *et al.* 2017 Modelling study | UK | 2010 | 2040<br>2060 | Prevalence | 23.1 per 1000a<br>32.0 per 1000b | 20.4 per 1000a<br>29.0 per 1000b | 25.8 per 1000a<br>34.9 per 1000b | >18 | Increase | |
| **Atrial fibrillation – related events** | | | | | | | | | | |
| Yiin *et al.* 2014 Modelling study | UK | 2012 | 2050 | Incidence | 87,353 | – | – | > 80 | Increase 2012-2050 (treble) | |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Atrial Fibrillation – related incident ischemic strokes** | | | | | | | | | | |
| Yiin *et al.* 2014 Modelling study | UK | 2012 | 2030 | Incidence | 34,694<br>11,777 | – | – | > 80<br>< 80 | Increase | |
| Yiin *et al.* 2014 Modelling study | UK | 2012 | 2050 | Incidence | 58,621<br>12,557 | – | – | > 80<br>< 80 | Increase | |
| **Atrial fibrillation – related incident systemic emboli** | | | | | | | | | | |
| Yiin *et al.* 2014 Modelling study | UK | 2012 | 2030 | Incidence | 7,968<br>1,710 | – | – | > 80<br>< 80 | Increase | |
| Yiin *et al.* 2014 Modelling study | UK | 2012 | 2050 | Incidence | 14,353<br>1,821 | – | – | > 80<br>< 80 | Increase | |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Cancer – all** | | | | | | | | | | |
| Macmillan Cancer Support 2020 Modelling study | Wales | 2015 | 2025<br>2030<br>2040 | Prevalence[c] | 200,000<br>230,000<br>300,000 | 110,000<br>130,000<br>170,000 | 90,000<br>100,000<br>130,000 | Not specified | Increase | |
| **Cancer – breast** | | | | | | | | | | |
| Macmillan Cancer Support 2020 Modelling study | Wales | 2015 | 2025<br>2030<br>2040 | Prevalence[c] | _ | 51,000<br>61,000<br>85,000 | _ | Not specified | Increase | |
| **Cancer – colorectal** | | | | | | | | | | |
| Macmillan Cancer Support 2020 Modelling study | Wales | 2015 | 2025<br>2030<br>2040 | Prevalence[c] | 22,000<br>27,000<br>36,000 | 9,000<br>11,000<br>14,000 | 13,000<br>16,000<br>22,000 | Not specified | Increase | |
| **Cancer – lung** | | | | | | | | | | |
| Macmillan Cancer Support 2020 Modelling study | Wales | 2015 | 2025<br>2030<br>2040 | Prevalence[c] | 6,000<br>7,000<br>9,000 | 3,510<br>4,410<br>6,610 | 2,260<br>2,300<br>2,320 | Not specified | Increase | |
| **Cancer – prostate** | | | | | | | | | | |
| Macmillan Cancer Support 2020 Modelling study | Wales | 2015 | 2025<br>2030<br>2040 | Prevalence[c] | _ | _ | 34,000<br>42,000<br>56,000 | Not specified | Increase | |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Cardiovascular disease** | | | | | | | | | | |
| Collins *et al.* 2022 Modelling study | England & Wales | 2011 | 2029 | Incidence[d] | 1,200 per 100,000 | – | – | 35-100 years | Decline 2011-2029 Plateau | |
| Collins *et al.* 2022 Modelling study | England & Wales | 2011 | 2029 | Prevalence[d] | Not reported | – | – | 35-100 years | Increase 2011-2029 (9%) | |
| Collins *et al.* 2022 Modelling study | England & Wales | 2011 | 2029 | Incidence[d] | <800 per 100,000 | – | – | 35-100 years | Decline 2011-2029 (6%) | |
| Collins *et al.* 2022 Modelling study | England & Wales | 2011 | 2029 | Prevalence[d] | Not reported | – | – | 35-100 years | Decline 2011-2029 (6%) | |
| **Cardiovascular disease: any heart condition excluding high blood pressure (Adults who self-reported ever having been treated for a heart attack, or currently being treated for angina, heart failure or another heart condition)** | | | | | | | | | | |
| Public Health Wales Observatory 2018 National dataset | Wales | 2015 | 2025 2030 2035 | Prevalence | – | – | – | 18+ | Increase 2015-2025 17% Increase 2015-2030 24% Increase 2015-2035 31% | N/A |
| Public Health Wales Observatory 2018 National dataset | Wales | 2015 | 2025 2030 2035 | Prevalence | 28,906 29,200 30,712 | – | – | 18-54- | Increase | N/A |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| Public Health Wales Observatory 2018 National dataset | Wales | 2015 | 2025<br>2030<br>2035 | Prevalence | | _ | _ | 65-74 | Decline | N/A |
| Public Health Wales Observatory 2018 National dataset | Wales | 2015 | 2025<br>2030<br>2035 | Prevalence | 141,289<br>155,889<br>170,262 | _ | _ | 75+ | Increase | N/A |
| **Cardiovascular disease: hypertension** | | | | | | | | | | |
| Kingston et al. 2018 Modelling study | England | 2015 | 2025<br>2035 | Prevalence | 6,423,400<br>8,080,400 | _ | _ | >65 | Increase 2015-2035 (69.5%) | |
| **Cardiovascular disease: coronary heart disease** | | | | | | | | | | |
| Kingston et al. 2018 Modelling study | England | 2015 | 2025<br>2035 | Prevalence | 1,937,800<br>2,172,500 | _ | _ | >65 | Increase 2015-2035 (22.1%) | |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Cardiovascular disease: myocardial infarction** | | | | | | | | | | |
| Scarborough *et al.* 2022 Modelling study | England | 2011 | 2035 | Incidence | _ | 666 per 100,000 | – | 75-84 | Increase | |
| Scarborough *et al.* 2022 Modelling study | England | 2011 | 2035 | Incidence | _ | – | 592 per 100,000 | 55-64 | Increase | |
| Scarborough *et al.* 2022 Modelling study | England | 2011 | 2035 | Incidence | _ | 482 per 100,000 | 1042 per 100,000 | 55-85+ age standardised | Increase | |
| **Cardiovascular disease: related disability** | | | | | | | | | | |
| Guzman-Castillo *et al.* 2017 Modelling study | England & Wales | 2015 | 2025 | Prevalence | 348,000 | _ | – | 65-84 | Decline 2015-2025 (16.9%) | |
| Guzman-Castillo *et al.* 2017 Modelling study | England & Wales | 2015 | 2025 | Prevalence | 179,000 | _ | – | 85+ | Increase 2015-2025 (6%) | |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Cardiovascular disease: stroke – all)** | | | | | | | | | | |
| King *et al.* 2020 Modelling study | UK | 2015 | 2025<br>2035 | Prevalence | 1,424,100<br>2,119,400 | | | >45 | Increase 2015-2025 (123%) | |
| King *et al.* 2020 Modelling study | UK | 2015 | 2025<br>2035 | Incidence | 148,700<br>186,900 | | | >45 | Increase 2015-2045 (59%) | |
| Li *et al* 2020 Modelling study | UK | 2015 | 2045 | Incidence[f] | Not reported | _ | – | Not specified | Increase 2015-2045 (66%) | |
| Li *et al* 2020 Modelling study | UK | 2015 | 2045 | Incidence[f] | Not reported | _ | – | Not specified | Decline 2015-2045 (13%) | |
| Kingston *et al.* 2018 Modelling study | England | 2015 | 2025<br>2035 | Prevalence | 1,021,700<br>1,337,500 | _ | – | >65 | Increase 2015-2035 (84.2%) | |
| **Cardiovascular disease: stroke – all) (Adults who self-reported ever having been treated for stroke)** | | | | | | | | | | |
| Public Health Wales Observatory 2018 National dataset | Wales | 2015 | 2025<br>2030<br>2035 | Prevalence | _ | – | _ | – | Increase 2015-2025 19%<br>Increase 2015-2030 27%<br>Increase 2015-2035 33% | N/A |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Cardiovascular disease: stroke – ischaemic stroke** | | | | | | | | | | |
| King *et al.* 2020 Modelling study | UK | 2015 | 2025<br>2035 | Prevalence | 1,288,100<br>1,916,900 | 594,800<br>912,500 | 693,300<br>1,004,300 | | Increase | |
| King *et al.* 2020 Modelling study | UK | 2015 | 2025<br>2035 | Incidence | 133,000<br>167,200 | 66,400<br>84,300 | 66,600<br>82,900 | | Increase | |
| **Cardiovascular disease: stroke – haemorrhagic stroke** | | | | | | | | | | |
| King *et al.* 2020 Modelling study | UK | 2015 | 2025<br>2035 | Prevalence | 136,100<br>202,600 | 62,700<br>96,200 | 73,300<br>106,300 | | Increase | |
| King *et al.* 2020 Modelling study | UK | 2015 | 2025<br>2035 | Incidence | 15,700<br>19,700 | 7,900<br>10,000 | 7,700<br>9,800 | | Increase | |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Dementia** | | | | | | | | | | |
| Wittenberg *et al.* 2019 Modelling study | Wales | 2014 | 2025<br>2030<br>2040 | Prevalence | 55,570<br>64,200<br>79,700 | | | >65 | Increase 2015-2040 (81%) | |
| **Dementia (Estimated number of people with dementia based on the 'Expert Delhi Consensus')** | | | | | | | | | | |
| Public Health Wales Observatory 2018 National dataset | Wales | 2015 | 2025<br>2030<br>2035 | Prevalence | 6,821<br>7,344<br>7,853 | _ | – | 65-74 | Increase | |
| Public Health Wales Observatory 2018 National dataset | Wales | 2015 | 2025<br>2030<br>2035 | Prevalence | 9,346<br>8,630<br>9,203 | _ | – | 75-79 | Increase | |
| Public Health Wales Observatory 2018 National dataset | Wales | 2015 | 2025<br>2030<br>2035 | Prevalence | 12,944<br>15,889<br>14,832 | _ | – | 80-84 | Increase | |
| Public Health Wales Observatory 2018 National dataset | Wales | 2015 | 2025<br>2030<br>2035 | Prevalence | 26,144<br>32,225<br>40,881 | _ | – | 85+ | Increase | |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Diabetes – all** | | | | | | | | | | |
| Ampofo and Boateng 2020 Modelling study | UK | 2014 | 2030 | Prevalence | Not reported | _ | – | >18 | Increase (5.2%) | |
| Haider *et al.* 2021 Modelling study | UK | 2017 | 2030 | Prevalence | 4,299,680 | _ | – | >12 | Increase | |
| Public Health England 2016 Modelling study | England | 2015 | 2025<br>2030<br>2035 | Prevalence | 4,389,883<br>4,675,175<br>4,936,101 | _ | – | >16 | Not reported | |
| Kingston *et al.* 2018 Modelling study | England | 2015 | 2025<br>2030<br>2035 | Prevalence | 2,317,900<br>3,115,400 | _ | – | >65 | Increase 2015-2035 (118.1%) | |
| **Diabetes – all (Adults who self-reported currently being treated for type 1 or type 2 diabetes)** | | | | | | | | | | |
| Public Health Wales Observatory 2018 National dataset | Wales | 2015 | 2025<br>2030<br>2035 | Prevalence | _ | – | – | >25 | Increase 2015-2025 12%<br>Increase 2015-2030 17%<br>Increase 2015-2035 21% | N/A |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Diabetes – type 1** | | | | | | | | | | |
| Haider *et al.* 2021 Modelling study | UK | 2017 | 2030 | Prevalence | 362,960 | _ | – | >12 | Increase 2017-2030 (24%) | |
| **Diabetes – type 2** | | | | | | | | | | |
| Haider *et al.* 2021 Modelling study | UK | 2017 | 2030 | Prevalence | 3,936,720 | _ | – | >12 | Increase 2017-2030 (7%) | |
| **Hypertension** | | | | | | | | | | |
| Kingston *et al.* 2018 Modelling study | England | 2015 | 2025<br>2035 | Prevalence | 6,243,400<br>8,080,400 | _ | – | >65 | Increase 2015-2035 (69.5%) | |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Mental illness – depression** | | | | | | | | | | |
| Kingston *et al.* 2018 Modelling study | England | 2015 | 2025<br>2035 | Prevalence | 155,500<br>191,600 | _ | – | >65 | Decline 2015-2035 (-15.1%) | |
| **Mental illness – psychosis** | | | | | | | | | | |
| McDonald *et al*, 2021 Modelling study | England | 2019 | 2025 | Incidence (Treated) | 11,067 | _ | – | 16-64 | Increase 2019-2025 (6.2%) | |
| McDonald *et al*, 2021 Modelling study | England | 2019 | 2025 | Incidence (Probable) | 9,541 | _ | – | 16-64 | Increase 2019-2025 (6.4%) | |
| McDonald *et al*, 2021 Modelling study | England | 2019 | 2025 | Incidence (Treated) | 7,041 | _ | – | 16-35 | Increase 2019-2025 (5.6%) | |
| McDonald *et al*, 2021 Modelling study | England | 2019 | 2025 | Incidence (Probable) | 6,070 | _ | – | 16-35 | Increase 2019-2025 (5.5%) | |
| McDonald *et al*, 2021 Modelling study | England | 2019 | 2025 | Incidence (Treated) | 4,026 | _ | – | 35-64 | Increase 2019-2025 (7.8%) | |
| McDonald *et al*, 2021 Modelling study | England | 2019 | 2025 | Incidence (Probable) | 3,471 | _ | – | 35-64 | Increase 2019-2025 (8.4%) | |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Multi-morbidities – 2 or more** | | | | | | | | | | |
| Kingston *et al.* 2018 Modelling study | England | 2015 | 2025<br>2035 | Prevalence | 7,535,600<br>9,789,100 | _ | – | >65 | Increase 2015-2025 (86.4%) | |
| Kingston *et al.* 2018 Modelling study | England | 2015 | 2025<br>2035 | Prevalence | 1,539,400<br>2,548,800 | _ | – | >85 | Increase 2015-2035 (181.6%) | |
| **Multi-morbidities – 4 or more** | | | | | | | | | | |
| Kingston *et al.* 2018 Modelling study | England | 2015 | 2025<br>2035 | Prevalence | 1,749,900<br>2,453,200 | _ | – | >65 | Increase 2015-2035 (157.6%) | |
| Kingston *et al.* 2018 Modelling study | England | 2015 | 2035 | Prevalence | 586,900<br>1,117,500 | _ | – | >85 | Increase 2015-2035 (470.2%) | |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Obesity** | | | | | | | | | | |
| Keaver *et al.* 2019 | Wales | 2005 | 2035 | Prevalence | h | _ | – | >16 | Increase | |
| Keaver *et al.* 2020 | Wales | 2015 | 2025<br>2030<br>2035 | Prevalence | 6%<br>8%<br>11% | _ | – | >15 | Increase | |
| Pineda *et al.* 2018 | Wales | 2015 | 2025 | Prevalence | _ | _ | – | >20 | Increase 2015-2035 (28%) | |
| **Obesity (Overweight and obesity – the annual Welsh Health Survey asks adults to report their height and weight. From this the BMI of respondents can be calculated. Persons with a BMI of 25+ and 30+ are defined to be overweight and obese respectively)** | | | | | | | | | | |
| Public Health Wales Observatory 2018 National dataset | Wales | 2017 | 2025 | Prevalence | 59.4% | _ | _ | >16 | Increase | |

| Author/s Study design | Country | Years | | Projection data | | | | Age (years) | Trend | Quality appraisal |
|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Type | Total (number or %) | Female (number or %) | Male (number or %) | | | |
| **Smoking** | | | | | | | | | | |
| Pérez-Ferrer *et al.* 2018 Modelling study | England | 2011 | 2030<br>2035<br>2040<br>2045<br>2050 | Prevalence | –<br>–<br>–<br>–<br>– | 0.11<br>0.10<br>0.09<br>0.08<br>0.07 | 0.12<br>0.11<br>0.09<br>0.08<br>0.07 | >20 | Decline | |
| **Smoking (Estimated smoking prevalence projection based on 15 year olds already smoking, 16+ year old starting to smoke and the 16+ population that quit each year)** | | | | | | | | | | |
| Public Health Wales Observatory 2018 National dataset | Wales | 2016 | 2025<br>2030<br>2035<br>2039 | Prevalence | 15.7%<br>14.8%<br>13.9%<br>13.3% | _ | _ | >16 | Decline | |

**Note h**: Amongst those aged 16+, for females the projected % change was 75.9 (managerial) 103.9 (intermediate) 83.0 (routine and manual) and for males the projected % change was 83.4 (managerial) 99.5(intermediate) 89.2 (routine and manual).

a Model 1 – Constant incidence rate from 2010

b Model 2 – Constant 1% increase in the incidence rate from 2010

c Rounded numbers for complete (all-time) prevalence

d Scenario 1 – if annual CVD incidence/prevalence remains at 2011 levels

e Scenario 2 – if annual CVD incidence/prevalence continues to decline

f Scenario 1 – if age-specific stroke incidence remained stable over the next 30 years

g Scenario 2 – if age-specific stroke incidence continued to decline by 6% every 5 years

h Projected prevalence (%) data available by occupational and educational level (See Table 12)

i UK or England only projection data available but not added to Table 1

# Appendix B

## Condition-age-group projections

For the conditions Asthma, Hypertension, Anxiety disorders, Depression, Type 2 diabetes there are two values – the higher value with a cap based on previous maximum (twice previous maximum for Anxiety disorders because they already had a rising 2000 to 2021 trend) and the lower value with a cap based on catch-up after COVID-19 but without any other factors. The projections in these tables show estimated diagnoses in that age-group in that year. It will be possible to convert any cell of interest into a rate ("per 100,000") if you know the projected population in that age-group in that year (though these have not been provided in this appendix).

### Table B5. LTC number projections, also 2021 actuals for comparison

| Anxiety discorders | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low** | | | | | | | | | | | | | | | | | |
| 0-19 | 5,922 | 101% | 9,267 | 9,802 | 9,055 | 8,334 | 7,797 | 7,441 | 7,146 | 6,868 | 6,661 | 6,490 | 6,335 | 6,241 | 6,147 | 6,072 | 6,006 |
| 20-29 | 9,153 | 128% | 11,393 | 11,675 | 12,429 | 13,188 | 13,349 | 12,886 | 12,559 | 12,305 | 12,230 | 12,161 | 12,062 | 12,035 | 11,973 | 11,879 | 11,729 |
| 30-39 | 6,494 | 110% | 6,601 | 6,205 | 6,060 | 5,905 | 5,842 | 5,873 | 5,936 | 5,981 | 6,037 | 6,118 | 6,207 | 6,408 | 6,626 | 6,853 | 7,116 |
| 40-49 | 4,121 | 156% | 4,318 | 4,204 | 4,258 | 4,307 | 4,457 | 4,681 | 4,933 | 5,230 | 5,605 | 6,006 | 6,396 | 6,400 | 6,415 | 6,439 | 6,443 |
| 50-59 | 4,041 | 109% | 4,535 | 4,403 | 4,430 | 4,441 | 4,544 | 4,763 | 4,653 | 4,471 | 4,341 | 4,267 | 4,219 | 4,244 | 4,284 | 4,334 | 4,403 |
| 60-69 | 2,547 | 120% | 2,925 | 2,906 | 2,977 | 3,032 | 3,129 | 3,291 | 3,469 | 3,665 | 3,695 | 3,592 | 3,465 | 3,361 | 3,258 | 3,158 | 3,067 |
| 70-79 | 1,907 | 154% | 2,208 | 2,179 | 2,236 | 2,247 | 2,325 | 2,472 | 2,660 | 2,776 | 2,780 | 2,789 | 2,807 | 2,858 | 2,892 | 2,919 | 2,930 |
| 80-89 | 1,086 | 174% | 1,292 | 1,296 | 1,343 | 1,444 | 1,552 | 1,677 | 1,812 | 1,949 | 1,960 | 1,945 | 1,926 | 1,917 | 1,914 | 1,893 | 1,894 |
| 90+ | 240 | 54% | 196 | 174 | 160 | 147 | 139 | 133 | 128 | 122 | 120 | 120 | 120 | 120 | 120 | 126 | 129 |

| Anxiety discorders | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **High** | | | | | | | | | | | | | | | | | |
| 0-19 | | 193% | 10,854 | 12,805 | 12,723 | 12,628 | 12,504 | 12,389 | 12,262 | 12,118 | 11,983 | 11,868 | 11,764 | 11,664 | 11,563 | 11,483 | 11,417 |
| 20-29 | | 244% | 13,344 | 15,251 | 17,463 | 19,982 | 21,408 | 21,456 | 21,551 | 21,712 | 22,003 | 22,239 | 22,400 | 22,494 | 22,521 | 22,467 | 22,298 |
| 30-39 | | 208% | 7,732 | 8,106 | 8,514 | 8,948 | 9,369 | 9,779 | 10,185 | 10,553 | 10,860 | 11,188 | 11,527 | 11,977 | 12,462 | 12,961 | 13,528 |
| 40-49 | | 297% | 5,057 | 5,492 | 5,983 | 6,527 | 7,147 | 7,794 | 8,465 | 9,228 | 10,085 | 10,983 | 11,879 | 11,962 | 12,065 | 12,178 | 12,249 |
| 50-59 | | 207% | 5,311 | 5,751 | 6,225 | 6,728 | 7,286 | 7,931 | 7,985 | 7,889 | 7,811 | 7,802 | 7,836 | 7,933 | 8,058 | 8,197 | 8,370 |
| 60-69 | | 229% | 3,425 | 3,796 | 4,183 | 4,593 | 5,017 | 5,480 | 5,953 | 6,466 | 6,648 | 6,569 | 6,436 | 6,283 | 6,129 | 5,972 | 5,830 |
| 70-79 | | 292% | 2,586 | 2,847 | 3,141 | 3,404 | 3,729 | 4,116 | 4,565 | 4,898 | 5,002 | 5,100 | 5,214 | 5,341 | 5,439 | 5,520 | 5,571 |
| 80-89 | | 332% | 1,513 | 1,693 | 1,887 | 2,188 | 2,489 | 2,792 | 3,109 | 3,439 | 3,526 | 3,556 | 3,577 | 3,583 | 3,600 | 3,581 | 3,600 |
| 90+ | | 102% | 229 | 227 | 225 | 223 | 223 | 221 | 219 | 216 | 216 | 219 | 223 | 225 | 225 | 239 | 245 |

| Asthma | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low** | | | | | | | | | | | | | | | | | |
| 0-19 | 3,535 | 134% | 4,920 | 5,100 | 5,489 | 5,684 | 5,508 | 5,329 | 5,163 | 5,055 | 4,984 | 4,917 | 4,878 | 4,841 | 4,802 | 4,772 | 4,744 |
| 20-29 | 1,403 | 114% | 1,863 | 1,921 | 1,773 | 1,660 | 1,629 | 1,595 | 1,568 | 1,565 | 1,581 | 1,592 | 1,605 | 1,613 | 1,616 | 1,613 | 1,601 |
| 30-39 | 1,187 | 119% | 1,673 | 1,726 | 1,673 | 1,582 | 1,557 | 1,525 | 1,493 | 1,472 | 1,451 | 1,430 | 1,416 | 1,415 | 1,415 | 1,414 | 1,417 |
| 40-49 | 1,056 | 129% | 1,331 | 1,356 | 1,332 | 1,269 | 1,268 | 1,258 | 1,247 | 1,256 | 1,276 | 1,290 | 1,314 | 1,324 | 1,336 | 1,350 | 1,357 |
| 50-59 | 1,306 | 104% | 1,234 | 1,114 | 1,045 | 1,045 | 1,094 | 1,148 | 1,220 | 1,284 | 1,267 | 1,261 | 1,267 | 1,284 | 1,305 | 1,329 | 1,357 |
| 60-69 | 1,182 | 132% | 1,326 | 1,287 | 1,292 | 1,379 | 1,530 | 1,693 | 1,810 | 1,798 | 1,783 | 1,755 | 1,721 | 1,682 | 1,642 | 1,601 | 1,563 |
| 70-79 | 856 | 116% | 741 | 654 | 601 | 579 | 589 | 603 | 621 | 653 | 693 | 734 | 783 | 837 | 890 | 942 | 992 |
| 80-89 | 429 | 197% | 453 | 430 | 423 | 461 | 516 | 568 | 622 | 685 | 754 | 828 | 837 | 840 | 844 | 840 | 845 |
| 90+ | 88 | 48% | 63 | 52 | 45 | 42 | 41 | 40 | 38 | 38 | 37 | 38 | 38 | 39 | 39 | 41 | 42 |

| Asthma | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **High** | | | | | | | | | | | | | | | | | |
| 0-19 | | 280% | 6,588 | 8,091 | 9,915 | 10,959 | 10,852 | 10,753 | 10,642 | 10,517 | 10,400 | 10,300 | 10,210 | 10,123 | 10,035 | 9,966 | 9,909 |
| 20-29 | | 238% | 2,495 | 3,047 | 3,202 | 3,200 | 3,211 | 3,218 | 3,232 | 3,256 | 3,300 | 3,335 | 3,359 | 3,373 | 3,378 | 3,369 | 3,344 |
| 30-39 | | 249% | 2,241 | 2,739 | 3,023 | 3,051 | 3,069 | 3,076 | 3,078 | 3,063 | 3,027 | 2,995 | 2,964 | 2,958 | 2,956 | 2,953 | 2,960 |
| 40-49 | | 268% | 1,782 | 2,152 | 2,406 | 2,447 | 2,498 | 2,539 | 2,571 | 2,613 | 2,662 | 2,703 | 2,750 | 2,769 | 2,793 | 2,819 | 2,835 |
| 50-59 | | 217% | 1,653 | 1,767 | 1,888 | 2,016 | 2,155 | 2,316 | 2,516 | 2,671 | 2,644 | 2,641 | 2,653 | 2,686 | 2,728 | 2,775 | 2,833 |
| 60-69 | | 276% | 1,776 | 2,041 | 2,334 | 2,659 | 3,014 | 3,415 | 3,731 | 3,741 | 3,722 | 3,677 | 3,603 | 3,517 | 3,431 | 3,343 | 3,264 |
| 70-79 | | 242% | 993 | 1,037 | 1,086 | 1,117 | 1,161 | 1,217 | 1,281 | 1,358 | 1,446 | 1,537 | 1,639 | 1,751 | 1,860 | 1,968 | 2,072 |
| 80-89 | | 411% | 606 | 682 | 763 | 889 | 1,017 | 1,146 | 1,282 | 1,425 | 1,573 | 1,734 | 1,753 | 1,756 | 1,764 | 1,755 | 1,765 |
| 90+ | | 100% | 84 | 83 | 82 | 81 | 81 | 80 | 79 | 78 | 78 | 79 | 80 | 81 | 81 | 86 | 88 |

| Atrial fibrillation | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 41 | 105% | 44 | 44 | 44 | 45 | 45 | 45 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 43 | 43 |
| 20-29 | 174 | 104% | 162 | 162 | 163 | 164 | 165 | 167 | 168 | 171 | 174 | 177 | 179 | 180 | 182 | 182 | 182 |
| 30-39 | 391 | 105% | 390 | 397 | 405 | 414 | 421 | 426 | 427 | 425 | 420 | 415 | 411 | 410 | 410 | 409 | 410 |
| 40-49 | 674 | 120% | 642 | 658 | 678 | 698 | 715 | 727 | 736 | 748 | 763 | 774 | 788 | 793 | 800 | 807 | 812 |
| 50-59 | 1,616 | 89% | 1,467 | 1,438 | 1,408 | 1,377 | 1,349 | 1,329 | 1,322 | 1,312 | 1,304 | 1,308 | 1,319 | 1,341 | 1,367 | 1,397 | 1,431 |
| 60-69 | 2,995 | 94% | 3,127 | 3,189 | 3,234 | 3,268 | 3,285 | 3,302 | 3,301 | 3,300 | 3,272 | 3,223 | 3,148 | 3,063 | 2,978 | 2,893 | 2,815 |
| 70-79 | 5,221 | 107% | 5,329 | 5,302 | 5,288 | 5,180 | 5,128 | 5,116 | 5,128 | 5,175 | 5,247 | 5,312 | 5,391 | 5,483 | 5,543 | 5,584 | 5,594 |
| 80-89 | 4,294 | 133% | 4,739 | 4,848 | 4,942 | 5,240 | 5,450 | 5,590 | 5,691 | 5,756 | 5,780 | 5,798 | 5,800 | 5,779 | 5,775 | 5,713 | 5,713 |
| 90+ | 1,346 | 180% | 1,480 | 1,509 | 1,545 | 1,580 | 1,622 | 1,663 | 1,697 | 1,725 | 1,781 | 1,860 | 1,950 | 2,027 | 2,094 | 2,292 | 2,425 |

| Coronary Heart Disease | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 6 | 0% | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20-29 | 33 | 83% | 31 | 31 | 30 | 30 | 30 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 28 | 28 | 27 |
| 30-39 | 111 | 162% | 160 | 179 | 184 | 186 | 187 | 187 | 187 | 186 | 184 | 182 | 180 | 180 | 180 | 180 | 180 |
| 40-49 | 491 | 211% | 638 | 706 | 784 | 872 | 914 | 929 | 940 | 956 | 974 | 989 | 1,006 | 1,013 | 1,021 | 1,031 | 1,037 |
| 50-59 | 1,607 | 172% | 2,355 | 2,749 | 2,854 | 2,780 | 2,713 | 2,660 | 2,636 | 2,605 | 2,579 | 2,576 | 2,587 | 2,619 | 2,661 | 2,706 | 2,763 |
| 60-69 | 2,454 | 231% | 4,500 | 5,591 | 6,269 | 6,355 | 6,408 | 6,461 | 6,479 | 6,497 | 6,463 | 6,386 | 6,257 | 6,108 | 5,958 | 5,806 | 5,668 |
| 70-79 | 2,877 | 300% | 4,511 | 5,139 | 5,899 | 6,652 | 7,368 | 7,402 | 7,471 | 7,592 | 7,753 | 7,904 | 8,081 | 8,278 | 8,430 | 8,555 | 8,634 |
| 80-89 | 1,701 | 359% | 2,260 | 2,489 | 2,732 | 3,118 | 3,491 | 3,855 | 4,225 | 4,601 | 4,975 | 5,373 | 5,787 | 6,078 | 6,108 | 6,076 | 6,109 |
| 90+ | 431 | 429% | 611 | 690 | 782 | 884 | 1,005 | 1,140 | 1,287 | 1,315 | 1,358 | 1,418 | 1,487 | 1,545 | 1,596 | 1,746 | 1,847 |

| CKD | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 305 | 137% | 364 | 370 | 375 | 380 | 384 | 388 | 391 | 394 | 397 | 400 | 404 | 407 | 411 | 415 | 419 |
| 20-29 | 334 | 158% | 365 | 375 | 385 | 395 | 406 | 417 | 429 | 443 | 459 | 475 | 489 | 501 | 513 | 522 | 529 |
| 30-39 | 524 | 198% | 667 | 699 | 732 | 767 | 799 | 829 | 857 | 880 | 897 | 915 | 932 | 957 | 983 | 1,008 | 1,037 |
| 40-49 | 781 | 195% | 880 | 918 | 960 | 1,004 | 1,054 | 1,100 | 1,144 | 1,192 | 1,245 | 1,295 | 1,348 | 1,390 | 1,433 | 1,479 | 1,520 |
| 50-59 | 1,775 | 143% | 1,962 | 1,970 | 1,975 | 1,976 | 1,979 | 1,991 | 2,023 | 2,048 | 2,076 | 2,123 | 2,181 | 2,257 | 2,343 | 2,435 | 2,538 |
| 60-69 | 3,118 | 121% | 3,551 | 3,665 | 3,761 | 3,846 | 3,912 | 3,978 | 4,023 | 4,069 | 4,081 | 4,066 | 4,017 | 3,953 | 3,888 | 3,819 | 3,758 |
| 70-79 | 5,723 | 91% | 5,750 | 5,671 | 5,605 | 5,440 | 5,336 | 5,272 | 5,232 | 5,226 | 5,245 | 5,253 | 5,274 | 5,304 | 5,301 | 5,277 | 5,223 |
| 80-89 | 5,822 | 79% | 5,861 | 5,856 | 5,824 | 6,020 | 6,097 | 6,085 | 6,021 | 5,912 | 5,756 | 5,590 | 5,407 | 5,201 | 5,009 | 4,767 | 4,576 |
| 90+ | 2,022 | 122% | 2,101 | 2,099 | 2,104 | 2,106 | 2,116 | 2,121 | 2,115 | 2,100 | 2,118 | 2,158 | 2,207 | 2,234 | 2,249 | 2,395 | 2,464 |

| COPD | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 61 | 149% | 102 | 102 | 101 | 100 | 99 | 98 | 97 | 96 | 95 | 94 | 93 | 93 | 92 | 91 | 91 |
| 20-29 | 48 | 2% | 23 | 18 | 15 | 12 | 9 | 7 | 6 | 5 | 4 | 3 | 2 | 2 | 2 | 1 | 1 |
| 30-39 | 154 | 45% | 140 | 134 | 128 | 123 | 118 | 112 | 107 | 101 | 95 | 89 | 84 | 80 | 76 | 72 | 69 |
| 40-49 | 462 | 150% | 478 | 490 | 504 | 520 | 537 | 554 | 568 | 585 | 604 | 621 | 640 | 653 | 667 | 682 | 695 |
| 50-59 | 1,294 | 68% | 1,187 | 1,140 | 1,094 | 1,049 | 1,008 | 973 | 949 | 923 | 900 | 885 | 875 | 872 | 872 | 873 | 877 |
| 60-69 | 1,836 | 189% | 2,207 | 2,356 | 2,501 | 2,646 | 2,784 | 2,929 | 3,065 | 3,208 | 3,330 | 3,433 | 3,510 | 3,576 | 3,639 | 3,546 | 3,462 |
| 70-79 | 2,203 | 250% | 2,729 | 2,914 | 3,120 | 3,280 | 3,486 | 3,734 | 4,017 | 4,352 | 4,738 | 5,038 | 5,150 | 5,276 | 5,373 | 5,453 | 5,503 |
| 80-89 | 1,249 | 116% | 1,305 | 1,327 | 1,344 | 1,416 | 1,464 | 1,492 | 1,510 | 1,518 | 1,515 | 1,510 | 1,502 | 1,487 | 1,477 | 1,453 | 1,444 |
| 90+ | 268 | 238% | 297 | 309 | 323 | 336 | 352 | 368 | 383 | 397 | 418 | 445 | 475 | 503 | 530 | 592 | 638 |

| Dementia | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 18 | 20% | 14 | 13 | 11 | 10 | 9 | 9 | 8 | 7 | 6 | 6 | 5 | 5 | 4 | 4 | 4 |
| 20-29 | 34 | 202% | 66 | 66 | 66 | 66 | 66 | 66 | 67 | 67 | 68 | 69 | 69 | 69 | 70 | 69 | 69 |
| 30-39 | 61 | 4% | 36 | 30 | 25 | 21 | 17 | 14 | 12 | 10 | 8 | 6 | 5 | 4 | 4 | 3 | 2 |
| 40-49 | 163 | 43% | 135 | 129 | 123 | 118 | 114 | 109 | 104 | 99 | 95 | 91 | 87 | 83 | 79 | 75 | 71 |
| 50-59 | 620 | 177% | 919 | 1,103 | 1,134 | 1,105 | 1,078 | 1,057 | 1,048 | 1,035 | 1,025 | 1,024 | 1,028 | 1,041 | 1,057 | 1,076 | 1,098 |
| 60-69 | 1,399 | 147% | 1,601 | 1,672 | 1,731 | 1,810 | 1,862 | 1,925 | 1,972 | 2,031 | 2,046 | 2,058 | 2,052 | 2,089 | 2,059 | 2,065 | 2,063 |
| 70-79 | 4,292 | 237% | 5,645 | 6,155 | 6,730 | 7,221 | 7,836 | 8,566 | 8,801 | 8,944 | 9,133 | 9,312 | 9,520 | 9,752 | 9,931 | 10,078 | 10,171 |
| 80-89 | 5,977 | 283% | 9,094 | 10,478 | 12,031 | 14,366 | 15,299 | 15,775 | 16,145 | 16,416 | 16,572 | 16,713 | 16,809 | 16,838 | 16,919 | 16,830 | 16,921 |
| 90+ | 2,374 | 349% | 3,670 | 4,261 | 4,969 | 5,400 | 5,545 | 5,682 | 5,797 | 5,891 | 6,083 | 6,352 | 6,660 | 6,919 | 7,149 | 7,823 | 8,275 |

| Depression | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low** | | | | | | | | | | | | | | | | | |
| 0-19 | 3,120 | 97% | 3,999 | 3,787 | 3,588 | 3,476 | 3,372 | 3,310 | 3,259 | 3,218 | 3,177 | 3,143 | 3,112 | 3,083 | 3,053 | 3,032 | 3,016 |
| 20-29 | 7,549 | 103% | 8,815 | 8,370 | 7,981 | 7,785 | 7,652 | 7,598 | 7,593 | 7,642 | 7,733 | 7,806 | 7,855 | 7,879 | 7,881 | 7,863 | 7,808 |
| 30-39 | 4,783 | 129% | 6,184 | 6,427 | 6,707 | 6,636 | 6,539 | 6,495 | 6,465 | 6,426 | 6,343 | 6,268 | 6,197 | 6,178 | 6,168 | 6,162 | 6,180 |
| 40-49 | 2,923 | 178% | 3,589 | 3,759 | 3,960 | 4,275 | 4,651 | 4,723 | 4,758 | 4,830 | 4,914 | 4,983 | 5,064 | 5,094 | 5,133 | 5,182 | 5,214 |
| 50-59 | 2,789 | 131% | 3,177 | 3,163 | 3,155 | 3,217 | 3,299 | 3,438 | 3,518 | 3,473 | 3,433 | 3,425 | 3,436 | 3,475 | 3,527 | 3,588 | 3,665 |
| 60-69 | 1,835 | 126% | 2,721 | 2,808 | 2,723 | 2,695 | 2,662 | 2,659 | 2,653 | 2,658 | 2,640 | 2,605 | 2,550 | 2,487 | 2,423 | 2,362 | 2,307 |
| 70-79 | 1,377 | 187% | 2,013 | 2,191 | 2,386 | 2,296 | 2,243 | 2,232 | 2,242 | 2,276 | 2,321 | 2,363 | 2,413 | 2,470 | 2,512 | 2,550 | 2,575 |
| 80-89 | 924 | 202% | 1,279 | 1,376 | 1,480 | 1,683 | 1,724 | 1,761 | 1,793 | 1,821 | 1,836 | 1,849 | 1,858 | 1,859 | 1,866 | 1,857 | 1,868 |
| 90+ | 238 | 21% | 172 | 149 | 130 | 117 | 105 | 96 | 87 | 79 | 73 | 68 | 64 | 59 | 55 | 54 | 51 |
| **High** | | | | | | | | | | | | | | | | | |
| 0-19 | | 119% | 4,166 | 4,147 | 4,120 | 4,090 | 4,050 | 4,013 | 3,971 | 3,925 | 3,881 | 3,844 | 3,810 | 3,778 | 3,745 | 3,719 | 3,698 |
| 20-29 | | 127% | 9,183 | 9,166 | 9,166 | 9,160 | 9,190 | 9,210 | 9,251 | 9,320 | 9,445 | 9,547 | 9,616 | 9,656 | 9,668 | 9,644 | 9,572 |
| 30-39 | | 158% | 6,443 | 7,038 | 7,703 | 7,809 | 7,854 | 7,873 | 7,876 | 7,838 | 7,748 | 7,666 | 7,586 | 7,571 | 7,566 | 7,558 | 7,577 |
| 40-49 | | 219% | 3,739 | 4,117 | 4,548 | 5,031 | 5,586 | 5,725 | 5,797 | 5,892 | 6,002 | 6,094 | 6,199 | 6,243 | 6,297 | 6,355 | 6,393 |
| 50-59 | | 161% | 3,310 | 3,464 | 3,623 | 3,785 | 3,962 | 4,168 | 4,287 | 4,236 | 4,193 | 4,189 | 4,207 | 4,259 | 4,326 | 4,401 | 4,493 |
| 60-69 | | 154% | 2,835 | 3,075 | 3,128 | 3,171 | 3,197 | 3,224 | 3,233 | 3,241 | 3,225 | 3,186 | 3,122 | 3,047 | 2,973 | 2,897 | 2,828 |
| 70-79 | | 229% | 2,097 | 2,399 | 2,740 | 2,702 | 2,694 | 2,706 | 2,731 | 2,776 | 2,835 | 2,890 | 2,954 | 3,027 | 3,082 | 3,128 | 3,157 |
| 80-89 | | 248% | 1,332 | 1,507 | 1,700 | 1,980 | 2,070 | 2,135 | 2,185 | 2,221 | 2,243 | 2,262 | 2,275 | 2,279 | 2,290 | 2,278 | 2,290 |
| 90+ | | 26% | 179 | 163 | 150 | 137 | 126 | 116 | 106 | 96 | 89 | 83 | 78 | 73 | 67 | 66 | 63 |

| Epilepsy | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 478 | 66% | 464 | 454 | 443 | 432 | 420 | 409 | 397 | 385 | 374 | 363 | 352 | 342 | 332 | 323 | 314 |
| 20-29 | 270 | 77% | 238 | 235 | 232 | 229 | 227 | 225 | 223 | 222 | 223 | 222 | 221 | 219 | 216 | 213 | 209 |
| 30-39 | 220 | 38% | 201 | 194 | 187 | 181 | 173 | 165 | 156 | 147 | 136 | 126 | 117 | 108 | 100 | 91 | 83 |
| 40-49 | 191 | 48% | 169 | 164 | 160 | 155 | 152 | 147 | 141 | 136 | 131 | 126 | 120 | 113 | 106 | 99 | 92 |
| 50-59 | 255 | 58% | 231 | 221 | 211 | 200 | 191 | 183 | 177 | 170 | 164 | 160 | 156 | 153 | 151 | 149 | 148 |
| 60-69 | 235 | 42% | 237 | 233 | 227 | 220 | 212 | 203 | 194 | 184 | 173 | 161 | 148 | 135 | 122 | 110 | 99 |
| 70-79 | 313 | 15% | 257 | 242 | 227 | 209 | 193 | 178 | 164 | 151 | 138 | 124 | 110 | 96 | 80 | 63 | 46 |
| 80-89 | 233 | 36% | 220 | 214 | 208 | 209 | 206 | 199 | 190 | 179 | 167 | 154 | 140 | 126 | 113 | 98 | 84 |
| 90+ | 55 | 97% | 58 | 57 | 57 | 56 | 56 | 55 | 54 | 53 | 52 | 52 | 53 | 52 | 51 | 53 | 53 |

| Heart failure | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 40 | 279% | 110 | 125 | 125 | 124 | 122 | 121 | 120 | 119 | 117 | 116 | 115 | 114 | 113 | 112 | 112 |
| 20-29 | 57 | 139% | 76 | 76 | 76 | 76 | 76 | 76 | 77 | 77 | 78 | 79 | 80 | 80 | 80 | 80 | 79 |
| 30-39 | 132 | 114% | 151 | 152 | 153 | 155 | 156 | 156 | 156 | 156 | 154 | 152 | 151 | 150 | 150 | 150 | 150 |
| 40-49 | 324 | 120% | 322 | 326 | 331 | 337 | 344 | 350 | 354 | 360 | 367 | 372 | 379 | 381 | 385 | 388 | 390 |
| 50-59 | 848 | 91% | 842 | 822 | 801 | 780 | 761 | 747 | 740 | 731 | 724 | 723 | 726 | 735 | 747 | 760 | 776 |
| 60-69 | 1,645 | 140% | 2,445 | 2,501 | 2,544 | 2,579 | 2,600 | 2,622 | 2,629 | 2,636 | 2,623 | 2,591 | 2,539 | 2,479 | 2,418 | 2,356 | 2,300 |
| 70-79 | 3,276 | 188% | 5,318 | 5,327 | 5,349 | 5,275 | 5,259 | 5,283 | 5,332 | 5,419 | 5,534 | 5,642 | 5,768 | 5,909 | 6,017 | 6,106 | 6,163 |
| 80-89 | 3,424 | 193% | 5,070 | 5,221 | 5,350 | 5,701 | 5,960 | 6,146 | 6,290 | 6,395 | 6,456 | 6,511 | 6,548 | 6,560 | 6,591 | 6,557 | 6,592 |
| 90+ | 1,281 | 187% | 1,465 | 1,493 | 1,528 | 1,563 | 1,605 | 1,645 | 1,678 | 1,705 | 1,761 | 1,838 | 1,927 | 2,002 | 2,069 | 2,264 | 2,395 |

| Hypertension | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low** | | | | | | | | | | | | | | | | | |
| 0-19 | 142 | 52% | 122 | 119 | 113 | 108 | 100 | 97 | 103 | 97 | 90 | 83 | 80 | 79 | 77 | 75 | 73 |
| 20-29 | 397 | 140% | 624 | 621 | 605 | 591 | 565 | 561 | 618 | 602 | 582 | 555 | 553 | 562 | 564 | 565 | 558 |
| 30-39 | 1,380 | 147% | 2,383 | 2,395 | 2,353 | 2,319 | 2,224 | 2,211 | 2,423 | 2,333 | 2,198 | 2,054 | 2,010 | 2,030 | 2,032 | 2,039 | 2,033 |
| 40-49 | 3,343 | 174% | 5,584 | 5,641 | 5,580 | 5,542 | 5,394 | 5,438 | 6,031 | 5,931 | 5,758 | 5,524 | 5,556 | 5,661 | 5,720 | 5,800 | 5,802 |
| 50-59 | 6,166 | 101% | 5,311 | 5,134 | 4,891 | 4,703 | 4,431 | 4,486 | 3,461 | 4,024 | 4,690 | 5,543 | 5,751 | 5,891 | 5,994 | 6,126 | 6,220 |
| 60-69 | 5,992 | 63% | 6,989 | 6,468 | 6,093 | 5,638 | 5,357 | 4,912 | 5,136 | 4,757 | 4,575 | 4,283 | 4,010 | 3,930 | 3,854 | 3,819 | 3,759 |
| 70-79 | 5,341 | 86% | 6,378 | 6,281 | 6,262 | 5,805 | 5,473 | 5,470 | 4,431 | 4,653 | 4,882 | 5,172 | 5,308 | 5,004 | 4,862 | 4,645 | 4,610 |
| 80-89 | 2,099 | 393% | 3,524 | 4,321 | 5,153 | 6,408 | 7,633 | 8,049 | 9,022 | 8,876 | 8,540 | 8,138 | 8,092 | 8,202 | 8,256 | 8,251 | 8,249 |
| 90+ | 349 | 197% | 356 | 370 | 378 | 386 | 387 | 402 | 460 | 462 | 465 | 470 | 498 | 536 | 568 | 638 | 687 |
| **High** | | | | | | | | | | | | | | | | | |
| 0-19 | | 66% | 134 | 131 | 128 | 125 | 122 | 119 | 115 | 112 | 109 | 106 | 104 | 101 | 98 | 96 | 94 |
| 20-29 | | 180% | 686 | 684 | 684 | 684 | 686 | 688 | 691 | 696 | 705 | 713 | 718 | 721 | 722 | 720 | 715 |
| 30-39 | | 189% | 2,620 | 2,638 | 2,661 | 2,686 | 2,702 | 2,708 | 2,709 | 2,696 | 2,665 | 2,637 | 2,610 | 2,604 | 2,603 | 2,600 | 2,606 |
| 40-49 | | 222% | 6,137 | 6,213 | 6,311 | 6,418 | 6,552 | 6,661 | 6,745 | 6,855 | 6,984 | 7,091 | 7,213 | 7,263 | 7,326 | 7,394 | 7,438 |
| 50-59 | | 129% | 5,837 | 5,655 | 5,532 | 5,447 | 5,382 | 5,494 | 3,871 | 4,652 | 5,688 | 7,114 | 7,466 | 7,558 | 7,677 | 7,810 | 7,974 |
| 60-69 | | 80% | 7,682 | 7,124 | 6,892 | 6,529 | 6,507 | 6,016 | 5,744 | 5,498 | 5,549 | 5,498 | 5,206 | 5,042 | 4,936 | 4,868 | 4,819 |
| 70-79 | | 111% | 7,010 | 6,919 | 7,083 | 6,723 | 6,648 | 6,700 | 4,956 | 5,377 | 5,921 | 6,638 | 6,891 | 6,420 | 6,228 | 5,921 | 5,909 |
| 80-89 | | 504% | 3,874 | 4,760 | 5,828 | 7,422 | 9,272 | 9,859 | 10,090 | 10,259 | 10,357 | 10,445 | 10,505 | 10,523 | 10,574 | 10,518 | 10,575 |
| 90+ | | 252% | 391 | 408 | 427 | 447 | 470 | 492 | 514 | 534 | 565 | 603 | 647 | 688 | 727 | 814 | 881 |

| Inflammatory Bowel Disease | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 159 | 90% | 155 | 155 | 154 | 154 | 153 | 152 | 150 | 149 | 148 | 147 | 146 | 145 | 144 | 143 | 143 |
| 20-29 | 295 | 105% | 288 | 290 | 293 | 295 | 299 | 299 | 301 | 303 | 307 | 310 | 312 | 314 | 314 | 313 | 311 |
| 30-39 | 334 | 110% | 368 | 371 | 375 | 378 | 380 | 381 | 382 | 380 | 375 | 371 | 367 | 367 | 367 | 366 | 367 |
| 40-49 | 293 | 146% | 304 | 315 | 327 | 340 | 354 | 368 | 380 | 394 | 402 | 408 | 415 | 418 | 422 | 425 | 428 |
| 50-59 | 357 | 104% | 341 | 337 | 333 | 328 | 324 | 322 | 323 | 323 | 324 | 327 | 332 | 340 | 349 | 359 | 371 |
| 60-69 | 332 | 112% | 356 | 367 | 376 | 384 | 390 | 396 | 400 | 404 | 405 | 403 | 398 | 391 | 384 | 377 | 371 |
| 70-79 | 300 | 151% | 318 | 324 | 330 | 331 | 335 | 342 | 350 | 361 | 374 | 387 | 402 | 417 | 431 | 443 | 454 |
| 80-89 | 117 | 140% | 117 | 121 | 124 | 133 | 140 | 145 | 150 | 153 | 155 | 157 | 159 | 160 | 162 | 162 | 163 |
| 90+ | 16 | 180% | 15 | 16 | 16 | 17 | 17 | 18 | 19 | 19 | 20 | 21 | 22 | 23 | 24 | 27 | 29 |

| Osteoporosis | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 37 | 223% | 93 | 93 | 92 | 91 | 90 | 90 | 89 | 88 | 87 | 86 | 85 | 84 | 84 | 83 | 83 |
| 20-29 | 17 | 7% | 10 | 9 | 8 | 6 | 6 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 |
| 30-39 | 52 | 290% | 66 | 70 | 75 | 80 | 86 | 91 | 97 | 103 | 108 | 113 | 119 | 126 | 133 | 141 | 151 |
| 40-49 | 108 | 677% | 153 | 175 | 200 | 228 | 262 | 300 | 342 | 392 | 449 | 513 | 588 | 666 | 721 | 727 | 731 |
| 50-59 | 541 | 338% | 659 | 695 | 734 | 773 | 816 | 866 | 928 | 992 | 1,063 | 1,149 | 1,248 | 1,367 | 1,502 | 1,654 | 1,827 |
| 60-69 | 1,096 | 377% | 1,900 | 2,291 | 2,748 | 3,283 | 3,903 | 4,639 | 4,728 | 4,741 | 4,716 | 4,660 | 4,566 | 4,457 | 4,348 | 4,237 | 4,136 |
| 70-79 | 1,638 | 433% | 2,815 | 3,353 | 4,003 | 4,694 | 5,564 | 6,074 | 6,130 | 6,230 | 6,362 | 6,486 | 6,631 | 6,793 | 6,917 | 7,020 | 7,085 |
| 80-89 | 1,287 | 362% | 1,645 | 1,788 | 1,937 | 2,182 | 2,412 | 2,629 | 2,845 | 3,058 | 3,264 | 3,480 | 3,700 | 3,918 | 4,162 | 4,377 | 4,653 |
| 90+ | 383 | 306% | 444 | 469 | 496 | 525 | 558 | 592 | 625 | 657 | 702 | 759 | 823 | 885 | 946 | 1,072 | 1,173 |

| PVD | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 49 | 104% | 58 | 57 | 57 | 56 | 56 | 55 | 55 | 54 | 54 | 53 | 53 | 52 | 52 | 51 | 51 |
| 20-29 | 68 | 132% | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 87 | 88 | 89 | 90 | 90 | 90 | 90 | 89 |
| 30-39 | 144 | 132% | 191 | 192 | 194 | 196 | 197 | 198 | 198 | 197 | 194 | 192 | 190 | 190 | 190 | 190 | 190 |
| 40-49 | 289 | 141% | 337 | 341 | 346 | 352 | 360 | 366 | 370 | 376 | 383 | 389 | 396 | 399 | 402 | 406 | 408 |
| 50-59 | 699 | 116% | 882 | 861 | 839 | 817 | 798 | 782 | 775 | 766 | 758 | 758 | 761 | 770 | 782 | 796 | 813 |
| 60-69 | 1,090 | 156% | 1,808 | 1,850 | 1,882 | 1,908 | 1,924 | 1,939 | 1,945 | 1,950 | 1,940 | 1,917 | 1,878 | 1,834 | 1,789 | 1,743 | 1,701 |
| 70-79 | 1,301 | 223% | 1,675 | 1,812 | 1,966 | 2,093 | 2,254 | 2,445 | 2,506 | 2,547 | 2,601 | 2,651 | 2,711 | 2,777 | 2,828 | 2,870 | 2,896 |
| 80-89 | 1,056 | 201% | 1,636 | 1,683 | 1,724 | 1,838 | 1,921 | 1,981 | 2,027 | 2,061 | 2,081 | 2,099 | 2,111 | 2,114 | 2,125 | 2,113 | 2,125 |
| 90+ | 334 | 230% | 469 | 478 | 489 | 500 | 514 | 526 | 537 | 546 | 564 | 589 | 617 | 641 | 662 | 725 | 767 |

| Rheumatoid Arthritis | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 53 | 82% | 53 | 52 | 52 | 51 | 50 | 50 | 49 | 48 | 47 | 46 | 46 | 45 | 45 | 44 | 43 |
| 20-29 | 68 | 89% | 65 | 64 | 64 | 63 | 63 | 63 | 62 | 62 | 63 | 63 | 63 | 63 | 62 | 62 | 61 |
| 30-39 | 128 | 92% | 141 | 141 | 140 | 140 | 139 | 137 | 136 | 133 | 130 | 127 | 124 | 122 | 121 | 119 | 117 |
| 40-49 | 218 | 96% | 217 | 216 | 216 | 217 | 218 | 218 | 218 | 218 | 218 | 218 | 218 | 216 | 214 | 213 | 210 |
| 50-59 | 359 | 63% | 379 | 360 | 342 | 324 | 308 | 294 | 283 | 271 | 260 | 252 | 244 | 239 | 234 | 230 | 226 |
| 60-69 | 491 | 80% | 527 | 531 | 532 | 531 | 527 | 523 | 516 | 509 | 497 | 483 | 465 | 446 | 427 | 408 | 391 |
| 70-79 | 476 | 95% | 523 | 515 | 507 | 491 | 480 | 472 | 467 | 465 | 465 | 463 | 463 | 464 | 462 | 457 | 450 |
| 80-89 | 258 | 123% | 307 | 311 | 314 | 330 | 339 | 344 | 347 | 347 | 345 | 342 | 338 | 333 | 329 | 321 | 317 |
| 90+ | 47 | 184% | 66 | 66 | 67 | 67 | 68 | 69 | 69 | 69 | 70 | 72 | 74 | 76 | 77 | 83 | 86 |

| Stroke & TIA | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 36 | 27% | 30 | 28 | 27 | 25 | 24 | 22 | 21 | 19 | 18 | 16 | 15 | 14 | 12 | 11 | 10 |
| 20-29 | 43 | 114% | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 48 | 48 | 49 | 49 | 49 | 50 | 49 | 49 |
| 30-39 | 146 | 128% | 159 | 162 | 165 | 169 | 172 | 175 | 177 | 179 | 179 | 179 | 179 | 181 | 183 | 185 | 188 |
| 40-49 | 378 | 88% | 337 | 336 | 337 | 338 | 340 | 341 | 340 | 341 | 342 | 342 | 343 | 340 | 338 | 336 | 332 |
| 50-59 | 985 | 64% | 902 | 865 | 828 | 792 | 759 | 730 | 710 | 688 | 667 | 653 | 642 | 637 | 633 | 630 | 628 |
| 60-69 | 1,567 | 53% | 1,499 | 1,489 | 1,469 | 1,442 | 1,407 | 1,371 | 1,328 | 1,284 | 1,230 | 1,168 | 1,099 | 1,028 | 959 | 892 | 830 |
| 70-79 | 2,440 | 44% | 2,162 | 2,077 | 1,996 | 1,881 | 1,788 | 1,708 | 1,635 | 1,571 | 1,513 | 1,448 | 1,385 | 1,320 | 1,244 | 1,161 | 1,069 |
| 80-89 | 1,925 | 53% | 1,874 | 1,847 | 1,811 | 1,843 | 1,835 | 1,799 | 1,744 | 1,676 | 1,593 | 1,507 | 1,415 | 1,317 | 1,223 | 1,116 | 1,021 |
| 90+ | 645 | 23% | 530 | 508 | 487 | 465 | 443 | 419 | 391 | 361 | 335 | 311 | 285 | 253 | 217 | 189 | 149 |

## Table B2. Diabetes number projections, also disaggregated into subtypes, also 2021 actuals for comparison

| Diabetes | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low** | | | | | | | | | | | | | | | | | |
| 0-19 | 318 | 88% | 301 | 303 | 305 | 306 | 303 | 300 | 297 | 294 | 291 | 288 | 286 | 284 | 282 | 281 | 280 |
| 20-29 | 789 | 85% | 654 | 647 | 646 | 645 | 646 | 647 | 649 | 654 | 663 | 671 | 676 | 679 | 680 | 678 | 672 |
| 30-39 | 1,426 | 96% | 1,496 | 1,474 | 1,477 | 1,481 | 1,480 | 1,473 | 1,463 | 1,450 | 1,428 | 1,409 | 1,390 | 1,384 | 1,380 | 1,375 | 1,375 |
| 40-49 | 1,867 | 100% | 1,718 | 1,679 | 1,688 | 1,702 | 1,721 | 1,731 | 1,734 | 1,754 | 1,780 | 1,802 | 1,829 | 1,837 | 1,850 | 1,864 | 1,871 |
| 50-59 | 3,295 | 83% | 3,325 | 3,126 | 3,018 | 2,912 | 2,815 | 2,730 | 2,675 | 2,632 | 2,596 | 2,586 | 2,591 | 2,617 | 2,653 | 2,695 | 2,746 |
| 60-69 | 3,215 | 122% | 4,707 | 4,632 | 4,660 | 4,676 | 4,667 | 4,649 | 4,606 | 4,594 | 4,551 | 4,480 | 4,376 | 4,260 | 4,146 | 4,031 | 3,927 |
| 70-79 | 2,538 | 179% | 3,881 | 4,195 | 4,181 | 4,093 | 4,042 | 4,014 | 4,006 | 4,052 | 4,123 | 4,192 | 4,276 | 4,371 | 4,444 | 4,504 | 4,537 |
| 80-89 | 1,110 | 212% | 1,351 | 1,427 | 1,545 | 1,740 | 1,923 | 2,091 | 2,245 | 2,277 | 2,296 | 2,314 | 2,327 | 2,332 | 2,344 | 2,334 | 2,349 |
| 90+ | 204 | 251% | 265 | 286 | 318 | 346 | 353 | 358 | 362 | 366 | 378 | 394 | 412 | 428 | 442 | 484 | 512 |
| **High** | | | | | | | | | | | | | | | | | |
| 0-19 | | 88% | 302 | 304 | 306 | 307 | 304 | 301 | 298 | 295 | 291 | 289 | 287 | 285 | 283 | 281 | 280 |
| 20-29 | | 90% | 672 | 672 | 673 | 674 | 677 | 680 | 684 | 691 | 701 | 710 | 716 | 720 | 721 | 719 | 713 |
| 30-39 | | 108% | 1,571 | 1,580 | 1,592 | 1,605 | 1,612 | 1,614 | 1,613 | 1,603 | 1,583 | 1,564 | 1,546 | 1,541 | 1,538 | 1,535 | 1,537 |
| 40-49 | | 121% | 1,865 | 1,888 | 1,918 | 1,950 | 1,991 | 2,024 | 2,049 | 2,083 | 2,122 | 2,154 | 2,191 | 2,207 | 2,226 | 2,246 | 2,259 |
| 50-59 | | 102% | 3,625 | 3,538 | 3,451 | 3,362 | 3,281 | 3,219 | 3,190 | 3,153 | 3,122 | 3,120 | 3,134 | 3,174 | 3,224 | 3,279 | 3,348 |
| 60-69 | | 150% | 5,144 | 5,261 | 5,350 | 5,422 | 5,466 | 5,510 | 5,524 | 5,537 | 5,507 | 5,440 | 5,329 | 5,201 | 5,072 | 4,941 | 4,822 |
| 70-79 | | 219% | 4,243 | 4,769 | 4,802 | 4,746 | 4,734 | 4,757 | 4,803 | 4,883 | 4,988 | 5,087 | 5,203 | 5,331 | 5,431 | 5,513 | 5,565 |
| 80-89 | | 258% | 1,475 | 1,620 | 1,772 | 2,016 | 2,250 | 2,476 | 2,690 | 2,741 | 2,774 | 2,803 | 2,826 | 2,837 | 2,857 | 2,848 | 2,869 |
| 90+ | | 307% | 290 | 325 | 365 | 402 | 413 | 424 | 433 | 441 | 456 | 477 | 501 | 521 | 539 | 591 | 627 |

| Type 1 Diabetes | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 242 | 88% | 227 | 230 | 233 | 236 | 234 | 232 | 229 | 226 | 224 | 222 | 220 | 218 | 216 | 215 | 213 |
| 20-29 | 85 | 124% | 89 | 90 | 91 | 92 | 94 | 95 | 97 | 99 | 101 | 104 | 106 | 107 | 107 | 106 | 106 |
| 30-39 | 58 | 55% | 58 | 57 | 55 | 54 | 52 | 51 | 49 | 47 | 44 | 42 | 39 | 38 | 36 | 34 | 32 |
| 40-49 | 49 | 111% | 46 | 46 | 47 | 48 | 48 | 49 | 50 | 51 | 51 | 52 | 53 | 53 | 54 | 54 | 54 |
| 50-59 | 67 | 89% | 54 | 54 | 54 | 53 | 53 | 52 | 53 | 53 | 53 | 54 | 55 | 56 | 57 | 58 | 59 |
| 60-69 | 37 | 41% | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 27 | 26 | 24 | 22 | 20 | 18 | 17 | 15 |
| 70-79 | 39 | 181% | 39 | 41 | 42 | 44 | 45 | 47 | 49 | 52 | 55 | 57 | 61 | 64 | 67 | 70 | 71 |
| 80-89 | 15 | 140% | 16 | 17 | 17 | 18 | 19 | 20 | 20 | 20 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| 90+ | 5 | 146% | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 |

| Type 2 Diabetes | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low** | | | | | | | | | | | | | | | | | |
| 0-19 | 20 | 4% | 11 | 9 | 7 | 6 | 5 | 4 | 4 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| 20-29 | 203 | 84% | 185 | 177 | 175 | 173 | 172 | 170 | 169 | 169 | 170 | 172 | 172 | 173 | 173 | 172 | 170 |
| 30-39 | 654 | 102% | 758 | 733 | 731 | 730 | 726 | 719 | 710 | 703 | 692 | 683 | 673 | 670 | 668 | 666 | 667 |
| 40-49 | 1,654 | 97% | 1,499 | 1,457 | 1,463 | 1,472 | 1,487 | 1,493 | 1,493 | 1,509 | 1,531 | 1,549 | 1,571 | 1,578 | 1,588 | 1,600 | 1,606 |
| 50-59 | 3,142 | 79% | 3,059 | 2,865 | 2,763 | 2,663 | 2,571 | 2,490 | 2,437 | 2,395 | 2,361 | 2,350 | 2,354 | 2,377 | 2,409 | 2,446 | 2,492 |
| 60-69 | 3,085 | 120% | 4,453 | 4,374 | 4,399 | 4,413 | 4,403 | 4,384 | 4,342 | 4,331 | 4,290 | 4,224 | 4,127 | 4,018 | 3,911 | 3,804 | 3,706 |
| 70-79 | 2,416 | 176% | 3,690 | 3,990 | 3,962 | 3,867 | 3,814 | 3,785 | 3,772 | 3,813 | 3,877 | 3,939 | 4,016 | 4,103 | 4,168 | 4,222 | 4,253 |
| 80-89 | 1,056 | 204% | 1,269 | 1,338 | 1,448 | 1,632 | 1,804 | 1,962 | 2,107 | 2,131 | 2,143 | 2,153 | 2,159 | 2,157 | 2,163 | 2,148 | 2,155 |
| 90+ | 195 | 242% | 249 | 269 | 300 | 327 | 332 | 336 | 339 | 343 | 352 | 367 | 383 | 397 | 409 | 447 | 472 |

| Type 2 Diabetes | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **High** | | | | | | | | | | | | | | | | | |
| 0-19 | | 5% | 12 | 10 | 9 | 7 | 6 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 |
| 20-29 | | 104% | 203 | 202 | 202 | 202 | 203 | 203 | 204 | 206 | 209 | 211 | 212 | 213 | 213 | 213 | 211 |
| 30-39 | | 127% | 832 | 838 | 845 | 853 | 858 | 860 | 861 | 856 | 847 | 838 | 829 | 827 | 827 | 826 | 828 |
| 40-49 | | 121% | 1,646 | 1,666 | 1,692 | 1,721 | 1,757 | 1,786 | 1,808 | 1,838 | 1,872 | 1,901 | 1,934 | 1,948 | 1,964 | 1,983 | 1,994 |
| 50-59 | | 98% | 3,359 | 3,277 | 3,196 | 3,113 | 3,037 | 2,979 | 2,952 | 2,917 | 2,888 | 2,885 | 2,897 | 2,933 | 2,979 | 3,030 | 3,094 |
| 60-69 | | 149% | 4,890 | 5,003 | 5,089 | 5,159 | 5,202 | 5,245 | 5,259 | 5,274 | 5,247 | 5,184 | 5,079 | 4,958 | 4,837 | 4,713 | 4,601 |
| 70-79 | | 219% | 4,052 | 4,564 | 4,583 | 4,520 | 4,507 | 4,527 | 4,569 | 4,643 | 4,742 | 4,834 | 4,942 | 5,063 | 5,156 | 5,232 | 5,281 |
| 80-89 | | 253% | 1,393 | 1,530 | 1,676 | 1,908 | 2,131 | 2,348 | 2,553 | 2,596 | 2,620 | 2,643 | 2,658 | 2,662 | 2,675 | 2,661 | 2,676 |
| 90+ | | 301% | 274 | 308 | 347 | 382 | 393 | 403 | 411 | 417 | 431 | 450 | 472 | 490 | 506 | 554 | 586 |

| Undetermined Type Diabetes | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 61 | 107% | 63 | 64 | 64 | 64 | 64 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 66 |
| 20-29 | 365 | 109% | 380 | 380 | 380 | 380 | 381 | 382 | 383 | 386 | 391 | 396 | 398 | 400 | 401 | 400 | 397 |
| 30-39 | 621 | 109% | 680 | 685 | 691 | 697 | 701 | 703 | 703 | 700 | 692 | 685 | 678 | 676 | 676 | 675 | 677 |
| 40-49 | 175 | 120% | 174 | 176 | 179 | 182 | 186 | 189 | 191 | 194 | 198 | 201 | 204 | 206 | 208 | 210 | 211 |
| 50-59 | 220 | 89% | 212 | 206 | 201 | 196 | 191 | 188 | 186 | 184 | 182 | 182 | 182 | 185 | 188 | 191 | 195 |
| 60-69 | 207 | 100% | 219 | 224 | 228 | 231 | 233 | 235 | 236 | 236 | 235 | 232 | 227 | 222 | 217 | 211 | 206 |
| 70-79 | 139 | 153% | 152 | 164 | 176 | 183 | 182 | 183 | 184 | 187 | 191 | 195 | 200 | 204 | 208 | 211 | 213 |
| 80-89 | 52 | 332% | 66 | 73 | 80 | 90 | 100 | 109 | 117 | 125 | 133 | 140 | 147 | 153 | 160 | 166 | 173 |
| 90+ | 10 | 330% | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 20 | 21 | 23 | 25 | 27 | 30 | 33 |

# Appendix C

## Population projections, LTC diagnoses, condition-age-group projections and ambulance callout projections

In September 2023, The Office for National Statistics plans to rebase their 2012 to 2020 mid-year population estimates based on Census 2021 data. It is possible that future projections based on Census 2021 data will be lower than the current projections. The main body of this report has already applied such a lowering pro-rata, where each age-group ratio of 2021 as last projected to 2021 as discovered by the 2021 Census is also applied to all projected years. This results, on average, with a small reduction, around -2% ranging from a multiplier of 0.9 for the 20 to 29 age-group to a multiplier of 1 for the 40 to 49 age-group.

This appendix repeats the information if that had not been done. General statements about ratios within 2038 would not change because fluctuations across 2038's age-groups are too small to change them.

Figures 4a, 4b, 4c would be unchanged because they compare various years to 2021 – if the whole lot are left unmodified by the new information in the 2021 Census then ratioed the same changes over time will be seen.

The total LTC count had fallen (2011) then risen in parts (2021) and was projected to rise:

**Table C.2: Wales LTC diagnoses (17 conditions, Diabetes included only once).**

Percentages shown are versus 2001. Note that these counts are NOT counts of persons diagnosed – some people will be diagnosed with more than one LTC during the year.

C.2a: Actuals shown for years 2001, 2011, 2021.

| | 2001 | 2011 | 2021 | 2011 (%) | 2021 (%) |
|---|---|---|---|---|---|
| Under 60s | 113,565 | 93,600 | 98,954 | 82 | 87 |
| 60-69 | 39,429 | 37,711 | 33,029 | 96 | 84 |
| 70+ | 87,218 | 83,177 | 85,391 | 95 | 98 |
| **Total** | **240,212** | **214,488** | **217,374** | **89** | **90** |

C.2b: Projected for years 2024 2031 2038, Low.

| LOW | 2024 | 2031 | 2038 | 2024 (%) | 2031 (%) | 2038 (%) |
|---|---|---|---|---|---|---|
| Under 60s | 119,398 | 116,897 | 122,412 | 105 | 103 | 108 |
| 60-69 | 43,070 | 48,971 | 42,825 | 109 | 124 | 109 |
| 70+ | 109,284 | 145,799 | 159,806 | 125 | 167 | 183 |
| **Total** | **271,752** | **311,667** | **325,043** | **113** | **130** | **135** |

C.2b: Projected for years 2024 2031 2038, High.

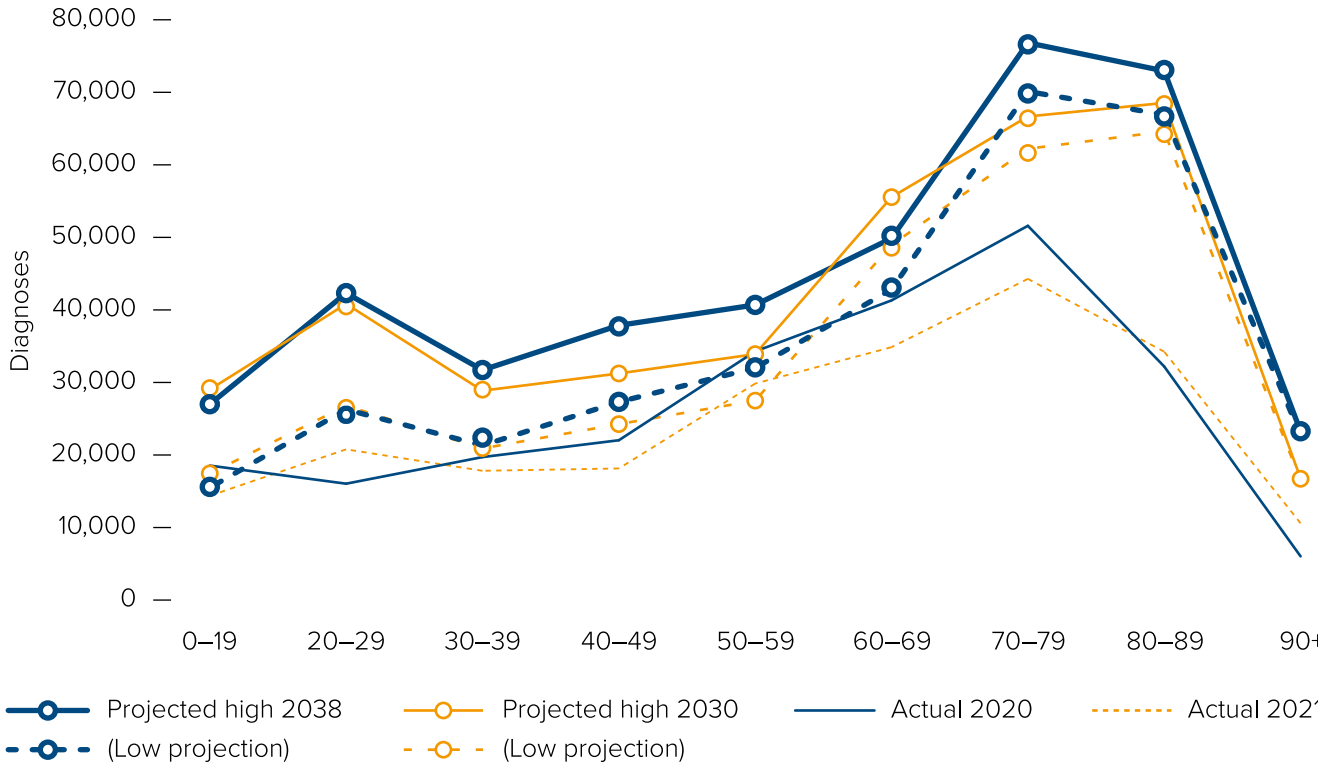
| HIGH | 2024 | 2031 | 2038 | 2024 (%) | 2031 (%) | 2038 (%) |
|---|---|---|---|---|---|---|
| Under 60s | 133,450 | 166,041 | 179,591 | 118 | 146 | 158 |
| 60-69 | 45,266 | 56,097 | 49,868 | 115 | 142 | 126 |
| 70+ | 112,023 | 155,639 | 173,045 | 128 | 178 | 198 |
| **Total** | **290,740** | **377,778** | **402,504** | **121** | **157** | **168** |

The following analysis is based on the UK Census Population for Census years (2001, 2011, 2021) and mid year population estimates or population projections for non- Census years. In 2021 the population of Wales (number of people) aged under 60 has changed by less than 500 since 2001. The proportion of the population under 60 has decreased (77.3% in 2001 to 72.3% in 2021) due to an increase in the number of people over 60. The proportion of the population aged under 60 is projected to decrease (72.3% in 2021, 69.0% in 2038). This will mostly be due to an increase in the number of people over 60. The population of Wales aged 60-69 in 2021 has increased since 2001 (by 29%). So the projected rise in 60-69 diagnosed incidence represents a decreasing rate once population is taken into account. The lower scenario for 70+s projects a rise in diagnoses versus 2001, with 2024 projected to reach 125% of 2001 and 2031 projected to reach 167% of 2001 and 2038 projected to reach 183% of 2001. The population of Wales aged 70 and over in 2021 has increased since 2001 (by 32%). So lower scenario 70+ diagnosed incidence projections are rising, but those projected rises are small once population is taken into account.

The 'High' scenario will be relevant if upticks after the COVID-19 pandemic translate into higher diagnoses over a long period, COVID-19 infection having permanently exacerbated certain conditions.

In the 'High' scenario for under 60s the projected rise in diagnoses versus 2001 is large, with 2024 diagnoses projected to reach 118% of 2001 and 2031 diagnoses projected to reach 146% of 2001 and 2038 diagnoses projected to reach 158% of 2001. The High scenario for 60-69s projects a rise in diagnoses versus 2001, with 2024 diagnoses projected to reach 115% of 2001 and 2031 diagnoses projected to reach 142% of 2001 and 2038 diagnoses projected to reach 126% of 2001. Such rising 60-69 diagnosis projections represent a decreasing incidence rate once population is taken into account. The High scenario for 70+s projects a rise in diagnoses versus 2001, with 2024 diagnoses projected to reach 128% of 2001 and 2031 diagnoses projected to reach 178% of 2001 and 2038 diagnoses projected to reach 198% of 2001. But the rising 70+ diagnosis projections remain rising after 2024 even after population is taken into account.

**Figure C.7 Age profile of Wales diagnoses, years 2000, 2021, 2030, 2038, 17 long-term conditions**




**Note:** that these counts are NOT counts of persons diagnosed – some people will be diagnosed with more than one LTC during the year.

**Description of Figure C.7:** In the years for which actual counts were available there were fewer diagnoses in younger age groups 0-19, 20-29, 30-39, 40-49 (around 20,000 per year) and more in the 70-79 age group (around 40-50,000 per year). In projected years diagnoses rise in younger age groups 0-19, 20-29, 30-39, 40-49 (to around 30-40,000 per year) and rise in the 70-79 age group (to between 60- and 80,000 per year). In the years for which actual counts were available diagnoses in the 80-89 age group were somewhere between younger age groups and the 70-79 age group at a time when the 80-89 age group accounted for a relatively small part of Wales' population. In projected years the 80-89 age group will form a larger part of the population and so their diagnoses move closer to the 70-79 age group (to around 60-70,000 per year).

In the next 25 years, the number of people older than 85 in England will double to 2.6 million (ONS population projection for 2045, versus 1.4 million in 2020); this might be expected to equate to 0.1 million in Wales. In mid-2020, the population aged 85 years or older in Wales was estimated to be 85,000. Using ONS's 2020-based national population projections, this is projected to be 150,000 by 2045. In the latest mid-2021 population estimates, based on Census 2021, it was estimated that there was just under 84,000 people aged 85 years or older.

## Atrial Fibrillation

ONS population aged 80 or over in Wales in 2010 was 152,669. The population aged 80 or over in Wales in 2050 using ONS projection was projected to be 324,140 – over double in ratio (2.12). On that basis, Wales' atrial fibrillation diagnoses of those aged 80 or over which were 5,308 in 2010 would double to around 11,000.

## Ambulance callouts

Ambulance callout projections if the population figures were not rebased to the 2021 Census figures: the number of red and amber calls would be estimated between 359,000 and 423,000 for the year. It is estimated that the total number of red, amber and green calls during the year 2033 could be between 446,000 and 492,000 (compared with 446,832 in the year 2022), or an increase of around 5%.

# Condition age-group projections with higher populations

| Anxiety disorders | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low** | | | | | | | | | | | | | | | | | |
| 0-19 | 5,922 | 101% | 9,244 | 9,773 | 9,014 | 8,284 | 7,749 | 7,403 | 7,114 | 6,842 | 6,638 | 6,470 | 6,318 | 6,225 | 6,133 | 6,058 | 5,994 |
| 20-29 | 9,153 | 140% | 12,436 | 12,737 | 13,540 | 14,345 | 14,517 | 14,029 | 13,683 | 13,415 | 13,338 | 13,268 | 13,164 | 13,137 | 13,071 | 12,971 | 12,810 |
| 30-39 | 6,494 | 110% | 6,631 | 6,230 | 6,075 | 5,911 | 5,847 | 5,884 | 5,951 | 6,000 | 6,058 | 6,142 | 6,234 | 6,437 | 6,656 | 6,886 | 7,152 |
| 40-49 | 4,121 | 154% | 4,257 | 4,143 | 4,190 | 4,232 | 4,378 | 4,603 | 4,855 | 5,150 | 5,522 | 5,918 | 6,306 | 6,310 | 6,325 | 6,350 | 6,356 |
| 50-59 | 4,041 | 108% | 4,494 | 4,360 | 4,381 | 4,385 | 4,486 | 4,708 | 4,602 | 4,425 | 4,298 | 4,226 | 4,181 | 4,206 | 4,246 | 4,296 | 4,365 |
| 60-69 | 2,547 | 121% | 2,927 | 2,907 | 2,974 | 3,024 | 3,120 | 3,286 | 3,466 | 3,664 | 3,696 | 3,594 | 3,469 | 3,365 | 3,262 | 3,162 | 3,072 |
| 70-79 | 1,907 | 154% | 2,218 | 2,188 | 2,241 | 2,249 | 2,327 | 2,477 | 2,667 | 2,785 | 2,790 | 2,800 | 2,820 | 2,871 | 2,905 | 2,933 | 2,945 |
| 80-89 | 1,086 | 177% | 1,313 | 1,316 | 1,362 | 1,462 | 1,571 | 1,700 | 1,838 | 1,978 | 1,990 | 1,975 | 1,957 | 1,948 | 1,945 | 1,925 | 1,926 |
| 90+ | 240 | 56% | 202 | 179 | 165 | 152 | 143 | 137 | 132 | 126 | 124 | 124 | 124 | 124 | 124 | 131 | 134 |
| **High** | | | | | | | | | | | | | | | | | |
| 0-19 | | 195% | 10,973 | 12,945 | 12,862 | 12,766 | 12,641 | 12,525 | 12,396 | 12,250 | 12,114 | 11,998 | 11,893 | 11,791 | 11,689 | 11,609 | 11,542 |
| 20-29 | | 270% | 14,762 | 16,872 | 19,319 | 22,106 | 23,683 | 23,736 | 23,841 | 24,019 | 24,341 | 24,603 | 24,781 | 24,884 | 24,914 | 24,854 | 24,668 |
| 30-39 | | 212% | 7,871 | 8,252 | 8,668 | 9,109 | 9,538 | 9,955 | 10,369 | 10,743 | 11,056 | 11,389 | 11,735 | 12,193 | 12,687 | 13,194 | 13,771 |
| 40-49 | | 297% | 5,053 | 5,487 | 5,978 | 6,522 | 7,141 | 7,788 | 8,459 | 9,221 | 10,077 | 10,974 | 11,870 | 11,953 | 12,056 | 12,168 | 12,239 |
| 50-59 | | 208% | 5,334 | 5,776 | 6,251 | 6,757 | 7,318 | 7,965 | 8,019 | 7,923 | 7,844 | 7,836 | 7,870 | 7,967 | 8,093 | 8,232 | 8,406 |
| 60-69 | | 232% | 3,475 | 3,851 | 4,244 | 4,660 | 5,090 | 5,559 | 6,039 | 6,560 | 6,744 | 6,664 | 6,529 | 6,374 | 6,218 | 6,059 | 5,915 |
| 70-79 | | 297% | 2,633 | 2,898 | 3,198 | 3,465 | 3,796 | 4,190 | 4,647 | 4,987 | 5,093 | 5,192 | 5,308 | 5,438 | 5,537 | 5,619 | 5,672 |
| 80-89 | | 341% | 1,558 | 1,743 | 1,943 | 2,253 | 2,563 | 2,876 | 3,202 | 3,542 | 3,632 | 3,663 | 3,684 | 3,690 | 3,708 | 3,688 | 3,708 |
| 90+ | | 107% | 240 | 238 | 236 | 234 | 233 | 232 | 230 | 226 | 227 | 230 | 234 | 236 | 236 | 251 | 257 |

| Asthma | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low** | | | | | | | | | | | | | | | | | |
| 0-19 | 3,535 | 136% | 4,967 | 5,146 | 5,545 | 5,747 | 5,569 | 5,390 | 5,223 | 5,115 | 5,042 | 4,974 | 4,935 | 4,897 | 4,858 | 4,828 | 4,799 |
| 20-29 | 1,403 | 126% | 2,058 | 2,121 | 1,960 | 1,836 | 1,803 | 1,765 | 1,736 | 1,733 | 1,751 | 1,762 | 1,777 | 1,786 | 1,789 | 1,786 | 1,772 |
| 30-39 | 1,187 | 122% | 1,701 | 1,754 | 1,702 | 1,611 | 1,586 | 1,553 | 1,521 | 1,500 | 1,478 | 1,456 | 1,443 | 1,441 | 1,441 | 1,441 | 1,444 |
| 40-49 | 1,056 | 129% | 1,328 | 1,353 | 1,330 | 1,268 | 1,267 | 1,258 | 1,247 | 1,256 | 1,276 | 1,290 | 1,314 | 1,324 | 1,336 | 1,350 | 1,357 |
| 50-59 | 1,306 | 104% | 1,238 | 1,116 | 1,049 | 1,050 | 1,099 | 1,154 | 1,227 | 1,290 | 1,273 | 1,267 | 1,274 | 1,291 | 1,312 | 1,335 | 1,363 |
| 60-69 | 1,182 | 134% | 1,343 | 1,303 | 1,310 | 1,399 | 1,552 | 1,718 | 1,837 | 1,826 | 1,811 | 1,782 | 1,747 | 1,707 | 1,667 | 1,625 | 1,586 |
| 70-79 | 856 | 118% | 754 | 664 | 612 | 590 | 600 | 614 | 633 | 665 | 706 | 748 | 798 | 853 | 907 | 960 | 1,010 |
| 80-89 | 429 | 203% | 466 | 442 | 435 | 475 | 532 | 585 | 641 | 706 | 777 | 853 | 863 | 865 | 870 | 866 | 871 |
| 90+ | 88 | 50% | 65 | 55 | 48 | 44 | 43 | 42 | 40 | 39 | 39 | 40 | 40 | 41 | 41 | 43 | 44 |
| **High** | | | | | | | | | | | | | | | | | |
| 0-19 | | 283% | 6,660 | 8,179 | 10,024 | 11,079 | 10,971 | 10,870 | 10,758 | 10,632 | 10,514 | 10,413 | 10,322 | 10,234 | 10,145 | 10,075 | 10,017 |
| 20-29 | | 264% | 2,761 | 3,371 | 3,543 | 3,540 | 3,552 | 3,560 | 3,575 | 3,602 | 3,651 | 3,690 | 3,716 | 3,732 | 3,736 | 3,727 | 3,699 |
| 30-39 | | 254% | 2,281 | 2,788 | 3,077 | 3,106 | 3,124 | 3,132 | 3,133 | 3,118 | 3,082 | 3,049 | 3,017 | 3,011 | 3,010 | 3,006 | 3,014 |
| 40-49 | | 268% | 1,781 | 2,150 | 2,404 | 2,445 | 2,496 | 2,537 | 2,569 | 2,611 | 2,660 | 2,701 | 2,748 | 2,767 | 2,791 | 2,817 | 2,833 |
| 50-59 | | 218% | 1,660 | 1,775 | 1,896 | 2,024 | 2,164 | 2,326 | 2,526 | 2,682 | 2,655 | 2,653 | 2,664 | 2,697 | 2,740 | 2,787 | 2,846 |
| 60-69 | | 280% | 1,801 | 2,071 | 2,368 | 2,698 | 3,057 | 3,465 | 3,785 | 3,795 | 3,775 | 3,730 | 3,655 | 3,568 | 3,481 | 3,392 | 3,311 |
| 70-79 | | 246% | 1,011 | 1,056 | 1,106 | 1,137 | 1,182 | 1,239 | 1,304 | 1,382 | 1,472 | 1,565 | 1,669 | 1,783 | 1,893 | 2,004 | 2,109 |
| 80-89 | | 424% | 624 | 702 | 786 | 916 | 1,047 | 1,180 | 1,321 | 1,468 | 1,620 | 1,786 | 1,805 | 1,808 | 1,817 | 1,808 | 1,817 |
| 90+ | | 105% | 88 | 87 | 86 | 85 | 85 | 84 | 83 | 82 | 82 | 83 | 84 | 85 | 85 | 90 | 92 |

| Atrial fibrillation | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 41 | 106% | 44 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 44 | 44 | 44 |
| 20-29 | 174 | 116% | 179 | 180 | 181 | 181 | 183 | 184 | 186 | 189 | 192 | 195 | 198 | 200 | 201 | 202 | 201 |
| 30-39 | 391 | 107% | 397 | 404 | 413 | 421 | 429 | 434 | 434 | 432 | 427 | 423 | 418 | 417 | 417 | 417 | 418 |
| 40-49 | 674 | 120% | 641 | 658 | 677 | 697 | 715 | 727 | 736 | 748 | 762 | 774 | 787 | 792 | 799 | 807 | 811 |
| 50-59 | 1,616 | 89% | 1,474 | 1,444 | 1,414 | 1,383 | 1,355 | 1,334 | 1,328 | 1,317 | 1,310 | 1,314 | 1,325 | 1,346 | 1,373 | 1,403 | 1,437 |
| 60-69 | 2,995 | 95% | 3,172 | 3,235 | 3,281 | 3,316 | 3,333 | 3,350 | 3,349 | 3,347 | 3,320 | 3,269 | 3,193 | 3,107 | 3,022 | 2,935 | 2,856 |
| 70-79 | 5,221 | 109% | 5,425 | 5,397 | 5,384 | 5,273 | 5,221 | 5,209 | 5,220 | 5,268 | 5,342 | 5,407 | 5,489 | 5,582 | 5,643 | 5,685 | 5,695 |
| 80-89 | 4,294 | 137% | 4,881 | 4,993 | 5,090 | 5,397 | 5,613 | 5,757 | 5,862 | 5,928 | 5,953 | 5,972 | 5,974 | 5,952 | 5,948 | 5,885 | 5,884 |
| 90+ | 1,346 | 189% | 1,551 | 1,582 | 1,619 | 1,656 | 1,701 | 1,743 | 1,778 | 1,808 | 1,867 | 1,950 | 2,044 | 2,124 | 2,195 | 2,402 | 2,542 |

| Coronary Heart Disease | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 6 | 0% | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20-29 | 33 | 92% | 34 | 34 | 33 | 33 | 33 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 31 | 31 | 30 |
| 30-39 | 111 | 165% | 163 | 182 | 187 | 189 | 190 | 190 | 191 | 190 | 187 | 185 | 183 | 183 | 183 | 183 | 183 |
| 40-49 | 491 | 211% | 638 | 706 | 784 | 871 | 913 | 928 | 940 | 955 | 973 | 988 | 1,005 | 1,012 | 1,021 | 1,030 | 1,036 |
| 50-59 | 1,607 | 173% | 2,365 | 2,761 | 2,866 | 2,792 | 2,724 | 2,672 | 2,647 | 2,616 | 2,590 | 2,587 | 2,598 | 2,630 | 2,672 | 2,718 | 2,775 |
| 60-69 | 2,454 | 234% | 4,565 | 5,672 | 6,360 | 6,447 | 6,501 | 6,554 | 6,573 | 6,591 | 6,557 | 6,478 | 6,347 | 6,196 | 6,045 | 5,890 | 5,750 |
| 70-79 | 2,877 | 306% | 4,576 | 5,215 | 5,987 | 6,754 | 7,501 | 7,536 | 7,606 | 7,729 | 7,893 | 8,047 | 8,227 | 8,428 | 8,582 | 8,709 | 8,790 |
| 80-89 | 1,701 | 370% | 2,328 | 2,564 | 2,813 | 3,211 | 3,595 | 3,970 | 4,352 | 4,739 | 5,124 | 5,534 | 5,961 | 6,261 | 6,291 | 6,258 | 6,292 |
| 90+ | 431 | 449% | 641 | 723 | 819 | 927 | 1,054 | 1,195 | 1,349 | 1,378 | 1,423 | 1,486 | 1,558 | 1,619 | 1,673 | 1,830 | 1,936 |

| CKD | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 305 | 139% | 368 | 374 | 379 | 384 | 388 | 392 | 395 | 398 | 401 | 404 | 408 | 412 | 415 | 419 | 424 |
| 20-29 | 334 | 175% | 404 | 415 | 426 | 437 | 449 | 462 | 475 | 490 | 508 | 525 | 541 | 555 | 567 | 577 | 585 |
| 30-39 | 524 | 202% | 679 | 712 | 746 | 781 | 813 | 844 | 872 | 896 | 913 | 931 | 949 | 974 | 1,000 | 1,026 | 1,056 |
| 40-49 | 781 | 194% | 880 | 918 | 959 | 1,004 | 1,053 | 1,099 | 1,143 | 1,191 | 1,244 | 1,294 | 1,347 | 1,388 | 1,432 | 1,478 | 1,519 |
| 50-59 | 1,775 | 144% | 1,971 | 1,978 | 1,983 | 1,984 | 1,988 | 2,000 | 2,032 | 2,057 | 2,085 | 2,132 | 2,190 | 2,267 | 2,353 | 2,445 | 2,549 |
| 60-69 | 3,118 | 122% | 3,603 | 3,718 | 3,816 | 3,902 | 3,969 | 4,036 | 4,082 | 4,128 | 4,141 | 4,125 | 4,075 | 4,011 | 3,944 | 3,875 | 3,812 |
| 70-79 | 5,723 | 93% | 5,853 | 5,773 | 5,706 | 5,538 | 5,432 | 5,367 | 5,326 | 5,320 | 5,339 | 5,348 | 5,369 | 5,400 | 5,396 | 5,373 | 5,318 |
| 80-89 | 5,822 | 81% | 6,037 | 6,031 | 5,999 | 6,200 | 6,280 | 6,268 | 6,202 | 6,089 | 5,928 | 5,758 | 5,569 | 5,357 | 5,159 | 4,910 | 4,714 |
| 90+ | 2,022 | 128% | 2,202 | 2,200 | 2,205 | 2,208 | 2,218 | 2,223 | 2,217 | 2,201 | 2,220 | 2,262 | 2,313 | 2,342 | 2,357 | 2,510 | 2,583 |

| COPD | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 61 | 150% | 103 | 103 | 102 | 101 | 100 | 100 | 99 | 97 | 96 | 95 | 95 | 94 | 93 | 92 | 92 |
| 20-29 | 48 | 2% | 26 | 20 | 16 | 13 | 10 | 8 | 7 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 1 |
| 30-39 | 154 | 45% | 142 | 136 | 131 | 125 | 120 | 114 | 109 | 103 | 97 | 91 | 86 | 81 | 77 | 73 | 70 |
| 40-49 | 462 | 150% | 477 | 490 | 504 | 519 | 537 | 553 | 567 | 584 | 603 | 620 | 639 | 652 | 667 | 682 | 695 |
| 50-59 | 1,294 | 68% | 1,192 | 1,145 | 1,099 | 1,054 | 1,012 | 977 | 953 | 927 | 904 | 889 | 879 | 876 | 875 | 877 | 881 |
| 60-69 | 1,836 | 191% | 2,239 | 2,390 | 2,538 | 2,684 | 2,824 | 2,972 | 3,110 | 3,254 | 3,378 | 3,483 | 3,561 | 3,628 | 3,692 | 3,598 | 3,512 |
| 70-79 | 2,203 | 254% | 2,778 | 2,967 | 3,176 | 3,339 | 3,549 | 3,801 | 4,090 | 4,431 | 4,824 | 5,129 | 5,243 | 5,371 | 5,470 | 5,551 | 5,602 |
| 80-89 | 1,249 | 119% | 1,344 | 1,367 | 1,385 | 1,459 | 1,508 | 1,537 | 1,555 | 1,563 | 1,560 | 1,556 | 1,547 | 1,532 | 1,522 | 1,497 | 1,487 |
| 90+ | 268 | 250% | 312 | 324 | 338 | 352 | 369 | 386 | 401 | 416 | 438 | 466 | 498 | 528 | 556 | 620 | 669 |

| Dementia | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 18 | 20% | 14 | 13 | 12 | 10 | 10 | 9 | 8 | 7 | 6 | 6 | 5 | 5 | 4 | 4 | 4 |
| 20-29 | 34 | 224% | 73 | 73 | 73 | 73 | 73 | 73 | 74 | 74 | 75 | 76 | 77 | 77 | 77 | 77 | 76 |
| 30-39 | 61 | 4% | 37 | 30 | 25 | 21 | 18 | 14 | 12 | 10 | 8 | 7 | 5 | 4 | 4 | 3 | 2 |
| 40-49 | 163 | 43% | 135 | 129 | 123 | 118 | 113 | 109 | 104 | 99 | 95 | 91 | 87 | 83 | 78 | 75 | 71 |
| 50-59 | 620 | 178% | 923 | 1,108 | 1,139 | 1,109 | 1,083 | 1,062 | 1,052 | 1,040 | 1,029 | 1,028 | 1,033 | 1,045 | 1,062 | 1,080 | 1,103 |
| 60-69 | 1,399 | 150% | 1,624 | 1,697 | 1,756 | 1,836 | 1,889 | 1,953 | 2,000 | 2,061 | 2,076 | 2,088 | 2,081 | 2,119 | 2,089 | 2,095 | 2,093 |
| 70-79 | 4,292 | 241% | 5,746 | 6,266 | 6,852 | 7,352 | 7,979 | 8,722 | 8,959 | 9,105 | 9,298 | 9,480 | 9,691 | 9,928 | 10,110 | 10,260 | 10,355 |
| 80-89 | 5,977 | 292% | 9,367 | 10,793 | 12,392 | 14,797 | 15,758 | 16,248 | 16,629 | 16,908 | 17,069 | 17,214 | 17,313 | 17,343 | 17,426 | 17,335 | 17,428 |
| 90+ | 2,374 | 365% | 3,847 | 4,467 | 5,208 | 5,660 | 5,812 | 5,956 | 6,076 | 6,175 | 6,376 | 6,658 | 6,980 | 7,252 | 7,493 | 8,199 | 8,674 |

| Depression | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low** | | | | | | | | | | | | | | | | | |
| 0-19 | 3,120 | 97% | 3,983 | 3,777 | 3,582 | 3,473 | 3,372 | 3,311 | 3,261 | 3,219 | 3,178 | 3,144 | 3,113 | 3,083 | 3,054 | 3,033 | 3,018 |
| 20-29 | 7,549 | 113% | 9,609 | 9,136 | 8,721 | 8,513 | 8,373 | 8,316 | 8,312 | 8,365 | 8,464 | 8,544 | 8,597 | 8,624 | 8,626 | 8,608 | 8,548 |
| 30-39 | 4,783 | 130% | 6,204 | 6,455 | 6,744 | 6,678 | 6,585 | 6,541 | 6,512 | 6,473 | 6,389 | 6,313 | 6,241 | 6,223 | 6,213 | 6,208 | 6,226 |
| 40-49 | 2,923 | 176% | 3,534 | 3,706 | 3,908 | 4,223 | 4,597 | 4,669 | 4,705 | 4,776 | 4,858 | 4,926 | 5,006 | 5,036 | 5,075 | 5,124 | 5,156 |
| 50-59 | 2,789 | 131% | 3,144 | 3,134 | 3,129 | 3,194 | 3,277 | 3,416 | 3,496 | 3,451 | 3,411 | 3,403 | 3,415 | 3,453 | 3,504 | 3,566 | 3,643 |
| 60-69 | 1,835 | 126% | 2,720 | 2,810 | 2,729 | 2,702 | 2,671 | 2,669 | 2,663 | 2,668 | 2,650 | 2,615 | 2,560 | 2,496 | 2,433 | 2,371 | 2,316 |
| 70-79 | 1,377 | 188% | 2,019 | 2,200 | 2,399 | 2,311 | 2,259 | 2,249 | 2,258 | 2,292 | 2,337 | 2,380 | 2,431 | 2,488 | 2,531 | 2,569 | 2,594 |
| 80-89 | 924 | 206% | 1,298 | 1,399 | 1,506 | 1,713 | 1,756 | 1,795 | 1,828 | 1,856 | 1,871 | 1,885 | 1,893 | 1,895 | 1,902 | 1,893 | 1,904 |
| 90+ | 238 | 22% | 177 | 154 | 135 | 121 | 109 | 99 | 90 | 82 | 76 | 71 | 66 | 62 | 57 | 56 | 53 |
| **High** | | | | | | | | | | | | | | | | | |
| 0-19 | | 120% | 4,211 | 4,193 | 4,166 | 4,134 | 4,094 | 4,056 | 4,015 | 3,967 | 3,923 | 3,886 | 3,852 | 3,819 | 3,786 | 3,760 | 3,738 |
| 20-29 | | 140% | 10,159 | 10,140 | 10,140 | 10,134 | 10,167 | 10,189 | 10,234 | 10,311 | 10,449 | 10,561 | 10,638 | 10,682 | 10,695 | 10,669 | 10,589 |
| 30-39 | | 161% | 6,559 | 7,165 | 7,842 | 7,949 | 7,995 | 8,015 | 8,018 | 7,979 | 7,887 | 7,804 | 7,723 | 7,707 | 7,703 | 7,694 | 7,713 |
| 40-49 | | 219% | 3,736 | 4,114 | 4,544 | 5,027 | 5,581 | 5,721 | 5,793 | 5,887 | 5,998 | 6,089 | 6,195 | 6,238 | 6,292 | 6,350 | 6,388 |
| 50-59 | | 162% | 3,324 | 3,479 | 3,639 | 3,802 | 3,979 | 4,186 | 4,305 | 4,254 | 4,211 | 4,207 | 4,225 | 4,277 | 4,345 | 4,419 | 4,513 |
| 60-69 | | 156% | 2,876 | 3,119 | 3,173 | 3,217 | 3,243 | 3,270 | 3,279 | 3,288 | 3,271 | 3,232 | 3,167 | 3,092 | 3,016 | 2,939 | 2,869 |
| 70-79 | | 233% | 2,135 | 2,443 | 2,789 | 2,751 | 2,742 | 2,755 | 2,781 | 2,826 | 2,886 | 2,942 | 3,008 | 3,081 | 3,138 | 3,184 | 3,214 |
| 80-89 | | 255% | 1,372 | 1,552 | 1,751 | 2,040 | 2,132 | 2,199 | 2,250 | 2,288 | 2,310 | 2,329 | 2,343 | 2,347 | 2,358 | 2,346 | 2,359 |
| 90+ | | 28% | 188 | 171 | 157 | 144 | 132 | 121 | 111 | 101 | 93 | 87 | 82 | 76 | 71 | 69 | 66 |

| Epilepsy | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 478 | 66% | 469 | 459 | 448 | 437 | 425 | 413 | 401 | 389 | 378 | 367 | 356 | 346 | 336 | 327 | 318 |
| 20-29 | 270 | 86% | 263 | 260 | 257 | 254 | 251 | 249 | 247 | 246 | 246 | 246 | 244 | 242 | 239 | 236 | 231 |
| 30-39 | 220 | 38% | 205 | 198 | 191 | 184 | 176 | 168 | 159 | 149 | 139 | 129 | 119 | 110 | 102 | 93 | 85 |
| 40-49 | 191 | 48% | 168 | 164 | 160 | 155 | 151 | 147 | 141 | 136 | 131 | 126 | 120 | 113 | 106 | 99 | 92 |
| 50-59 | 255 | 58% | 232 | 222 | 211 | 201 | 192 | 184 | 177 | 171 | 165 | 160 | 157 | 154 | 152 | 150 | 149 |
| 60-69 | 235 | 43% | 240 | 236 | 230 | 223 | 215 | 206 | 197 | 187 | 176 | 163 | 150 | 137 | 124 | 112 | 100 |
| 70-79 | 313 | 15% | 262 | 246 | 231 | 212 | 196 | 181 | 167 | 154 | 140 | 126 | 112 | 97 | 81 | 64 | 46 |
| 80-89 | 233 | 37% | 226 | 221 | 214 | 216 | 212 | 205 | 195 | 184 | 172 | 158 | 145 | 130 | 116 | 101 | 86 |
| 90+ | 55 | 102% | 61 | 60 | 60 | 59 | 58 | 58 | 57 | 55 | 55 | 55 | 55 | 55 | 54 | 56 | 56 |

| Heart failure | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 40 | 282% | 111 | 127 | 126 | 125 | 124 | 123 | 121 | 120 | 119 | 117 | 116 | 115 | 114 | 114 | 113 |
| 20-29 | 57 | 154% | 84 | 84 | 84 | 84 | 84 | 84 | 85 | 85 | 87 | 87 | 88 | 88 | 89 | 88 | 88 |
| 30-39 | 132 | 116% | 154 | 155 | 156 | 158 | 159 | 159 | 159 | 158 | 156 | 155 | 153 | 153 | 153 | 153 | 153 |
| 40-49 | 324 | 120% | 322 | 326 | 331 | 337 | 344 | 349 | 354 | 360 | 366 | 372 | 378 | 381 | 384 | 388 | 390 |
| 50-59 | 848 | 92% | 846 | 825 | 805 | 784 | 765 | 750 | 743 | 734 | 727 | 726 | 729 | 738 | 750 | 763 | 779 |
| 60-69 | 1,645 | 142% | 2,480 | 2,537 | 2,581 | 2,616 | 2,638 | 2,660 | 2,667 | 2,675 | 2,661 | 2,629 | 2,576 | 2,515 | 2,453 | 2,390 | 2,333 |
| 70-79 | 3,276 | 192% | 5,413 | 5,423 | 5,446 | 5,370 | 5,354 | 5,379 | 5,429 | 5,517 | 5,634 | 5,744 | 5,872 | 6,015 | 6,126 | 6,216 | 6,274 |
| 80-89 | 3,424 | 198% | 5,222 | 5,377 | 5,510 | 5,872 | 6,139 | 6,330 | 6,479 | 6,587 | 6,650 | 6,706 | 6,745 | 6,756 | 6,789 | 6,754 | 6,790 |
| 90+ | 1,281 | 196% | 1,535 | 1,565 | 1,602 | 1,638 | 1,682 | 1,724 | 1,758 | 1,787 | 1,845 | 1,927 | 2,020 | 2,099 | 2,169 | 2,373 | 2,510 |

| Hypertension | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low** | | | | | | | | | | | | | | | | | |
| 0-19 | 142 | 53% | 125 | 122 | 116 | 110 | 102 | 99 | 105 | 99 | 92 | 84 | 81 | 80 | 78 | 77 | 75 |
| 20-29 | 397 | 157% | 697 | 694 | 676 | 659 | 630 | 626 | 689 | 671 | 649 | 620 | 617 | 627 | 629 | 631 | 622 |
| 30-39 | 1,380 | 151% | 2,452 | 2,463 | 2,418 | 2,382 | 2,283 | 2,269 | 2,485 | 2,394 | 2,256 | 2,110 | 2,065 | 2,085 | 2,088 | 2,095 | 2,089 |
| 40-49 | 3,343 | 175% | 5,638 | 5,693 | 5,629 | 5,586 | 5,434 | 5,478 | 6,072 | 5,973 | 5,802 | 5,569 | 5,602 | 5,708 | 5,768 | 5,849 | 5,850 |
| 50-59 | 6,166 | 102% | 5,390 | 5,207 | 4,959 | 4,765 | 4,486 | 4,541 | 3,502 | 4,074 | 4,750 | 5,615 | 5,827 | 5,970 | 6,075 | 6,209 | 6,304 |
| 60-69 | 5,992 | 64% | 7,165 | 6,628 | 6,241 | 5,770 | 5,479 | 5,023 | 5,251 | 4,864 | 4,680 | 4,384 | 4,105 | 4,023 | 3,946 | 3,910 | 3,848 |
| 70-79 | 5,341 | 87% | 6,484 | 6,382 | 6,361 | 5,889 | 5,549 | 5,545 | 4,470 | 4,700 | 4,940 | 5,242 | 5,382 | 5,067 | 4,921 | 4,696 | 4,659 |
| 80-89 | 2,099 | 409% | 3,668 | 4,496 | 5,358 | 6,659 | 7,927 | 8,358 | 9,364 | 9,216 | 8,870 | 8,456 | 8,410 | 8,525 | 8,581 | 8,577 | 8,575 |
| 90+ | 349 | 208% | 377 | 392 | 400 | 408 | 409 | 425 | 485 | 488 | 492 | 497 | 527 | 567 | 600 | 675 | 727 |
| **High** | | | | | | | | | | | | | | | | | |
| 0-19 | | 67% | 136 | 133 | 130 | 126 | 123 | 120 | 117 | 113 | 110 | 107 | 105 | 102 | 99 | 97 | 95 |
| 20-29 | | 199% | 759 | 757 | 757 | 757 | 759 | 761 | 764 | 770 | 780 | 789 | 794 | 798 | 799 | 797 | 791 |
| 30-39 | | 192% | 2,667 | 2,685 | 2,709 | 2,735 | 2,750 | 2,757 | 2,758 | 2,745 | 2,713 | 2,684 | 2,657 | 2,651 | 2,650 | 2,647 | 2,653 |
| 40-49 | | 222% | 6,132 | 6,208 | 6,306 | 6,413 | 6,547 | 6,656 | 6,740 | 6,849 | 6,978 | 7,085 | 7,207 | 7,258 | 7,320 | 7,389 | 7,432 |
| 50-59 | | 130% | 5,862 | 5,679 | 5,556 | 5,470 | 5,405 | 5,517 | 3,887 | 4,671 | 5,713 | 7,145 | 7,498 | 7,590 | 7,710 | 7,843 | 8,008 |
| 60-69 | | 82% | 7,793 | 7,227 | 6,992 | 6,624 | 6,601 | 6,103 | 5,828 | 5,578 | 5,629 | 5,578 | 5,281 | 5,115 | 5,008 | 4,938 | 4,888 |
| 70-79 | | 111% | 7,052 | 6,959 | 7,126 | 6,761 | 6,685 | 6,737 | 4,961 | 5,389 | 5,941 | 6,669 | 6,924 | 6,442 | 6,245 | 5,932 | 5,919 |
| 80-89 | | 519% | 3,990 | 4,903 | 6,003 | 7,644 | 9,550 | 10,155 | 10,393 | 10,567 | 10,668 | 10,758 | 10,820 | 10,839 | 10,891 | 10,834 | 10,892 |
| 90+ | | 265% | 410 | 428 | 448 | 468 | 492 | 516 | 539 | 560 | 592 | 632 | 678 | 721 | 762 | 853 | 923 |

| Inflammatory Bowel Disease | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 159 | 91% | 157 | 157 | 156 | 155 | 154 | 153 | 152 | 151 | 149 | 148 | 147 | 146 | 146 | 145 | 144 |
| 20-29 | 295 | 117% | 318 | 321 | 324 | 327 | 330 | 331 | 332 | 335 | 339 | 343 | 346 | 347 | 347 | 347 | 344 |
| 30-39 | 334 | 112% | 374 | 378 | 382 | 385 | 387 | 388 | 388 | 387 | 382 | 378 | 374 | 373 | 373 | 373 | 374 |
| 40-49 | 293 | 146% | 304 | 314 | 327 | 340 | 354 | 368 | 380 | 394 | 401 | 408 | 415 | 418 | 421 | 425 | 428 |
| 50-59 | 357 | 104% | 343 | 339 | 334 | 330 | 326 | 323 | 324 | 324 | 325 | 328 | 334 | 342 | 351 | 361 | 373 |
| 60-69 | 332 | 113% | 361 | 372 | 381 | 389 | 396 | 402 | 406 | 410 | 411 | 409 | 403 | 397 | 390 | 382 | 376 |
| 70-79 | 300 | 154% | 323 | 329 | 336 | 337 | 341 | 348 | 357 | 368 | 381 | 394 | 409 | 425 | 439 | 451 | 462 |
| 80-89 | 117 | 144% | 120 | 124 | 128 | 137 | 144 | 150 | 154 | 157 | 160 | 162 | 164 | 165 | 167 | 167 | 168 |
| 90+ | 16 | 188% | 16 | 16 | 17 | 18 | 18 | 19 | 19 | 20 | 21 | 22 | 23 | 24 | 26 | 28 | 30 |

| Osteoporosis | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 37 | 226% | 94 | 94 | 93 | 92 | 91 | 91 | 90 | 89 | 88 | 87 | 86 | 85 | 85 | 84 | 83 |
| 20-29 | 17 | 8% | 11 | 10 | 8 | 7 | 6 | 5 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 1 |
| 30-39 | 52 | 295% | 67 | 71 | 76 | 82 | 87 | 93 | 99 | 104 | 110 | 115 | 121 | 128 | 136 | 144 | 153 |
| 40-49 | 108 | 677% | 153 | 174 | 199 | 228 | 262 | 300 | 342 | 391 | 449 | 513 | 587 | 666 | 720 | 727 | 731 |
| 50-59 | 541 | 339% | 662 | 698 | 737 | 776 | 820 | 870 | 932 | 997 | 1,067 | 1,154 | 1,254 | 1,373 | 1,509 | 1,661 | 1,835 |
| 60-69 | 1,096 | 383% | 1,927 | 2,324 | 2,787 | 3,331 | 3,959 | 4,706 | 4,796 | 4,809 | 4,784 | 4,727 | 4,632 | 4,522 | 4,411 | 4,298 | 4,196 |
| 70-79 | 1,638 | 440% | 2,866 | 3,413 | 4,075 | 4,779 | 5,664 | 6,184 | 6,241 | 6,342 | 6,477 | 6,603 | 6,751 | 6,916 | 7,042 | 7,147 | 7,213 |
| 80-89 | 1,287 | 372% | 1,694 | 1,842 | 1,995 | 2,248 | 2,484 | 2,708 | 2,930 | 3,150 | 3,362 | 3,584 | 3,811 | 4,036 | 4,287 | 4,509 | 4,792 |
| 90+ | 383 | 321% | 466 | 491 | 520 | 551 | 585 | 620 | 655 | 689 | 736 | 795 | 863 | 928 | 992 | 1,123 | 1,230 |

| PVD | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 49 | 105% | 58 | 58 | 58 | 57 | 57 | 56 | 55 | 55 | 54 | 54 | 53 | 53 | 52 | 52 | 52 |
| 20-29 | 68 | 146% | 95 | 95 | 95 | 95 | 95 | 95 | 96 | 96 | 98 | 99 | 99 | 100 | 100 | 100 | 99 |
| 30-39 | 144 | 134% | 195 | 196 | 198 | 200 | 201 | 201 | 201 | 200 | 198 | 196 | 194 | 193 | 193 | 193 | 194 |
| 40-49 | 289 | 141% | 337 | 341 | 346 | 352 | 359 | 365 | 370 | 376 | 383 | 389 | 396 | 398 | 402 | 406 | 408 |
| 50-59 | 699 | 117% | 886 | 864 | 843 | 821 | 801 | 786 | 779 | 769 | 762 | 761 | 764 | 774 | 786 | 799 | 816 |
| 60-69 | 1,090 | 158% | 1,835 | 1,877 | 1,909 | 1,935 | 1,951 | 1,968 | 1,973 | 1,978 | 1,968 | 1,945 | 1,905 | 1,860 | 1,815 | 1,768 | 1,726 |
| 70-79 | 1,301 | 227% | 1,706 | 1,845 | 2,001 | 2,131 | 2,295 | 2,489 | 2,551 | 2,593 | 2,647 | 2,699 | 2,759 | 2,827 | 2,879 | 2,921 | 2,948 |
| 80-89 | 1,056 | 207% | 1,685 | 1,733 | 1,776 | 1,893 | 1,979 | 2,040 | 2,088 | 2,123 | 2,143 | 2,162 | 2,174 | 2,178 | 2,188 | 2,177 | 2,189 |
| 90+ | 334 | 241% | 491 | 501 | 513 | 524 | 538 | 552 | 563 | 572 | 591 | 617 | 647 | 672 | 694 | 760 | 804 |

| Rheumatoid Arthritis | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 53 | 83% | 54 | 53 | 52 | 52 | 51 | 50 | 49 | 49 | 48 | 47 | 46 | 46 | 45 | 44 | 44 |
| 20-29 | 68 | 99% | 72 | 71 | 71 | 70 | 70 | 69 | 69 | 69 | 69 | 70 | 70 | 69 | 69 | 68 | 67 |
| 30-39 | 128 | 93% | 144 | 143 | 143 | 142 | 141 | 140 | 138 | 136 | 133 | 129 | 126 | 125 | 123 | 121 | 120 |
| 40-49 | 218 | 96% | 216 | 216 | 216 | 217 | 218 | 218 | 218 | 218 | 218 | 218 | 218 | 216 | 214 | 213 | 210 |
| 50-59 | 359 | 63% | 380 | 362 | 344 | 326 | 309 | 295 | 284 | 272 | 261 | 253 | 245 | 240 | 235 | 231 | 227 |
| 60-69 | 491 | 81% | 535 | 539 | 540 | 539 | 535 | 531 | 523 | 516 | 505 | 490 | 472 | 452 | 433 | 414 | 397 |
| 70-79 | 476 | 96% | 533 | 524 | 516 | 499 | 488 | 481 | 475 | 473 | 473 | 472 | 472 | 472 | 470 | 466 | 459 |
| 80-89 | 258 | 127% | 316 | 320 | 323 | 339 | 349 | 355 | 357 | 357 | 355 | 352 | 348 | 343 | 338 | 331 | 327 |
| 90+ | 47 | 193% | 69 | 69 | 70 | 70 | 71 | 72 | 72 | 72 | 74 | 76 | 78 | 80 | 81 | 87 | 91 |

| Rheumatoid Arthritis | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 53 | 83% | 54 | 53 | 52 | 52 | 51 | 50 | 49 | 49 | 48 | 47 | 46 | 46 | 45 | 44 | 44 |
| 20-29 | 68 | 99% | 72 | 71 | 71 | 70 | 70 | 69 | 69 | 69 | 69 | 70 | 70 | 69 | 69 | 68 | 67 |
| 30-39 | 128 | 93% | 144 | 143 | 143 | 142 | 141 | 140 | 138 | 136 | 133 | 129 | 126 | 125 | 123 | 121 | 120 |
| 40-49 | 218 | 96% | 216 | 216 | 216 | 217 | 218 | 218 | 218 | 218 | 218 | 218 | 218 | 216 | 214 | 213 | 210 |
| 50-59 | 359 | 63% | 380 | 362 | 344 | 326 | 309 | 295 | 284 | 272 | 261 | 253 | 245 | 240 | 235 | 231 | 227 |
| 60-69 | 491 | 81% | 535 | 539 | 540 | 539 | 535 | 531 | 523 | 516 | 505 | 490 | 472 | 452 | 433 | 414 | 397 |
| 70-79 | 476 | 96% | 533 | 524 | 516 | 499 | 488 | 481 | 475 | 473 | 473 | 472 | 472 | 472 | 470 | 466 | 459 |
| 80-89 | 258 | 127% | 316 | 320 | 323 | 339 | 349 | 355 | 357 | 357 | 355 | 352 | 348 | 343 | 338 | 331 | 327 |
| 90+ | 47 | 193% | 69 | 69 | 70 | 70 | 71 | 72 | 72 | 72 | 74 | 76 | 78 | 80 | 81 | 87 | 91 |

# Diabetes

| Diabetes | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low** | | | | | | | | | | | | | | | | | |
| 0-19 | 318 | 89% | 305 | 306 | 308 | 309 | 307 | 304 | 301 | 297 | 294 | 292 | 289 | 287 | 285 | 284 | 283 |
| 20-29 | 789 | 94% | 725 | 717 | 716 | 715 | 716 | 717 | 719 | 725 | 735 | 743 | 750 | 753 | 753 | 751 | 745 |
| 30-39 | 1,426 | 99% | 1,529 | 1,507 | 1,509 | 1,514 | 1,512 | 1,505 | 1,494 | 1,481 | 1,459 | 1,439 | 1,420 | 1,414 | 1,410 | 1,405 | 1,405 |
| 40-49 | 1,867 | 101% | 1,729 | 1,689 | 1,698 | 1,711 | 1,731 | 1,740 | 1,743 | 1,763 | 1,790 | 1,812 | 1,839 | 1,847 | 1,859 | 1,874 | 1,881 |
| 50-59 | 3,295 | 84% | 3,364 | 3,161 | 3,052 | 2,944 | 2,845 | 2,759 | 2,704 | 2,660 | 2,624 | 2,614 | 2,619 | 2,646 | 2,682 | 2,723 | 2,775 |
| 60-69 | 3,215 | 125% | 4,812 | 4,733 | 4,762 | 4,777 | 4,767 | 4,748 | 4,703 | 4,691 | 4,647 | 4,576 | 4,470 | 4,351 | 4,234 | 4,117 | 4,010 |
| 70-79 | 2,538 | 183% | 3,982 | 4,302 | 4,287 | 4,196 | 4,142 | 4,114 | 4,105 | 4,152 | 4,226 | 4,296 | 4,382 | 4,480 | 4,554 | 4,615 | 4,649 |
| 80-89 | 1,110 | 219% | 1,402 | 1,481 | 1,603 | 1,805 | 1,994 | 2,168 | 2,327 | 2,361 | 2,380 | 2,399 | 2,413 | 2,418 | 2,430 | 2,420 | 2,435 |
| 90+ | 204 | 265% | 280 | 302 | 336 | 365 | 372 | 378 | 381 | 387 | 398 | 415 | 435 | 452 | 467 | 511 | 541 |
| **High** | | | | | | | | | | | | | | | | | |
| 0-19 | | 89% | 306 | 308 | 309 | 310 | 307 | 304 | 301 | 298 | 295 | 292 | 290 | 288 | 286 | 284 | 283 |
| 20-29 | | 100% | 744 | 744 | 745 | 746 | 749 | 752 | 757 | 764 | 776 | 785 | 792 | 796 | 797 | 795 | 789 |
| 30-39 | | 110% | 1,599 | 1,608 | 1,620 | 1,634 | 1,641 | 1,643 | 1,642 | 1,632 | 1,611 | 1,592 | 1,574 | 1,569 | 1,566 | 1,562 | 1,564 |
| 40-49 | | 121% | 1,864 | 1,887 | 1,916 | 1,949 | 1,989 | 2,022 | 2,048 | 2,081 | 2,120 | 2,153 | 2,190 | 2,205 | 2,224 | 2,245 | 2,258 |
| 50-59 | | 102% | 3,641 | 3,553 | 3,465 | 3,376 | 3,295 | 3,232 | 3,204 | 3,167 | 3,136 | 3,133 | 3,148 | 3,187 | 3,238 | 3,293 | 3,363 |
| 60-69 | | 152% | 5,218 | 5,337 | 5,428 | 5,501 | 5,545 | 5,589 | 5,604 | 5,618 | 5,587 | 5,519 | 5,406 | 5,276 | 5,145 | 5,013 | 4,892 |
| 70-79 | | 223% | 4,320 | 4,855 | 4,889 | 4,832 | 4,819 | 4,843 | 4,889 | 4,971 | 5,078 | 5,179 | 5,296 | 5,428 | 5,529 | 5,613 | 5,665 |
| 80-89 | | 266% | 1,519 | 1,668 | 1,825 | 2,077 | 2,317 | 2,550 | 2,771 | 2,824 | 2,857 | 2,887 | 2,910 | 2,922 | 2,942 | 2,933 | 2,955 |
| 90+ | | 322% | 304 | 340 | 383 | 421 | 433 | 444 | 454 | 462 | 478 | 500 | 525 | 546 | 565 | 620 | 657 |

| Type 1 Diabetes | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 242 | 89% | 230 | 233 | 236 | 238 | 236 | 234 | 232 | 229 | 226 | 224 | 222 | 220 | 218 | 217 | 216 |
| 20-29 | 85 | 137% | 99 | 100 | 101 | 102 | 104 | 105 | 107 | 109 | 112 | 115 | 117 | 118 | 118 | 118 | 117 |
| 30-39 | 58 | 56% | 59 | 58 | 56 | 55 | 53 | 52 | 50 | 47 | 45 | 43 | 40 | 38 | 36 | 34 | 33 |
| 40-49 | 49 | 111% | 46 | 46 | 47 | 47 | 48 | 49 | 50 | 50 | 51 | 52 | 53 | 53 | 54 | 54 | 54 |
| 50-59 | 67 | 89% | 55 | 54 | 54 | 53 | 53 | 53 | 53 | 53 | 53 | 54 | 55 | 56 | 57 | 58 | 60 |
| 60-69 | 37 | 41% | 35 | 35 | 34 | 33 | 32 | 30 | 29 | 28 | 26 | 24 | 22 | 21 | 19 | 17 | 15 |
| 70-79 | 39 | 184% | 39 | 41 | 43 | 44 | 46 | 48 | 50 | 53 | 56 | 58 | 62 | 65 | 68 | 71 | 72 |
| 80-89 | 15 | 145% | 17 | 17 | 18 | 19 | 20 | 20 | 21 | 21 | 21 | 21 | 22 | 22 | 22 | 22 | 22 |
| 90+ | 5 | 153% | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 8 |

| Type 2 Diabetes | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low** | | | | | | | | | | | | | | | | | |
| 0-19 | 20 | 4% | 11 | 9 | 8 | 6 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 1 |
| 20-29 | 203 | 93% | 206 | 197 | 195 | 193 | 191 | 189 | 188 | 188 | 190 | 191 | 192 | 192 | 192 | 191 | 190 |
| 30-39 | 654 | 105% | 778 | 752 | 750 | 748 | 745 | 737 | 728 | 721 | 710 | 700 | 691 | 687 | 685 | 683 | 684 |
| 40-49 | 1,654 | 98% | 1,510 | 1,467 | 1,473 | 1,482 | 1,497 | 1,502 | 1,502 | 1,519 | 1,541 | 1,559 | 1,581 | 1,588 | 1,598 | 1,610 | 1,616 |
| 50-59 | 3,142 | 80% | 3,097 | 2,900 | 2,796 | 2,694 | 2,600 | 2,518 | 2,464 | 2,422 | 2,388 | 2,377 | 2,381 | 2,404 | 2,436 | 2,473 | 2,520 |
| 60-69 | 3,085 | 123% | 4,554 | 4,472 | 4,497 | 4,510 | 4,499 | 4,479 | 4,435 | 4,424 | 4,383 | 4,316 | 4,216 | 4,105 | 3,996 | 3,886 | 3,786 |
| 70-79 | 2,416 | 180% | 3,787 | 4,094 | 4,064 | 3,965 | 3,911 | 3,880 | 3,867 | 3,909 | 3,975 | 4,039 | 4,117 | 4,207 | 4,274 | 4,329 | 4,360 |
| 80-89 | 1,056 | 212% | 1,317 | 1,389 | 1,503 | 1,693 | 1,871 | 2,036 | 2,186 | 2,211 | 2,222 | 2,234 | 2,240 | 2,238 | 2,244 | 2,228 | 2,235 |
| 90+ | 195 | 256% | 263 | 284 | 317 | 345 | 351 | 355 | 358 | 362 | 372 | 387 | 405 | 419 | 432 | 472 | 498 |

| Type 2 Diabetes | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **High** | | | | | | | | | | | | | | | | | |
| 0-19 | | 5% | 12 | 10 | 9 | 7 | 6 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 |
| 20-29 | | 115% | 224 | 224 | 224 | 224 | 224 | 225 | 226 | 228 | 231 | 233 | 235 | 236 | 236 | 236 | 234 |
| 30-39 | | 129% | 847 | 853 | 861 | 869 | 874 | 876 | 876 | 872 | 862 | 853 | 844 | 842 | 842 | 841 | 843 |
| 40-49 | | 120% | 1,644 | 1,665 | 1,691 | 1,719 | 1,755 | 1,785 | 1,807 | 1,836 | 1,871 | 1,900 | 1,932 | 1,946 | 1,963 | 1,981 | 1,993 |
| 50-59 | | 99% | 3,373 | 3,291 | 3,210 | 3,126 | 3,050 | 2,991 | 2,964 | 2,929 | 2,900 | 2,897 | 2,909 | 2,945 | 2,992 | 3,043 | 3,107 |
| 60-69 | | 151% | 4,961 | 5,075 | 5,163 | 5,234 | 5,277 | 5,321 | 5,336 | 5,350 | 5,323 | 5,259 | 5,153 | 5,030 | 4,907 | 4,782 | 4,668 |
| 70-79 | | 223% | 4,126 | 4,646 | 4,666 | 4,602 | 4,588 | 4,609 | 4,652 | 4,727 | 4,827 | 4,922 | 5,032 | 5,154 | 5,249 | 5,327 | 5,376 |
| 80-89 | | 261% | 1,435 | 1,576 | 1,726 | 1,965 | 2,195 | 2,418 | 2,629 | 2,673 | 2,699 | 2,722 | 2,737 | 2,742 | 2,755 | 2,741 | 2,756 |
| 90+ | | 315% | 287 | 322 | 364 | 401 | 412 | 422 | 430 | 437 | 452 | 472 | 494 | 514 | 531 | 581 | 614 |

| Undetermined Type Diabetes | 2021 (Actual) | 2038 esimate versus 2021 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-19 | 61 | 109% | 64 | 64 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 66 | 66 | 66 | 66 |
| 20-29 | 365 | 120% | 421 | 420 | 420 | 420 | 421 | 422 | 424 | 427 | 433 | 438 | 441 | 443 | 443 | 442 | 439 |
| 30-39 | 621 | 111% | 692 | 697 | 703 | 710 | 714 | 716 | 716 | 713 | 704 | 697 | 690 | 688 | 688 | 687 | 689 |
| 40-49 | 175 | 120% | 174 | 176 | 179 | 182 | 186 | 189 | 191 | 194 | 198 | 201 | 204 | 206 | 208 | 209 | 211 |
| 50-59 | 220 | 89% | 212 | 207 | 202 | 197 | 192 | 188 | 187 | 184 | 183 | 182 | 183 | 185 | 188 | 192 | 196 |
| 60-69 | 207 | 101% | 222 | 227 | 231 | 234 | 236 | 238 | 239 | 240 | 238 | 236 | 231 | 225 | 220 | 214 | 209 |
| 70-79 | 139 | 156% | 155 | 167 | 180 | 186 | 185 | 186 | 188 | 191 | 195 | 199 | 203 | 208 | 212 | 215 | 217 |
| 80-89 | 52 | 342% | 68 | 75 | 82 | 93 | 103 | 112 | 121 | 129 | 137 | 144 | 151 | 158 | 165 | 171 | 178 |
| 90+ | 10 | 346% | 12 | 12 | 13 | 15 | 16 | 17 | 18 | 19 | 20 | 22 | 24 | 26 | 28 | 32 | 35 |

# Endnotes


1 McKee M *et al* **The changing health needs of the UK population - PubMed (nih.gov)**. Lancet. 2021 May 22;397(10288):1979-1991. doi: 10.1016/S0140-6736(21)00229-4. Epub 2021 May 6. PMID: 33965065; PMCID: PMC9751760

2 Guzman-Castillo *et al.* (2017). **Forecasted trends in disability and life expectancy in England and Wales up to 2025: a modelling study**. Lancet Public Health. 2(7): e307-e13. doi: 10.1016/s2468-2667(17)30091-9

3 Public Health Wales Observatory. (2018). Health and its determinants in Wales (2018). Available at: **www.phw.nhs.wales/services-and-teams/observatory/data-and-analysis/health-and-its-determinants-in-wales-2018/**

4 Public Health Wales Observatory. (2017). **Health and its determinants in Wales. Information strategic planning**. Interim Report Executive Summary Public Health Wales Observatory.

5 OECD (2016), OECD Reviews of Health Care Quality: United Kingdom 2016: Raising Standards, OECD Reviews of Health Care Quality, OECD Publishing, Paris, **www.doi.org/10.1787/9789264239487-en**

6 Simon Capewell, Ann Capewell, An effectiveness hierarchy of preventive interventions: neglected paradigm or self-evident truth?, Journal of Public Health, Volume 40, Issue 2, June 2018, Pages 350-358, **www.doi.org/10.1093/pubmed/fdx055**

7 **Health of the public in 2040 | The Academy of Medical Sciences (acmedsci.ac.uk)**

8 **National level population estimates by year, age and UK country (gov.wales)**

9 Boccarinai G. **www.health.org.uk/publications/long-reads/what-is-the-outlook-for-health-funding**

10 **www.health.org.uk/news-and-comment/news/uk-spent-around-a-fifth-less-than-european-neighbours-on-health-care-in-last-decade**

11 **www.bbc.co.uk/news/uk-wales-35533172**

12 Jagrič T. *et al.*, The impact of the health-care sector on national economies in selected European countries, Health Policy, Volume 125, Issue 1, 2021, Pages 90-97, ISSN 0168-8510, **The impact of the health-care sector on national economies in selected European countries – PubMed (nih.gov)**

13 Thomas C. *et al* **Healthy people, prosperous lives (ippr.org)**

14 'Side Effects: How Our Healthcare Lost Its Way and How We Fix It'. (2023) Sir David Haslam, published by Atlantic Books

15 **www.gov.wales/transforming-and-modernising-planned-care-and-reducing-nhs-waiting-lists**

16 **www.gov.wales/healthier-wales-long-term-plan-health-and-social-care**

17 **www.gov.wales/digital-strategy-wales**

18 www.gov.wales/diagnostics-recovery-and-transformation-strategy-wales-2023-2025

19 www.gov.wales/genomics-delivery-plan-2022-2025

20 www.gov.wales/sites/default/files/inline-documents/2019-04/190409%20-%20VG%20-%20Advanced%20Therapies%20Statement%20of%20Intent%20-%20English.pdf

21 www.gov.wales/allied-health-professions-ahp-framework

22 healthcare-science-in-nhs-wales.pdf (gov.wales)

23 www.gov.wales/innovation-strategy-wales

24 What is the forecasted prevalence and incidence of long-term conditions in Wales: a rapid evidence map | medRxiv

25 National level population estimates by year, age and UK country (gov.wales)

26 Principal projection – Wales population in age groups – Office for National Statistics (ons.gov.uk)

27 www.gov.uk/government/publications/future-of-an-ageing-population

28 Between 2012 and 2018, SPA will change from 65 years for men and 61 years for women, to 65 years for both sexes. Then between December 2018 and October 2020, SPA will change from 65 years to 66 years for both men and women, based on the 2011 Pensions Act. Between 2026 and 2028, SPA will increase to 67 for both sexes and is currently set to increase to 68 between 2044 and 2046.

29 Health and Care Research Wales Evidence Centre | Health Care Research Wales

30 Hiam L. *et al.* Falling down the global ranks: life expectancy in the UK, 1952-2021. Journal of the Royal Society of Medicine. 2023;116(3):89-92. doi:10.1177/01410768231155637 Falling down the global ranks: life expectancy in the UK, 1952-2021 – PubMed (nih.gov)

31 National life tables – life expectancy in the UK - Office for National Statistics (ons.gov.uk)

32 www.sciencedirect.com/science/article/pii/S0920996420301547

33 State Pension age Review 2023 – GOV.UK (www.gov.uk)

34 Chapter 1: life expectancy and healthy life expectancy – GOV.UK (www.gov.uk)

35 Introduction to Frailty | British Geriatrics Society (bgs.org.uk)

36 www.ageuk.org.uk/our-impact/policy-research/frailty-in-older-people/understanding-frailty/

37 www.england.nhs.uk/rightcare/wp-content/uploads/sites/40/2019/07/frailty-toolkit-june-2019-v1.pdf

38 www.bgs.org.uk/sites/default/files/content/attachment/2018-05-02/Bash_Current_and_future_cost_of_frailty.pdf

39 Bash_Current_and_future_cost_of_frailty.pdf (bgs.org.uk)

40 Bash_Current_and_future_cost_of_frailty.pdf (bgs.org.uk)

41 Afzali HA. et al Structuring a conceptual model for cost-effectiveness analysis of frailty interventions (nih.gov)

42 PowerPoint Presentation (england.nhs.uk)

43 rehabilitation-modelling-resource.pdf (gov.wales)

44 www.gov.wales/funding-increase-allied-health-professionals-and-access-community-based-care

45 www.primarycareone.nhs.wales/topics1/strategic-programme/

46 www.gov.wales/sites/default/files/publications/2020-02/allied-health-professions-framwework-for-wales.pdf

47 future-of-an-ageing-population.pdf (publishing.service.gov.uk)

48 Kingston A. *et al*, MODEM project Projections of multi-morbidity in the older population in England to 2035: estimates from the Population Ageing and Care Simulation (PACSim) model - PubMed (nih.gov)

49 Zemedikun DT.*et al.* Patterns of Multimorbidity in Middle-Aged and Older Adults: An Analysis of the UK Biobank Data. Mayo Clin Proc. 2018 Jul;93(7):857-866. doi: 10.1016/j.mayocp.2018.02.012. Epub 2018 May 22. PMID: 29801777

50 Head, A., *et al.* 2021. Multimorbidity: the case for prevention. J Epidemiol Community Health 75, 242-244.

51 Stafford M. *et al.* Understanding the health care needs of people with multiple health conditions.pdf

52 Chudasama *et al* Healthy lifestyle and life expectancy in people with multimorbidity in the UK Biobank: A longitudinal cohort study | PLOS Medicine

53 Versus Arthritis UK (2017) 'Musculoskeletal Conditions and Multimorbidity', MSK conditions and multimorbidity report (versusarthritis.org)

54 Versus arthritis (2021) 'The State of MSK Health 2021' (versusarthritis.org)

55 Office for Health, Improvements and Disparities (2023) Understanding the drivers of healthy life expectancy: report – GOV.UK (www.gov.uk)

56 Collins, B. *et al.*. (2022). What will the cardiovascular disease slowdown cost? Modelling the impact of CVD trends on dementia, disability, and economic costs in England and Wales from 2020-2029 - PubMed (nih.gov)

57 www.pubmed.ncbi.nlm.nih.gov/35767575/

58 Guzman-Castillo M. *et al.* Forecasted trends in disability and life expectancy in England and Wales up to 2025: a modelling study. Lancet Public Health. 2017 May 23;2(7):e307-e313. doi: 10.1016/S2468-2667(17)30091-9. PMID: 28736759; PMCID: PMC5500313

59 www.bjgp.org/content/bjgp/70/697/e525.full.pdf

60 www.nice.org.uk/guidance/indevelopment/gid-ng10178/documents

61 Lifetime Risks of Cardiovascular Disease | NEJM

62 World Stroke Organisation. (2022). World Stroke Organisation (WSO): Global Stroke Fact Sheet 2022 Available at: www.world-stroke.org/assets/downloads/WSO_Global_Stroke_Fact_Sheet.pdf

63 www.gov.uk/government/organisations/office-for-health-improvement-and-disparities/about/statistics

64 www.phw.nhs.wales/services-and-teams/observatory/data-and-analysis/health-and-its-determinants-in-wales-2018/

65 www.doi.org/10.1093/ehjopen/oeac066

66 World Stroke Organisation. (2022). World Stroke Organisation (WSO): Global Stroke Fach Sheet 2022 Available at: www.world-stroke.org/assets/downloads/WSO_Global_Stroke_Fact_Sheet.pdf

67 Freedman B. *et al.* Stroke prevention in atrial fibrillation Prof Ben Freedman, MBPhD Tatjana S Potpara, MD Prof Gregory Y H Lip, MD Published: August 20, 2016DOI: https://doi.org/10.1016/S0140-6736(16)31257-

68 www.cks.nice.org.uk/topics/stroke-tia/background-information/risk-factors/#:~:text=Risk%20factors%20for%20stroke%20and%20transient%20ischaemic%20attack,risk%20of%20stroke%20rises%20sharply%20with%20age.%20

69 King D. *et al.* The future incidence, prevalence and costs of stroke in the UK. Age Ageing. 2020 Feb 27;49(2):277-282. doi: 10.1093/ageing/afz163. PMID: 31957781; PMCID: PMC7047821. future incidence, prevalence and costs of stroke in the UK | Age and Ageing | Oxford Academic (oup.com)

70 Lane, DA, *et al* Temporal Trends in Incidence, Prevalence, and Mortality of Atrial Fibrillation in Primary Care – PubMed (nih.gov)

71 Yiin GS.*et al.* Oxford Vascular Study. Age-specific incidence, outcome, cost, and projected future burden of atrial fibrillation-related embolic vascular events: a population-based study – PubMed (nih.gov) Circulation. 2014 Oct 7;130(15):1236-44. doi: 10.1161/CIRCULATIONAHA.114.010942. Epub 2014 Sep 10. PMID: 25208551; PMCID: PMC5384634

72 Torabi F *et al.* Longitudinal study of adherence to anticoagulation guidelines in patients with atrial fibrillation | European Heart Journal | Oxford Academic (oup.com)

73 Kingston A. *et al* MODEM project, Projections of multi-morbidity in the older population in England to 2035: estimates from the Population Ageing and Care Simulation (PACSim) model, Age and Ageing, Volume 47, Issue 3, May 2018, Pages 374-380, www.doi.org/10.1093/ageing/afx201

74 Cancer incidence for all cancers combined | Cancer Research UK

75 macmillan-2020-cancer-prevalence-figures-and-methodology_tcm9-356351.pdf

76 Maddams J, *et al.* Projections of cancer prevalence in the United Kingdom, 2010-2040. British Journal of Cancer. 107: 1195-202. doi: 10.1038/bjc.2012.366 Projections of cancer prevalence in the United Kingdom, 2010-2040 - PubMed (nih.gov)

77 Smittenaar CR *et al.* Cancer incidence and mortality projections in the UK until 2035. Br J Cancer. 2016; 25;115(9):1147-1155. www.doi.org/10.1038/bjc.2016.304

78 Donnelly DW *et al* (2020). Cancer incidence projections in Northern Ireland to 20, 40. Cancer Epidemiology Biomarkers and Prevention. 29: 1398-405. doi: www.doi.org/10.1158/1055-9965.EPI-20-0098

79 Borras JM. *et al* (2016). How many new cancer patients in Europe will require radiotherapy by 2025? An ESTRO-HERO analysis. Radiotherapy and Oncology. 119: S153. doi: **www.doi.org/10.1016/j.radonc.2016.02.016**

80 Tsoi KKF *et al.* (2017). Predicted increases in incidence of colorectal cancer in developed and developing regions, in association with ageing populations. Clinical Gastroenterology & Hepatology. 15(6): 892-900.e4. doi: **www.doi.org// 10.1016/j.cgh.2016.09.155**

81 Teoh JYC *et al.* Global incidence of prostate cancer in developing and developed countries with changing age structures. PLoS One. 2019;14(10):e0221775. **www.doi.org/10.1371/journal.pone.0221775**

82 Greene *et al.* **Impact of the SARS-CoV-2 pandemic on female breast, colorectal and non-small cell lung cancer incidence, stage and healthcare pathway to diagnosis during 2020 in Wales, UK, using a national cancer clinical record system | Request PDF (researchgate.net)**

83 Cancer Research UK. (2018b). Breast cancer risk. Available at: **www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/breast-cancer/risk-factors**

84 Cancer Research UK. (2018a). Bowel cancer risk. Available at: **www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/bowel-cancer/risk-factors#heading-One**

85 Cancer Research UK. (2018c). Lung cancer risk. Available at: **www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/lung-cancer/risk-factors**

86 Risk factors with 'sufficient' or 'convincing' evidence of increasing lung cancer include production of graphite (Acheson process), production of aluminium, iron and steel, arsenic and inorganic arsenic compounds[a] asbestos (all forms), beryllium (and compounds), bis(chloromethyl) ether; chloromethyl methyl ether (technical grade), cadmium (and compounds), chromium (VI) compounds, household coal combustion emissions, production of coal/coke, coal-tar pitch, diesel engine exhaust hematite mining, MOPP (vincristine-prednisone-nitrogen mustard-procarbazine mixture), nickel compounds, outdoor air pollution (and particulate matter within), painting, plutonium, radon-222 and its decay products, production of rubber, crystalline silica dust, soot, sulphur mustard, tobacco smoking, environmental tobacco smoke, x-radiation, gamma-radiation, welding fumes, beta-carotene supplements (high dose, in smokers)
(Cancer Research UK 2018c)

87 Cancer Research UK. (2018d). Prostate cancer risk. Available at: **www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/prostate-cancer/risk-factors**

88 NICE. (2022g). Prostate cancer: What are the risk factors for prostate cancer? Clinical Knowledge Summaries
Available at: **www.cks.nice.org.uk/topics/prostate-cancer/background-information/risk-factors/**

89 Public Health Wales. Non-Melanoma Skin Cancer Incidence in Wales, 2016-2019. Available at: **20230207_NMSC_INCIDENCE_REPORT_HTML.knit (shinyapps.io)**

90 **An updated report on the incidence and epidemiological trends of keratinocyte cancers in the United Kingdom 2013–2018 - PMC (nih.gov)**

91 Ahmadi-Abhari S. *et al.* **Temporal trend in dementia incidence since 2002 and projections for prevalence in England and Wales to 2040: modelling study**. BMJ. 2017 Jul 5;358:j2856. doi: 10.1136/bmj.j2856. PMID: 28679494; PMCID: PMC5497174

92 Bandosz P.*et al.* **Potential impact of diabetes prevention on mortality and future burden of dementia and disability: a modelling study**. Diabetologia. 2020 Jan;63(1):104-115. doi: 10.1007/s00125-019-05015-4. Epub 2019 Nov 15. PMID: 31732789; PMCID: PMC6890625

93 Guzman *et al.***Forecasted trends in disability and life expectancy in England and Wales up to 2025: a modelling study – PubMed (nih.gov)**

94 Kingston *et al.* **Projections of multi-morbidity in the older population in England to 2035: estimates from the Population Ageing and Care Simulation (PACSim) model - PubMed (nih.gov)**

95 Li *et al.*. Model-Based Projection of Dementia Prevalence in China and Worldwide: 2020-2050. J Alzheimers Dis. 2021;82(4):1823-1831. doi: **10.3233/JAD-210493**. PMID: 34219732

96 Prince, M. *et al.* Dementia UK: Update. Alzheimer's Society **Dementia UK: Update (kcl.ac.uk)**

97 **Projections of older people living with dementia and costs of dementia care , UK, 2019-20 (lse.ac.uk)**

98 **Projections of care for older people with dementia in England: 2015 to 2040 – PMC (nih.gov)**

99 2021 Alzheimer's disease facts and figures. Alzheimers Dement. 2021 Mar;17(3):327-406. doi: 10.1002/alz.12328. Epub 2021 Mar 23. PMID: 33756057

100 Wittenberg R. *et al.* **Projections of care for older people with dementia in England: 2015 to 2040**. Age Ageing. 2020 Feb 27;49(2):264-269. doi: 10.1093/ageing/afz154. PMID: 31808792; PMCID: PMC7047814

101 **Risk factors | Background information | Dementia | CKS | NICE**

102 **factsheet_risk_factors_for_dementia.pdf (alzheimers.org.uk)**

103 **Quality Assurance and Improvement Framework (QAIF) disease registers by local health board (gov.wales)**

104 **Beyond 2020: Modelling obesity and diabetes prevalence – ScienceDirect**

105 Haider S. *et al.* **Disease burden of diabetes, diabetic retinopathy and their future projections in the UK: cross-sectional analyses of a primary care database – PubMed (nih.gov)** BMJ Open. 2021 Jul 12;11(7):e050058. doi: 10.1136/bmjopen-2021-050058. PMID: 34253675; PMCID: PMC8276304

106 **(PDF) Disease burden of diabetes, diabetic retinopathy and their future projections in the UK: cross-sectional analyses of a primary care database (researchgate.net)**

107 **Projections of multi-morbidity in the older population in England to 2035: estimates from the Population Ageing and Care Simulation (PACSim) model – PubMed (nih.gov)**

108 Besser, R, *et al* (2022) 'General population screening for childhood type 1 diabetes: is it time for a UK strategy?', **www.adc.bmj.com/content/107/9/790**

109 Royal Institute for Blind People (2021) **Key information and statistics on sight loss in the UK | RNIB**

110 Pezzullo, L (2018) **The economic impact of sight loss and blindness in the UK adult population – PubMed (nih.gov)**

111 Royal Institute for Blind People (2014) **The economic impact of sight loss and blindness in the UK adult population | RNIB**

112 Hackenberg, B, *et al* (2021) Hearing Loss and it's burden of Disease in a Large German Cohort – Hearing Loss in Germany', **www.onlinelibrary.wiley.com/doi/pdf/10.1002/lary.29980**

113 Archbold, S *et al*, The Ear Foundation (2014) 'The Real Cost of Adult Hearing Loss: Reducing its' impact by increasing access to the latest hearing technologies', **www.adulthearing.com/wp-content/uploads/2019/12/The_real_cost_of_adult_hearing_loss_The_Ear_Foundation_2014-1.pdf**

114 The Lancet Commissions (2020) Dementia prevention, intervention and care' **www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(20)30367-6.pdf**

115 Allum, J (2022) 'Association between hearing loss and deprivation among Welsh adults: a cross-sectional observational study' **www.bmjopen.bmj.com/content/bmjopen/13/5/e066419.full.pdf**

116 Stansfeld S *et al* **Stansfeld et al APMS2014 Common mental disorders.pdf (ucl.ac.uk)**

117 **Mental disorders (who.int)**

118 **Prevalence | Background information | Generalized anxiety disorder | CKS | NICE**

119 **Prevalence | Background information | Depression | CKS | NICE**

120 **Common Mental Health Disorders – OHID (phe.org.uk)**

121 Office for Health Improvement & Disparities. (2022f). **Mixed anxiety and depressive disorder: estimated % of population aged 16-74**

122 **National Social Care Data Portal for Wales**

123 Stansfeld S *et al* **Stansfeld et al APMS2014 Common mental disorders.pdf (ucl.ac.uk)**

124 **Generalized anxiety disorder | Health topics A to Z | CKS | NICE**

125 **Generalized anxiety disorder | Health topics A to Z | CKS | NICE**

126 **Incidence and prevalence | Background information | Bipolar disorder | CKS | NICE**

127 **Mental disorders (who.int)**

128 Merikangas *et al.***Prevalence and correlates of bipolar spectrum disorder in the world mental health survey initiative – PubMed (nih.gov)**

129 **Incidence and prevalence | Background information | Bipolar disorder | CKS | NICE**

130 John *et al.* **www.sciencedirect.com/science/article/pii/S092099641830198 1?via%3Dihub**

131 **National Social Care Data Portal for Wales**

132 **Bipolar disorder | NHS inform**

133 Bebbington *et al.* **Mental well-being and mental illness: findings from the Adult Psychiatric Morbidity Survey for England 2007 – PubMed (nih.gov)**

134 McDonald *et al.* **Using epidemiological evidence to forecast population need for early treatment programmes in mental health: a generalisable Bayesian prediction methodology applied to and validated for first-episode psychosis in England – PubMed (nih.gov)**

135 National Social Care Data Portal for Wales

136 Bebbington *et al.* Mental well-being and mental illness: findings from the Adult Psychiatric Morbidity Survey for England 2007 - PubMed (nih.gov) Br J Psychiatry. 2011 Jul;199(1):23-8. doi: 10.1192/bjp.bp.111.091496. PMID: 21719878

137 Causes and risk factors | Background information | Psychosis and schizophrenia | CKS | NICE

138 Over 26,000 adults with severe mental illness die prematurely from preventable illness each year (rcpsych.ac.uk)

139 www.ncbi.nlm.nih.gov/pmc/articles/PMC6939479/

140 www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/articles/prospectivenewmethodforsettingmortalityassumptionsfornationalpopulationprojectionsuk/january2023#:~:text=For%20the%20UK%2C%20annual%20rates,0%25%20improvement%20rate%?20was%20assumed

141 The Living Standards Outlook 2023 - Resolution Foundation

142 Relative income poverty: April 2021 to March 2022 | GOV.WALES

143 Keaver *et al.* Morbid obesity in the UK: A modelling projection study to 2035 – PubMed (nih.gov)

144 Pineda *et al* Forecasting Future Trends in Obesity across Europe: The Value of Improving Surveillance - PubMed (nih.gov)

145 Health and its determinants in Wales (2018) – Public Health Wales (nhs.wales)

146 Overview | Obesity prevention | Guidance | NICE

147 World Obesity Atlas 2023 | World Obesity Federation

148 Hannah *et al.* www.publichealthwales.nhs.wales/publications/publications1/the-primary-care-needs-of-people-living-with-overweight-and-obesity-in-wales-summary/

149 Health and its determinants in Wales (2018) – Public Health Wales (nhs.wales)

150 Janssen *et al.* Obesity Prevalence in the Long-Term Future in 18 European Countries and in the USA – PubMed (nih.gov)

151 Causes and risk factors | Background information | Obesity | CKS | NICE

152 Inequalities in smoking and obesity in Europe predicted to 2050: Findings from the EConDA project - Carolina Pérez-Ferrer, Abbygail Jaccard, Andre Knuchel-Takano, Lise Retat, Martin Brown, Vilma Kriaucioniene, Laura Webber, 2018 (sagepub.com)

153 Health and its determinants in Wales (2018) – Public Health Wales (nhs.wales)

154 Health and its determinants in Wales (2018) – Public Health Wales (nhs.wales)

155 What the NHS thinks about prevention. Faculty of Public Health. 2019.

156 Public spending on health: a closer look at global trends. Geneva: World Health Organisation; 2018. Licence: CC BY-NC-SA 3.0 IGO

157 **Noncommunicable diseases (who.int)**. September 2022

158 Masters R *et al* **Return on investment of public health interventions: a systematic review**. J Epidemiol Community Health 2017; 71:827-834

159 The U.K. National Institute for Health and Care Excellence (NICE) currently uses a cost-effectiveness threshold in the range of £20,000 to £30,000 per quality-adjusted life year (QALY) for reimbursing new drugs in the National Health Service (NHS). Guide to the methods of technology appraisal 2013 Process and methods Published: 4 April 2013 **www.nice.org.uk/process/pmg9**

160 Owen L, Fischer A. **The cost-effectiveness of public health interventions examined by the National Institute for Health and Care Excellence from 2005 to 2018**. Public Health. 2019 Apr; 169:151-162. doi: 10.1016/j.puhe.2019.02.011. Epub 2019 Mar 16. PMID: 30885422

161 Hughes K. *et al.* **Health and financial burden of adverse childhood experiences in England and Wales: a combined primary data study of five surveys'** BMJ Open 2020;10:e036374. doi:10.1136/bmjopen-2019-036374

162 Edwards R. *et al.* (2016). **Transforming young lives across Wales: The economic argument for investing in early years.** Bangor, UK: Bangor University.

163 Edwards, R. T., *et al*, (2018). **Living well for longer: The economic argument for investing in the health and wellbeing of older people in Wales**. Bangor, UK: Bangor University.

164 GP workload survey '**highlights immense pressure on practices**' – BMA media centre – BMA

165 Leong *et al.* **Full article: Task shifting in primary care to tackle healthcare worker shortages: An umbrella review (tandfonline.com)**

166 Ford *et al.* **AHP-and-Inequalities-Final-Version-V2.0.pdf (cam.ac.uk)**

167 **Understanding activity in general practice: what can the data tell us? (health.org.uk)**

168 NHS England and NHS Improvement (2019) 'Network Contract Directed Enhanced Service: Additional Roles Reimbursement Scheme Guidance' **network-contract-des-additional-roles-reimbursement-scheme-guidance-december2019.pdf (england.nhs.uk)**

169 **Funding to increase allied health professionals and access to community-based care | GOV.WALES**

170 Strategic Programme for Primary Care (2022) **'Strategic Programme for Primary Care: An All-Wales Health Board-led programme that works in collaboration with Welsh Government and responds to A Healthier Wales'**

171 **Allied Health Professions (AHP) Framework | GOV.WALES**

172 Strategic Programme for Primary Care (2021) **'Primary and Community Care Allied Health Professions (AHP) Workforce Guidance: Organising principles to optimise utilisation'**

173 **IAPT Manual (england.nhs.uk)**

174 **Trauma-Informed-Wales-Framework.pdf (traumaframeworkcymru.com)**

175 StatsWales 'NHS staff by staff group and year', **NHS staff by staff group and year (gov.wales)**

176 The Health Foundation (2022) **'How many NHS workers will we need over the coming decade? – The Health Foundation'**

177 Bazeer N. *et al*, How many NHS workers will we need over the coming decade? The Health Foundation; 2022 (**www.health.org.uk/publications/how-many-nhs-workers-will-we-need-over-the-coming-decade**)

178 The Health Foundation (2022) 'NHS workforce projections 2022', **www.health.org.uk/publications/nhs-workforce-projections-2022**

179 Shembavnekar N. *et al*, NHS workforce projections 2022. The Health Foundation; 2022, **www.doi.org/10.37829/HF-2022-RC01**

180 Wachter, M and Chair, MD (2016) **Making IT Work: Harnessing the Power of Health Information Technology to Improve Care in England (publishing.service.gov.uk)**

181 Welsh Government, NHS Wales and Wales Co-operative Centre (2019) 'Digital Inclusion Guide: for Health and Care in Wales', **www.dhcw.nhs.wales/files/publications/digital-inc-guide-0619-english-pdf/**

182 **www.health.org.uk/publications/our-ageing-population**

183 Government Office for Science, (2016) '**Future of an Ageing Population**'

184 National Institute for Health and Care Excellence (2018), '**Chapter 39 Bed occupancy: Emergency and acute medical care in over 16s: service delivery and organisation**'

185 Williamson A and Patel P (2023) Waiting for prosperity: Modelling the economic benefits of reducing elective waiting lists in the NHS, IPPR. **www.ippr.org/research/publications/waiting-for-prosperity**

186 Warner, M and Zaranko, B, The Institute for Fiscal Studies (2023) **One year on from the backlog recovery plan: what next for NHS waiting lists?**

187 RR00030. Wales COVID-19 Evidence Centre. Rapid review of the effectiveness of innovations to support patients on elective surgical waiting lists. April 2022 **www.medrxiv.org/content/10.1101/2022.06.10.22276151v1.full.pdf**

188 RR_00008. Wales COVID-19 Evidence Centre. A rapid review of the effectiveness of service delivery interventions for adult orthopaedic patients on a surgical waiting list. November 2021. **www.primecentre.wales/resources/RR/RR00008-Wales_COVID-19_Evidence_Centre-Rapid_Review_of_the_effectiveness_of_service_delivery_interventions_for_adult_orthopaedic_patients_on_a_surgical_waiting_list_November-2021.pdf**

189 Etkind *et al.* BMC Medicine (2017) How many people will need palliative care in 2040? Past trends, future projections and implications for services.**www.doi.org/10.1186/s12916-017-0860-2**

190 **Health and Care Research Wales Evidence Centre | Health Care Research Wales**

191 McDaid, D., *et al.* (2022). The economic case for investing in the prevention of mental health conditions in the UK. Mental Health Foundation, February 2022

192 Collins B, *et al.* (2022). What will the cardiovascular disease slowdown cost? Modelling the impact of CVD trends on dementia, disability, and economic costs in England and Wales from 2020-2029. PLoS ONE [Electronic Resource]. 17(6): e0268766. **www.dx.doi.org/10.1371/journal.pone.0268766**

193 Pathirana, T. & Jackson, C. A. (2018). Socioeconomic status and multimorbidity: a systematic review and meta-analysis. Australian and New Zealand Journal of Public Health, 42(2), 186-194. **www.doi.org/10.1111/1753-6405.12762**

194 Soley-Bori, M. *et al.* (2021). Impact of multimorbidity on healthcare costs and utilisation: A systematic review of the UK literature. British Journal of General Practice, 71(702). **www.doi.org/10.3399/bjgp20X713897**

195 **Life expectancy and healthy life expectancy at birth by deprivation – The Health Foundation**

196 Murray E. *et al.* (2022) Health and Place: How levelling up health can keep older workers working. International Longevity Centre – UK and The Health Foundation

197 **www.resource-allocation.biomedcentral.com/articles/10.1186/s12962-023-00436-w**

198 **www.health.org.uk/publications/long-reads/what-is-the-outlook-for-health-funding**

199 **www.nuffieldtrust.org.uk/news-item/how-well-is-the-nhs-in-wales-performing**

200 **www.health.org.uk/news-and-comment/news/uk-spent-around-a-fifth-less-than-european-neighbours-on-health-care-in-last-decade**

201 **www.nuffieldtrust.org.uk/research/a-decade-of-austerity-in-wales-the-funding-pressures-facing-the-nhs-in-wales-to-2025-26**

202 **www.bbc.co.uk/news/uk-wales-35533172**

203 **www.health.org.uk/chart/chart-spending-per-head-in-the-four-countries-of-uk**

204 **www.frontiersin.org/articles/10.3389/fpubh.2022.953752/full**

205 **www.sciencedirect.com/science/article/pii/S0168851020302645**

206 **www.ippr.org/research/publications/healthy-people-prosperous-lives**

207 **Annual Population Survey/Labour Force Survey – Data Sources – home – Nomis– Official Census and Labour Market Statistics (nomisweb.co.uk)**

208 **Healthy people, prosperous lives (ippr.org)**

209 **www.ippr.org/research/publications/healthy-people-prosperous-lives**

210 Government Office for Science (2015) 'How are attitudes and behaviours to the ageing process changing in light of new media and new technology? How might these continue to evolve by 2025 and 2040?'

211 McKinsey Global Institute (2013) **Disruptive technologies: Advances that will transform life, business, and the global economy**

212 Health Education England, (2019) The Topol Review, **www.topol.hee.nhs.uk/the-topol-review/**

213 Welsh Government (2018) **Written Statement – Statement of Intent for Diagnostic Imaging Services (5 March 2018) | GOV.WALES**

214 Welsh Government (2017) **Genomics for Precision medicine**

215 Welsh Government (2017) **Genomics for Precision medicine**

216 HM Government (2021) Life Sciences Vision, **Life Sciences Vision (HTML) – GOV.UK (www.gov.uk)**

217 HM Government (2021) Life Sciences Vision, **Life Sciences Vision (HTML) – GOV.UK (www.gov.uk)**

218 GOV.UK **Genome UK: the future of healthcare – GOV.UK (www.gov.uk)**

219 GOV.UK (2020) **Genome UK: the future of healthcare**

220 Welsh Government (2022) **Genomics Delivery Plan for Wales**

221 Welsh Government (2023) **New test to revolutionise lung cancer diagnosis rolled out in Wales | GOV.WALES**

222 Griffin, E (2023) **Evidence-Based Assessment of Congenital Heart Disease Genes to Enable Returning Results in a Genomic Study**

223 Government Office for Science (2022) **Genomics Beyond Health – full report**

224 GOV.UK (2022) **National AI Strategy**

225 European Commission (2021) **A European Strategy for Artificial Intelligence**

226 Centre for Data Ethics and Innovation (2021) **The roadmap to an effective AI assurance ecosystem**

227 GOV.UK (2023) **AI regulation: a pro-innovation approach – GOV.UK (www.gov.uk)**

228 GOV.UK (2023) **A pro-innovation approach to AI regulation – GOV.UK (www.gov.uk)**

229 NHS England **The AI and digital regulations service**

230 Government Office for Science (2016) **Future of an ageing population**