Longer, better lives

Technical annex

For the manifesto and programme for UK Government for cancer research and care

CANCER RESEARCH UK

Together we are beating cancer

Contents

Introduction

Longer, better lives: A manifesto for cancer research and care and Longer, better lives: A programme for UK Government for cancer research and care set out many areas for improvement that will contribute to the overall ambition of reducing cancer mortality, such as prevention, early diagnosis, improved treatment, research and quality improvement.

For many of these areas, the manifesto and programme provide quantitative estimates of the scale of the challenge and/or the potential impact of meeting that challenge.

This technical annex explains the overall mortality ambition as well as calculation methods for the cancer research funding deficit (Mission 1), the potential impact of meeting prevention targets (Mission 2) and improving survival in relation to comparable countries (vision for Mission 4). It also provides guidelines for future measurement, along with intermediate goals.

Details on other calculations and economic estimates in the manifesto and programme are provided within the programme. We can provide further information on request.

Ambition

To reduce the cancer mortality rates by 15% by 2040

This will lead to 20,000 fewer cancer deaths each year by 2040 compared to current projections.

Introduction

The age-standardised mortality rate (ASMR) for all cancers combined is an important measure of the impact of cancer on the population. It can be reduced by improvements in both prevention and survival. It reflects developments made through research and policy in public health, early detection and diagnosis, and better access to optimal treatments. It's a vital measure of overall improvements in cancer prevention and care.

The ASMR for all cancers combined has fallen by -10% over the last decade in the UK (persons, 2007–2009 to 2017–2019)[1]. But our current projections show the ASMR is projected to reduce by only -6% between 2023–25 and 2038–2040[2]. Whilst this is a conservative estimate due to the projection methodology which reduces the gradient of each trend over time, it represents a decrease of only -0.35% per year compared to the -1% annual decrease observed over the last decade. Projections are for only a -2.8% decrease from the 2023–25 projected baseline to 2028–2030, or an average annual decrease of -0.56%.

With a growing and ageing population across the UK, the number of cancer deaths each year is expected to increase, despite the falling mortality rate. That's why it's important to focus on reducing the ASMR across the population and keeping a minimum -1% annual reduction across the time period.

Methodology

To take into account changes over time in the age structure of a population, mortality rates are age-standardised using the European Standard Population (ESP)[3] – a theoretical population structure which is commonly used across Europe to make comparisons over time or between countries. We publish age-standardised cancer mortality rates for the UK using the ESP[1].

Projections of age-standardised cancer mortality rates for all cancers combined are made using an age-period-cohort model. These are calculated for each UK country cancer site, sex and five-year age band with the all-cancer mortality rate calculated from the sum of projected trends for each individual cancer site. We publish projected cancer mortality rates[2], alongside more detailed methodology[4].

The ambition is to see a reduction in the UK ASMR (persons) for all cancers combined of -15% by the 2038–2040 average, compared to the current projection for the 2023–25 average. This is more than double the current projected ASMR reduction for this period of -6%. An overall reduction in the ASMR of -15% compared to the baseline of 2023–25 would continue the trend of a -1% annual change observed over the last decade. This would equate to nearly 20,000 fewer cancer deaths each year by 2038–40 (compared to a -6% reduction).

Future measurement

We'll continue to calculate and publish ASMRs annually. These are based on official death registration data from each UK country, and population figures supplied by the Office for National Statistics.

Intermediate goals

It will take time to see interventions affect mortality rates, so comparatively greater mortality reductions would be expected in the 2030s than in the late 2020s. Intermediate goals reflect this with an increasing annual percentage change over time. The intermediate goals are:

- Baseline: 2023–2025: ASMR (for all cancers combined, persons, UK) of 253 per 100,000 population.
- 2028–2030: ASMR of 242.9 per 100,000 population (4% reduction from baseline).
- 2033–2035: ASMR of 230.2 per 100,000 population (9% reduction from baseline).
- 2038–2040: ASMR of 215.1 per 100,000 population (15% reduction from baseline).

Points of note

Whilst the ASMR for all cancers combined is projected to reduce by -6% by 2038–2040, the absolute number of cancer deaths each year is expected to increase because of the growing and ageing population. Current projections are for an increase in the number of cancer deaths across the UK each year from around 176,000 in 2023–2025 to 208,000 in 2038–2040. Whilst achieving the ambition of a -15% reduction in the ASMR for all cancers combined will lead to fewer annual cancer deaths than currently projected, this would still lead to around 188,000 cancer deaths per year by 2038–2040, an increase in the number of cancer deaths compared to the baseline of 2023–25.

Mission 1

Rebuild the UK's global position in biomedical research

Aim:

- Close the more than £1bn funding gap for cancer research in the UK over the next decade.

Introduction

We conducted the funding gap analysis internally to provide an approximate estimate of government spending needed over the next decade to maintain total public (government and not-for-profits (NFP)) spending on cancer research and development (R&D) at the 2019 level. This analysis has not been published and reflects our best estimates of the funding gap, based on our current knowledge of government and NFP spend data. It does not include private-sector spend.

Methodology

The analyses are based on the following data and assumptions:

1. **Cancer research spending data used:** International Cancer Research Partnership (ICRP) data for all UK public funding organisations. Data on private sector investment in cancer R&D is not readily available, so we haven't included private-sector spend in the analysis, nor any impact that variation on public sector spending may have on private sector spending.
2. **Base year:** We used 2019 as our base year to exclude potential distortion of more recent data by COVID-19-related spending. In 2019, total government and NFP investment in cancer research was ~£630m, of which ~£243m from government investment.

3. **Cancer research spend per cancer case:**
    - We divided the total government and NFP cancer research spend by the estimated number of cases in 2019 (our base year), estimating an average spend per cancer case in 2019 of £1.6m per thousand cases.
    - We collate and publish cancer cases for the UK[5]. There were an estimated 392,000 cases per year in 2018–20, which is projected to increase to 420,000 per year in 2023–2025 and to over 500,000 cases per year in 2038–2040. The projected number of cases for each three-year rolling cohort is available from the Cancer Research UK website[6].

    Based on our data, the average government and NFP cancer research spend was static in cash terms for the 10 years up to 2019 on a per-case basis, already representing a real-term decrease when inflation is taken into account.

4. **Projections** – we've looked at two scenarios: the impact of inflation on the current level of spend, and factoring in an increase in cancer cases to show what would be required to maintain spend on a per-case basis.
    - **Scenario 1:**
    - Cancer Research UK investment is fixed at £300m baseline projection on new research per year for the next 10 years.
    - Contribution from other NFPs remains fixed at current levels (~£80m a year) for the next 10 years.
    - Government investment will increase in line with inflation using Office for Budget Responsibility (OBR) data on GDP deflator[7].
    - No further impacts of the increase in public spending on efficiency or on private spending.
    - **Scenario 2:**
    - In addition to the assumption used in scenario 1, we've calculated the additional total spend needed based on the increase in cancer incidence cases. The current number of new cases per year is projected as ~420k for 2024 and is projected to rise to ~474k by 2033.

Based on the data and assumptions above, our analysis shows:

- To maintain an investment equivalent to the 2019 level in real terms, government investment will need to rise to ~£121m above inflation annually by 2033. This implies a total increase of £930m to government cancer research investment for the years 2024–2033 (scenario 1).
- To maintain an investment equivalent to £1.6m per thousand cases (as per 2019 baseline), total government investment will need to rise to ~£609m annually in real terms by 2033. This implies a total increase of £2bn to government cancer research investment for the years 2024–2033 (scenario 2).

Mission 2

Prevent thousands more cancer cases

Aim:

- By 2030, reduce prevalence of a) tobacco smoking, b) overweight and obesity and c) alcohol consumption above UK Government recommended limits, to such levels that around 29,000 cancer cases in England in total by 2040 could be prevented, compared with current projections.

Introduction

Nearly 4 in 10 cases of cancer in the UK are attributable to modifiable risk factors. Reducing prevalence of the main risk factors for cancer will reduce future cancer incidence rates, and therefore also reduce future cancer mortality rates. Risk factor prevalence changes take some time to impact cancer incidence rates because it takes some time for risk factor exposure to cause cancer

The biggest cancer risk factors in the UK are smoking (15% of UK cancer cases in 2015) and overweight and obesity (6%)[8,9]. Alcohol drinking also contributes a substantial proportion of cases (3%), though some other factors contribute a similar or slightly larger proportion, they're less amenable to change through policy levers.

12.7% of the adult population of England currently smokes cigarettes[10]. Smoking prevalence has been reducing with policy action for decades[11]. But current projections indicate that 'smokefree' (average adult smoking prevalence of 5% or below) targets will not be achieved in any UK country[12]. More than 6 in 10 adults in all UK countries are overweight (body mass index (BMI) 25–29.9) or obese (BMI 30+), and obesity prevalence is rising[13]. With smoking prevalence reducing, it's projected that overweight and obesity will become the largest preventable risk factor for cancer. Around a fifth (21%) of adults in England drink alcohol at levels above UK Government recommended limits[14].

England, Scotland, and Wales have committed to achieve smokefree by a specific year. Northern Ireland does not yet have a smokefree ambition. For overweight and obesity and alcohol drinking, there are no current government prevalence targets in any UK country.

Methodology

Methodology for estimating the proportion of cancer cases attributable to specific risk factors, combining data on risk factor prevalence, calculating the relative risk of being diagnosed with cancer following exposure to the risk factor (with a lag of 10 years, in line with the typical follow-up length of relevant studies) and projected cancer incidence has previously been published[5].

The number of cancer cases in England (UK figures available on request) each year between now and 2040 has been estimated by combining projected cancer incidence[15], gold-standard relative risk data and two risk factor prevalence scenarios:

1. Smoking, overweight and obesity and alcohol drinking prevalence rates continue to 2030 in line with recent trends.
2. Smoking, overweight and obesity and alcohol drinking prevalence rates are gradually reduced (linear reduction) to 2030, to reach levels set out in the table below.

The difference between the two scenarios in the number of cancer cases projected gives the number of cancer cases which stand to be prevented if the scenario is achieved.

Table 1:
Cancer risk factors and impact of scenarios on England cancer cases projected for 2040

Risk factor	Scenario	Cases prevented in 2040	Cases prevented 2034–40 total
Smoking	5% average adult smoking prevalence in 2030 in England	3.9k	18.2k
Adult overweight and obesity	10% of the population in each BMI category above 'healthy weight' shifting down a BMI category by 2030	2.0k	8.0k
Alcohol drinking	10% of the population in each alcohol drinking category above 14 units per week shifting down a drinking category by 2030	Around 630	2.7k
All the above factors combined		6.6k	29.0k

Notes:

The smoking target for England already has Government commitment. We've selected all other targets for this modelling to indicate the 'size of the prize'. Combining the three risk factors here may slightly overestimate the total cases prevented, as some cancer cases have more than one causal factor, although this is expected to be a very small overestimate.

Future measurement

Prevalence of the three risk factors is collected annually in routine population surveys as follows:

- England smoking prevalence from the Office for National Statistics Adult smoking habits in the UK report[16].
- England overweight and obesity prevalence and alcohol drinking prevalence from the Health Survey for England[11].
- All Scotland metrics from the Scottish Health Survey[17] and all Wales metrics from the National Survey for Wales[18].
- All Northern Ireland metrics from the Health Survey Northern Ireland[19].

Cancer registries collect cancer incidence data annually in the four UK countries and we collate for the UK[20].

Intermediate goals

The methodology assumes a consistent relative year-on-year reduction in risk factor prevalence between now and the stated ambition for 2030, so annual milestones are available and progress against these can be assessed using the resources listed above.

Mission 4 vision

Achieve amongst the best cancer survival in the world by 2035

Aim:

- For the UK to have amongst the best* cancer survival in the world by 2035.

*Defined as a maximum of 3 percentage points below the best-performing International Cancer Benchmarking Partnership (ICBP) country for colorectal, liver, lung, oesophagus, ovarian, pancreas and stomach cancers.

Introduction

The all-cancer survival index (CSI) of 10-year cancer survival across the UK, standardised by cancer site, has been increasing for several decades with cancer survival doubling over the last 50 years from around 1 in 4 to 2 in 4[21]. However, over the last decade, the CSI has seen a substantial slowdown in progress for 10-year cancer survival, although gains in shorter survival times are still being estimated[22].

Similarly, the ICBP has shown improvements in five-year cancer survival for multiple cancer sites. The ICBP provides an in-depth comparison of survival between jurisdictions across high-income countries that form the partnership[23]. This provides reliable comparisons between countries that can be considered as similar in terms of high-quality cancer registration, healthcare setup, wealth and healthcare expenditure.

The ICBPs SurvMark2[24] study shows the survival gap for each cancer site. Cancer survival for persons in 2014 showed the UK is behind the best-performing country for colorectal (10.9 percentage points), liver (7.9pp), lung (7.9pp), oesophagus (7.1pp), ovarian (females 9pp), pancreas (6.37pp) and stomach (12pp)[25]. The comparisons over time show that whilst survival is improving for all cancer sites across the UK, other countries are also improving and maintaining or increasing the 'survival gap'. The rate of improvement in cancer survival in the UK therefore needs to at least double for each cancer site to be comparable to the best-performing ICBP countries for people diagnosed with these cancers in 2035.

Methodology

The SurvMark2 study provides the definitive baseline for understanding differences in cancer survival between comparable high-income countries. Cancer survival methodology is well established internationally and given different exclusion criteria used for separate studies, comparisons between studies are not possible. To accurately understand trends over time the survival analyses must be using exactly the same approach.

There is a lag time in being able to confidently estimate five-year cancer survival after a cohort of people diagnosed with cancer to allow sufficient follow-up time for deaths to occur. This lag time means that five-year survival for the cohort up to 2035 will not be available for up to five years after. Projected survival will give a strong steer as to the estimated five-year cancer survival, but a full five-year follow-up provides the most accurate cancer survival calculations.

Future measurement

International survival comparisons are required to monitor progress against this ambition. There are no routine international survival comparisons. Studies such as CONCORD and those undertaken within the ICBP need to be funded in future for us to understand progress in closing the 'survival gap'.

Intermediate goals

Given the follow-up time required between a cohort of diagnosed patients and survival time, our latest 'survival gap' is for patients diagnosed 2010–2014. A baseline for patients diagnosed up to 2022 won't be available until sufficient time has passed to make five-year calculations reliable.

A proxy for progress can be taken from cancer survival calculations within UK countries. Given the need to improve the rate of improvement in cancer survival, an improved trend needs to be observed for one-year and five-year survival calculations. A continuation of current trends within country analysis will imply a lack of closing the 'survival gap', although this won't be confirmed until further ICBP studies provide definitive evidence.

Points of note

An all-cancer survival index for international comparisons does not currently exist. The ambition for the UK to have amongst the best cancer survival in the world reflects the need for this to be attained across multiple cancer sites.

A previous study by Abdel-Rahman et al[26] in 2009 set out that if survival in the UK matched the best in Europe, then there were up to 10,000 avoidable deaths each year in the UK. Whilst this looked at a wider set of cancer sites than in ICBP it highlights the size of the impact that improving survival can achieve, potentially contributing to most of the reduction in cancer mortality set out in these ambitions.

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