

Current, future and avoidable costs of stroke in the UK

Executive summary Part 1:

Burden of stroke in the next 20 years and potential returns from increased spending on research

Produced by the Centre for Primary Care & Public Health, Queen Mary University of London and the Personal Social Services Research Unit, London School of Economics and Political Science for the Stroke Association

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Introduction

Stroke is the second largest cause of death worldwide and fourth in the United Kingdom (UK).

There are over 113,000 strokes every year in the UK (Rothwell et al., 2004)* and there are over 950,000 stroke survivors aged 45 years and over (Geddes et al., 1996).* Many of these stroke survivors experience significant and long-term physical and psychological impacts, repeat strokes, transient ischaemic attacks (TIAs) and/or death within a year of stroke (Stroke Association, 2017).

Preventing, treating and managing the resulting illness or death from stroke all carry economic consequences, not just for health care services but also more widely across society (Saka et al., 2009; National Audit Office, 2010). For example, given that a quarter of all strokes in the UK happen among people of working age (Stroke Association, 2017), stroke can reduce employment prospects and productivity for society. It can also affect family and friends who are often involved with a stroke survivor's care and are unpaid in this caring role. This is even more concerning given current and likely ongoing financial pressures on health and social care services, families and other unpaid carers.

Despite significant progress in prevention, treatment and rehabilitation, there is still great capacity for further improvements, which in turn could reduce these large economic burdens. Achieving this requires more research, but stroke has received considerably less research investment compared to conditions with similar burdens. For example, the UK annual medical research-spend per stroke patient is £48, compared with £241 per cancer patient and £118 per dementia patient (Luengo-Fernandez et al., 2015).

*As noted on page 4, estimates of the number of strokes and stroke survivors can vary across different studies depending on many factors, including the population sample and data sources that are used. While we have used alternative estimates in our other publications (e.g. Stroke Association, 2017), we use averages from a range of estimates for the purpose of this work.

We carried out a large body of work that has been split into three distinct parts for reporting:*

1. The current and future burden of stroke and potential return from investment in research

Understanding the scale and range of impacts for a condition as prevalent as stroke can be of enormous value to help prioritise scarce resources. We therefore updated estimates of the current burden of stroke to ensure future research priorities, service and policy responses are based on timely and relevant data.

Furthermore, we forecasted the burden of stroke in the future based on our current estimates. We took into account likely changes in demography and expert views on potential future trends in the numbers of first-time strokes (stroke incidence) and survivors after stroke (stroke prevalence) each year.

However, estimates of the current and future burden of stroke won't in themselves offer solutions. We next gathered expert views on what research areas should be prioritised to reduce the burden of stroke in the UK. We also investigated whether investing in these research areas will help to reduce the burden of stroke in future years.

2. The current and future societal costs of stroke

Further to the burden of stroke, we updated the current societal costs of stroke and examined potential future costs of stroke over the next 10 and 20 years. We forecasted these costs based on our current estimates and accounting for demographic changes, future service costs and future stroke burden estimates.

3. Implementing what we know works

Finally, there is already evidence of interventions that could bring benefits to the care sector and the wider population, but these are not yet fully implemented. We therefore estimated the potential future economic gains from implementing these interventions more widely.

* This executive summary highlights our estimates from Part 1: the current and future burden of stroke and the potential returns that could be gained from greater investment in stroke research. The executive summaries of Parts 2 and 3 above will be reported separately.

Methods

We gathered up-to-date estimates from published literature on the number of first-time strokes (stroke incidence) and number of survivors after stroke (stroke prevalence) each year for the UK population. To estimate what this burden could look like in the future, we looked at official estimates (ONS, 2015) of future demographic changes (e.g. growth in population size or spread of ages) to the UK population.

In addition, we needed to account for context-specific changes e.g. trends in risk factors and available treatments. We also needed to explore whether more research could alleviate these future burdens by thinking about what areas of research would make the most difference and how. To achieve this, we asked for the views of academic experts with knowledge, expertise or an interest in stroke, stroke care and/or stroke research as appropriate.

We placed the academic experts into two overlapping groups. One group was asked about future trends in incidence and prevalence rates for different age bands of people. The other was asked to name their top three research priorities and to rate the likelihood and timing of potential benefits if that research was funded immediately. Both groups received two rounds of questionnaires. The research priorities group was also asked to rank priorities generated from the first round so that we could generate a top-five list.

We used these expert views to estimate:

- the number of strokes and stroke survivors in the future (to 2035)
- the size of future costs of stroke (to 2035)
- the benefits per person that might accrue, and how future returns might change as a result of more investment in just the top five research priorities, leading to the development of new or improved treatments or preventative measures.

We had to make various necessary assumptions, for example, on what the costs of that research might be – we assumed £10 million for each of the top five research priorities over the next few years, assuming that around five clinical trials costing £2 million each would be needed to produce a cost-effective and implementable intervention. We also made assumptions around what kind of new or improved treatments the research might result in and what returns, including quality of life benefits, could be generated by these treatments.



Results

Current burden of stroke: number of strokes and stroke survivors now

Incidence: the estimated annual number of first-time stroke cases (stroke incidence) ranges from 113,400 to 119,100. Using ranges of incidence rate reported by various individual studies, the number could conceivably range from 85,800 to 147,600. We focused on the mid-point estimate of 117,600 (Stewart et al., 1999) for our various calculations.

Prevalence: The estimated number of stroke survivors (stroke prevalence) aged 45 and over in the UK ranged from 950,000 to 1.3 million in 2015. When the low and high estimates from various individual studies are considered, the number could range from 797,000 to 1.4 million. We focused on the estimate of 950,200 (Geddes et al., 1996) for our various calculations.

Future burden of stroke: potential number of strokes and stroke survivors in the future

Experts had differing views on whether stroke incidence would decrease or increase in the future. Their views on prevalence were more similar, pointing towards no change or modest increases in prevalence among people aged 40-74 years and a modest or high increase among people aged 75-100 years. Alongside estimates of demographic trends, applying these views to current rates of

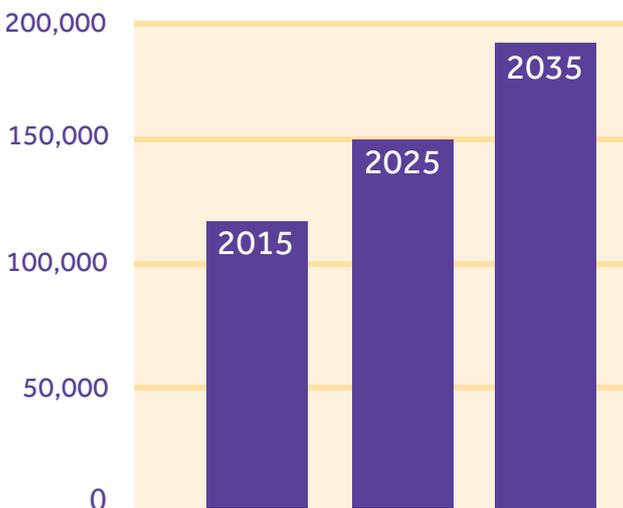
incidence and prevalence points to a substantial future burden of stroke.

Incidence: first-time strokes among people aged 45 and over in the UK will rise from 117,600 in 2015 to 148,700 in 2025 and 187,000 in 2035, **an increase of 59% over 20 years.** This is based on the assumption from expert views that incidence rates will stay the same up to 2035 for those aged 45 to 84, and rise by 0.5% per year for those aged 85 and over. If incidence rates change by 1% per year more or 1% less than under this assumption, incidence would be 228,000 or 153,000 respectively in 2035.

Prevalence: the number of stroke survivors among people aged 45 and over in the UK will rise from 950,000 in 2015 to 1,425,000 in 2025 and 2,120,000 in 2035, **an increase of 123% over 20 years.** This is based on the assumption from the expert views that prevalence rates will rise by 1% per year for those aged 45 to 64, 1.5% per year for those aged 65 to 74, 2.0% per year (2.5% after 2025) for those aged 75 to 84 and 2.5% per year (3.0% after 2025) for those aged 85 and over. If prevalence rates change by 1% per year more or 1% less than under this central set of assumptions, prevalence would be 2,575,000 or 1,740,000 respectively in 2035.

Figure 1: Stroke incidence and prevalence, now and in the future

Stroke incidence (number of people)



Stroke prevalence (number of people)



Returns from more spending on stroke research

Experts initially suggested 56 different research topics. After the ranking process, the top five were as follows (in rank order):

- Improved rehabilitation strategies
- Rehabilitation for cognitive difficulties
- Vascular dementia
- Thrombectomy
- Evidence-based practice

We estimate that annual NHS costs of stroke are set to treble from £3.4 billion in 2015 to £10.2 billion in 2035. Based on expert views and our own further assumptions, we estimate that investing £10 million into each of these priority research areas in the next few years could generate benefits that substantially reduce the burden of stroke by 2035 as follows:

- **Improved physical rehabilitation:** assuming a new rehabilitation intervention is offered to 10% of people experiencing a stroke from 2025 to 2029, and to 20% from 2030 onward, we estimate 230,000 stroke survivors in 2035 (11% of all stroke survivors in 2035) will have received it. We assume benefits would accrue over the first five years after the stroke and rehabilitation; that stroke survivors and their unpaid carers would experience improved quality of life; they would have lower disability and care needs so they would need less health care, social care and unpaid care; and they would be more likely to remain in employment.
- **Rehabilitation for cognitive difficulties:** as for improved physical rehabilitation, we again assume that a new rehabilitation intervention is offered to 10% of people experiencing a stroke from 2025 to 2029, and to 20% from 2030 onward, leading to 230,000 stroke survivors in 2035 (11% of all stroke survivors in 2035) receiving it. We assume stroke survivors would receive the same benefit as those receiving rehabilitation of physical function, plus an additional year's survival due to a reduced mortality rate.
- **Vascular dementia:** we assume that the incidence rate of stroke would be reduced by 5% from 2025 onward due to better detection and management of small vessel disease. The number of people living with stroke in 2035

would on this basis be some 70,000 lower than if the research was not conducted and the resulting improved treatment of small vessel disease was not developed.

- **Thrombectomy:** we assume that a further 5% of people experiencing a stroke between 2025 and 2029 and a further 10% of those experiencing a stroke from 2030 onward would receive thrombectomy. We estimate that on this basis 115,000 stroke survivors in 2035, (5.5% of stroke survivors in 2035), will have received this intervention. We assume that the benefits would be the same as for those receiving cognitive rehabilitation.
- **Evidence-based practice:** many effective clinical interventions are not implemented as well or as widely as they could be. Some need funding, service or policy changes to enable improved implementation (as will be highlighted in the third part of this work), others require further research to better understand, for example, the barriers and facilitators to good implementation so that relevant education or other support can be provided. Taking stroke prevention as an example, if we assume that better implementation of successful evidence-based measures, such as blood pressure control, could reduce the incidence of stroke by 5% from 2025 to 2029 and by 10% from 2030 onward, there would be around 114,000 fewer people living with stroke in 2035 than if these measures were not put in place.

Similarly, in terms of treatments that could improve outcomes after stroke, national stroke audit data have shown that despite evidence and guidance for intermittent pneumatic compression (IPC), an intervention for reducing deep vein thrombosis after stroke which can improve survival, only a minority of hospitals in England were using this well (Royal College of Physicians, 2016). If we assume that research to support the wider implementation of IPC led to an additional 15% of those who have a stroke during 2020 to 2024, and 25% of those who have a stroke from 2025 onward receiving IPC, then 140,000 stroke survivors in 2025 will have received it. The additional patients offered it would also gain one additional year of life.

Conclusions

The number of stroke survivors in the UK is expected to more than double in the next 20 years. Increased funding to invest in priority research areas, such as cutting edge emergency treatments, developing and rolling out new rehabilitation approaches, and understanding the cognitive difficulties that can be associated with stroke could alleviate this burden.

There are of course some caveats related to this work, the main one being that these are projections related to an unknown future. There is uncertainty in current estimates of new strokes that occur each year and the number of people living with stroke. So, considering future trends in these numbers is challenging, as illustrated here by the differing views of experts. Similarly, the potential returns from further research spending are based on a mixture of expert views on potential benefits of the priorities they suggested; estimates from current evidence; and a range of necessary assumptions related to future intervention costs, other care costs and benefits. While we have based our estimates on plausible assumptions, alternative assumptions and methods could of course generate different specific estimates of those returns. Our estimates nevertheless point toward potential scope for substantial future savings from increased research investment.

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