appg

THE ALL-PARTY PARLIAMENTARY GROUP FOR
ACQUIRED BRAIN INJURY

UKABIF
The United Kingdom
Acquired Brain Injury Forum
www.ukabif.org.uk

The Cost of Acquired Brain Injury to the UK Economy

RIGHT TO REHAB

TIME TO INVEST IN REBUILDING LIVES AFTER BRAIN INJURY

May 2025

ACKNOWLEDGEMENTS

Thanks to:

– **Tamsin Keyes** at Headway UK for her statistical work from the raw Hospital Episode Statistics data provided by the four nations' data teams
– **Miriam Duffy**, Director of the National Rehabilitation Centre (NRC), for her experience producing the NRC Full Business Case
– **Annie Ricketts** and **Dr Alyson Norman** for sharing their personal experiences of brain injury

Thanks also to the members of our steering group for their generosity with their time and expertise, and for their feedback on early findings:

Dr Emily Bennett
Professor Nathan Hughes
Dr Hope Kent
Dr Alyson Norman
Professor Lynne Turner-Stokes
The Story Network

Author
Jennifer Misak

Jennifer is a consultant Senior Economist. She is a career economist and public policy specialist with 20 years' experience as an economist in the UK Government, as well as economic consultancy. A senior analyst and Senior Civil Servant in three departments, Jennifer was seconded to HM Treasury to work on the Review of Quality Assurance of Government Models, 'The Aqua Book: guidance on producing quality analysis for government'.

This Report was researched and funded by the United Kingdom Acquired Brain Injury Forum.

Any errors remain the authors' responsibility.

Our thanks to Irwin Mitchell, Cygnet Health Care and Enable Therapy Services who support UKABIF's policy work. (These organisations do not have control over the content of this report).

CONTENTS

FOREWORD

The economic costs to the UK of Acquired Brain Injury are an estimated £43.0bn annually.

The economic costs to the UK of Acquired Brain Injury are an estimated £43.0bn annually. But we know the costs are far higher and for the first time we have estimated the wellbeing impacts on patients, carers and families. The cost estimates are conservative, and don't include many of the costs associated with homelessness, addiction services, mental health services and psychiatric stays. Both economic costs and wellbeing costs have been calculated using the methodology from the HMT Green Book and supplementary guidance.[7] This means that the calculations are consistent with those used for policy analysis across the UK government.

The cost to our NHS and welfare services is huge, with costs quickly amassing across an individual's acute hospital stay, community NHS support and longer-term social care provision. Much of this could be prevented if we invested in a statutory Right to Rehab. The Ministry of Defence already do this, and the recovery time for military personnel is much quicker than for civilians. Some of this experience is being developed at the new National Centre for Rehabilitation (NRC), but they will only treat a few hundred of the most acute patients. We need to learn the lessons from their business model and develop a national community framework for neurorehabilitation to save significant long term costs in education, welfare, the justice system, homelessness provision and the NHS.

The 16:1 return on investment, described in the NRC business case, if achieved, would make such a framework one of the best performing Value for

Acquired brain injury is the leading cause of death and disability for people aged under 40 in the UK.

Money programmes in Government. Clearly, we are realistic about what is possible, but we need a plan of action to get there! This is why we also recommend a cross-Whitehall standing committee to break down silos. A relatively small investment of £43,000 to drive £680,000 of savings per patient would help Government deliver on many of its missions: to drive economic growth by increasing productivity, and to build an NHS fit for the future, where everyone lives well for longer.

It is hard of course not to be moved by the personal stories here of loss. Annie Ricketts, a successful business person who ended up living in a car because she was failed by the NHS and social services. Or Dr Alyson Norman, whose brother tragically took his own life after a series of childhood brain injuries that were classified as "mild". Her research into serious case reviews found that a third were linked to some form of brain injury.

We know that when someone acquires a brain injury their wellbeing can suffer and their quality of life can deteriorate. Inevitably, this has an impact on their close family and friends too. We estimate the wellbeing costs associated with ABI stand at a staggering £91.5bn. That's around double the estimated economic cost and shows the major, and often unrecognised, impact ABI has across the UK.

This isn't just a debilitating condition for those impacted, who may find themselves suddenly unable to work, function or walk in the way they are used to. It is also a huge cost to society and the economy. If we are to address some of the most serious societal problems including addiction, mental health crises and violence, we need to look at the root cause – which in many cases may be a brain injury. By giving patients a right to specialist neurorehabilitation in the communities they live in, we can save money and improve lives at the same time!

Acquired brain injury is the leading cause of death and disability for people aged under 40 in the UK, and men are 1.5 times more likely to be affected than women. Prison services, homelessness and mental health services are overwhelmed by individuals whose underlying problems relate to brain injury.

There are around 350,000 admissions to hospitals in the UK of people with an acquired brain injury, and around 1.3m people live with the impact of brain injury.

We estimate the wellbeing costs associated with ABI stand at a staggering £91.5bn.

Seven years ago, our APPG and UKABIF published Acquired Brain Injury and Neurorehabilitation: Time for Change, a report which recommended "early access to specialist and/or community neurorehabilitation" as "critical components of the ABI care pathway". That need has still not been met across the UK. We need the Government to urgently address this.

Giving patients a right to rehab delivers substantial economic and social returns. It reduces long-term healthcare costs, increases workforce participation, and alleviates pressure on social services. At the same time, it strengthens communities by enabling individuals with brain injuries to lead more fulfilling lives, contribute to society, and support their families. The ripple effect of these outcomes benefits everyone.

Sir John Hayes
Chair of the APPG for Acquired Brain Injury

Chloë Hayward
Executive Director of UKABIF – the UK Acquired Brain Injury Forum

Report Recommendations to Policymakers

1 Introduce a statutory Right to Rehab
Specialist neurorehabilitation services after ABI must be in place in every community in the UK. They should co-ordinate the discharge from acute care and support patients' ongoing recovery and return to work or education, if able.

2 Establish a funding mechanism for community neurorehabilitation services
A model driven by savings in social services, acute care and benefits would enable the Government to deliver on the pending NICE guidelines: Rehabilitation for chronic neurological disorders including acquired brain injury.

3 Establish a cross-Whitehall standing committee
A joint ministerial action plan for Acquired Brain Injury should be agreed and reviewed every six months. The committee should hold local government and the NHS to account in delivering community specialist neurorehabilitation services.

4 Make better use of data analysis
Better data would support more effective neurorehabilitation commissioning to help end the postcode lottery.

5 Improve data collection in services that do not currently measure the impact of ABI
Introduce systematic data collection in education, homelessness, addiction and mental health care. Collecting information would enable costs to be apportioned to ABI types for education, mental health and psychiatric care.

Wes Streeting MP, Secretary of State for Health

"Rehab is key. Not just to good recovery, but prevention of future demand on the NHS.

So whether it's in the NHS or in social care, we definitely need to do more on rehabilitation. Because rehabilitation is often secondary prevention."

Prof Chris Whitty, Chief Medical Officer

"I really recognise the very important role that rehabilitation medicine plays.

There are multiple reasons why that's the case. The ability to transform lives, including in working age, so people can get back to the workforce and at various other stages in life."

EXECUTIVE SUMMARY

This report from the APPG for ABI and UKABIF estimates that the annual cost of ABI to the UK economy in 2023/2024 was £43.0bn, approximately 1.5% of UK GDP. However, the overall costs are far higher. For the first time, the impact on the wellbeing of individuals with ABI, their carers and families in the UK has also been estimated, at a cost of £91.5bn. This figure is almost double the estimated economic cost and highlights the significant, and often unrecognised impact of ABI on wellbeing.

Looking at a breakdown of these costs, £20.0bn is accounted for within the NHS and social care for acute and long-term care; as well as social care, £21.5bn is attributed to the lost productivity of individuals with ABI and their informal carers; and £1.5bn for the cost to the Criminal Justice System (CJS) and Department for Education (DfE). The Department for Work and Pensions (DWP) spends around £1.9bn in benefits.

The NHS costs include emergency care, diagnostic, therapeutic and the support services that are provided for Traumatic Brain Injury (TBI), stroke and brain tumour. Although rehabilitation for severe TBI, for example, is costly at over £43,000 per patient, the potential for savings is significant: the savings in care costs are £680,000 per patient after accounting for rehabilitation costs[a].

Productivity losses from illness and early death are the largest subset of the economic costs at £16.6bn, representing the total time taken off work when someone becomes ill, undergoes treatment, rehabilitation, and care. There is also a large cost of £4.9bn incurred because individuals and informal carers are out of the labour market.

The cost of funding Special Educational Needs (SEN) as a result of ABI is approximately £0.93bn, over 10% of the annual total SEN budget. On average, an additional £6,700 per child or young person with ABI is then required annually for the duration of their school education.

A significant percentage of the UK prison population has a history of ABI with over 60% reporting some form of head injury[b]. This report estimates that because of TBI the annual cost to the Criminal Justice System is £600m.

This report uses a model developed to estimate the costs of ABI to the UK economy in one year i.e. 2023/2024, compared to a world without ABI, using a 'cost of incidence' approach. The figures represent actual amounts of money in the UK economy that may be spent, saved, gained, or lost depending on the Government policy environment. The four UK nations use different definitions of ABI, so data was used for TBI, stroke and brain tumour which accounts for 85% of ABI episodes.

The wellbeing cost was estimated from the point of diagnosis through treatment, illness, and/or an early death. The costs also include some of the wider psychological impacts on partners, children, parents, and carers. The figure of £91.5bn is not a cash value which is spent, it represent the huge human costs. These are calculated in a consistent way to reflect the estimated costs to the economy and represents the loss of wellbeing experienced by individuals with ABI and those close to them; the hidden toll of ABI!.

The figures in the report are immense. Clearly action is required to address and reduce the cost impact of ABI. Access to rehabilitation and improved services and support are crucial, not only as an effective means of reducing the costs long-term, but also to benefit the overall wellbeing of individuals with ABI, their families, and carers. This will also support the Government's aim to improve productivity and its overall plans for economic growth.

a. Turner-Stokes, L *et al* 2019

b. Farrer TJ and Hedges DW 2011, Williams WH *et al* 2010

INTRODUCTION

Acquired Brain Injury (ABI) describes any injury to the brain which has occurred since birth. The causes of ABI include brain tumours, strokes, infections, inflammation, oxygen deprivation (e.g. through strangulation or stroke), and traumatic injuries. Traumatic brain injury (TBI) is a term which describes injuries resulting from blunt or penetrating blows to the head, caused by falls, road traffic collisions, workplace injuries, violent assault, and sporting injuries. ABI is a spectrum condition; the impact can range from mild concussive symptoms which resolve within days, to profound, lifelong disability. Most people who present at hospital with an ABI will require some form of ongoing support or rehabilitation. People with ABI often present at hospital with an acute condition (e.g. encephalitis) which is managed in hospital, but are then discharged with a resultant ABI which requires long-term support and rehabilitation. The level of provision the person receives is often very dependent on where they live and the access to rehabilitation services.

The statistics on ABI are stark. We know that there are 335,000 hospital episodes each year; 124,000 of those people present with TBI, and slightly higher numbers, 144,000, present with strokes and 43,000 present with a brain tumour. The remaining 25,000 are a result of a range of diseases, infections, and impairments such as meningitis (7,000), anoxia, carbon monoxide poisoning, encephalitis, hydrocephalus, and other disorders (the remaining 17,000). Epidemiological evidence[1] indicates that men are more likely to have a TBI compared with women in the general population, although this levels out above 75 years of age due to an increased prevalence of falls in later life. Women suffer more strokes in later years[2]. Paediatric injuries are also common, with a spike of injury incidence between birth and 4 years old, and again in adolescence, with boys being more vulnerable than girls in childhood[3].

By identifying the true economic costs of ABI, including monetising the substantial impact on wellbeing, we have been able to show the impact that ABI has on the UK economy. This analysis shows the scale of the resources spent on ABI and provides an impetus for bringing down those costs. Measures that improve the provision of rehabilitation come with a cost – our analysis shows that any improvement in these would improve outcomes for people with ABI, and would have a big impact on reducing costs within the National Health Service (NHS) and local authorities, as well as reducing costs across the whole economy.

METHODOLOGY

Introducing the economic analysis

We have created a model that estimates the economic costs of ABI to the UK economy in a year, as compared to a world without ABI. The figures we have calculated represent actual amounts of money in the UK economy that may be spent, saved, gained, or lost depending on the policy environment.

We have used data aggregated from Hospital Episode Statistics (HES) by analysts at Headway[4] to provide the incidence in 2023/24 of different categories of ABI. For the four nations of the UK, we have inconsistent information across different diagnostic conditions which are indicative of ABI. We have therefore used the data for TBI, stroke and brain tumour, as these were the most reliably available statistics. These conditions account for 85% of ABI episodes, however we note the importance of more comprehensive data collection for other conditions (including meningitis and encephalitis) in the future. While some data is available about these conditions we do not have robust enough costs and survival rates to calculate those costs to the same level of confidence. Hospital episodes do not match one-to-one with the number of patients; the same person may present more than once at hospital. We have adjusted the HES data to account for this, which is explained further in the Technical Appendices.

We have used a 'Cost of Incidence' approach in the model. Therefore, the costs presented are the lifetime costs associated with ABI in 2023/24. The predicted incidence rates are then used to calculate the size of the main areas of cost over time. The costs identified in our research and fed into the model are in Figure 1.

It is worth noting that the economic costs in our model are conservative central estimates. For example, we have used the mid-range of survival rates and costs. Assumptions in areas such as productivity loss are at the lower end of the ranges from research.

FIGURE 1: COSTS IDENTIFIED IN RESEARCH AND USED IN THE MODEL

DIRECT COSTS:
NHS costs in terms of acute care in hospital and longer-term rehabilitation, and formal social care costs

INDIRECT, SOCIETAL COSTS:
Productivity loss (from illness and early mortality) from patients and carers

COSTS TO OTHER AREAS OF THE PUBLIC SECTOR:
Education in the form of special educational needs; and Increased likelihood of contact with the criminal justice system (CJS)

The costs to the Department for Work and Pensions (DWP) of benefits paid to patients and carers are also estimated but as they are economic transfers[5] they are not included in the total costing, but sit alongside and show the scale of these.

FIGURE 2: WELLBEING COSTS

We used Quality Adjusted Life Years (QALY) measures for patients and children and wellbeing-Years (WELLBYs) with Life Satisfaction on a 0-10 scale for carers and partners.

Introducing the wellbeing analysis

We have also estimated the wellbeing cost of ABI. This gives a monetary value to the reduced Quality of Life (QoL) a patient has when they are diagnosed with an ABI, attributed to the treatment, resultant disability, illness, and/or an early death from ABI. The wellbeing costs also include some of the wider psychological impacts on partners, children, and carers, but it has not been possible to provide a monetary estimate for all of the impacts – on patients or on family and carers. Wellbeing costs are not reflective of an actual value in Gross Domestic Product (GDP) or national income but represent an established way to understand and value non-market impacts on people's lives. It is a useful tool to be able to compare and consider the wellbeing impacts of ABI and the possible policy options which might alleviate some of this wellbeing loss.

It shows that these additional wellbeing impacts are likely to be considerable and if only the 'market' impacts are included in an estimate of the costs of ABI, it underestimates the full impacts on individuals with ABI, their families, and friends. The wellbeing costs are outlined in Figure 2.

Bringing together the economic and wellbeing costs

The cost model includes both economic and wellbeing costs run from the same data for incidence, survival rates, additional deaths, and carers. By having both the economic costs and the wellbeing costs calculated, and on a consistent basis, we can see the scale of both, and they are directly comparable.

The main drivers of the costs are incidence rates, acute care and rehabilitation costs, survival rates, assumptions on the return-to-work rates and carers numbers, and the impacts on wellbeing.

Both economic costs and wellbeing costs have been calculated using the methodology from the HM Treasury Green Book and supplementary guidance.[7] This means that the calculations are consistent with those used for policy analysis across the UK government.

THE COSTS OF ACQUIRED BRAIN INJURY

Economic costs

Our economic modelling reveals that the annual cost of ABI to the UK economy is estimated to be £43.0bn annually (see Figure 4). This is around 1.5% of UK GDP. Of this just under half (£20bn) accrues to the NHS, in acute and longer-term care, and local authorities in adult and children's social care, with just over a half (£21.5bn) representing the lost productivity of people with ABI and their informal carers. Other costs are found in the criminal justice system and education, totalling £1.5bn combined.

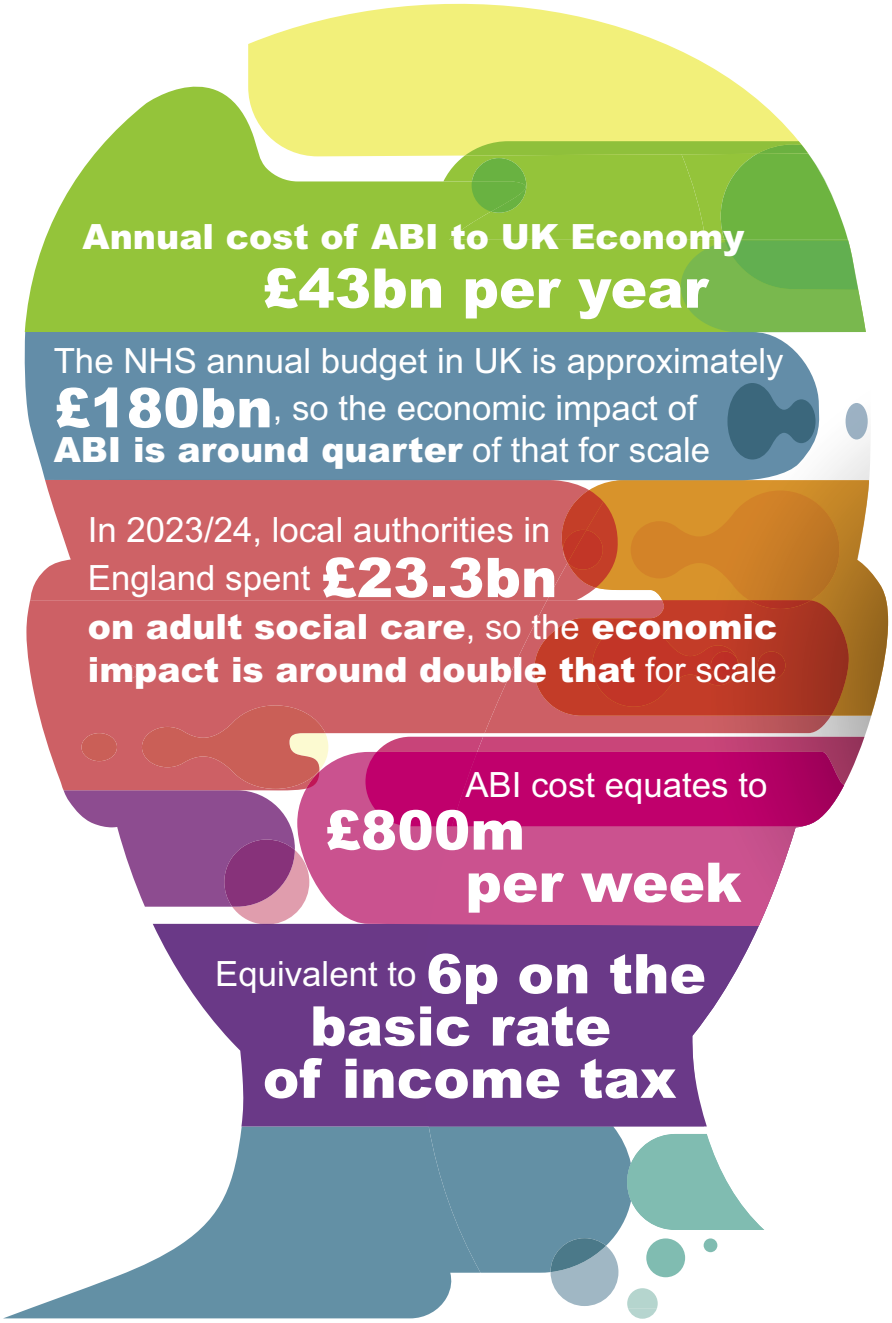
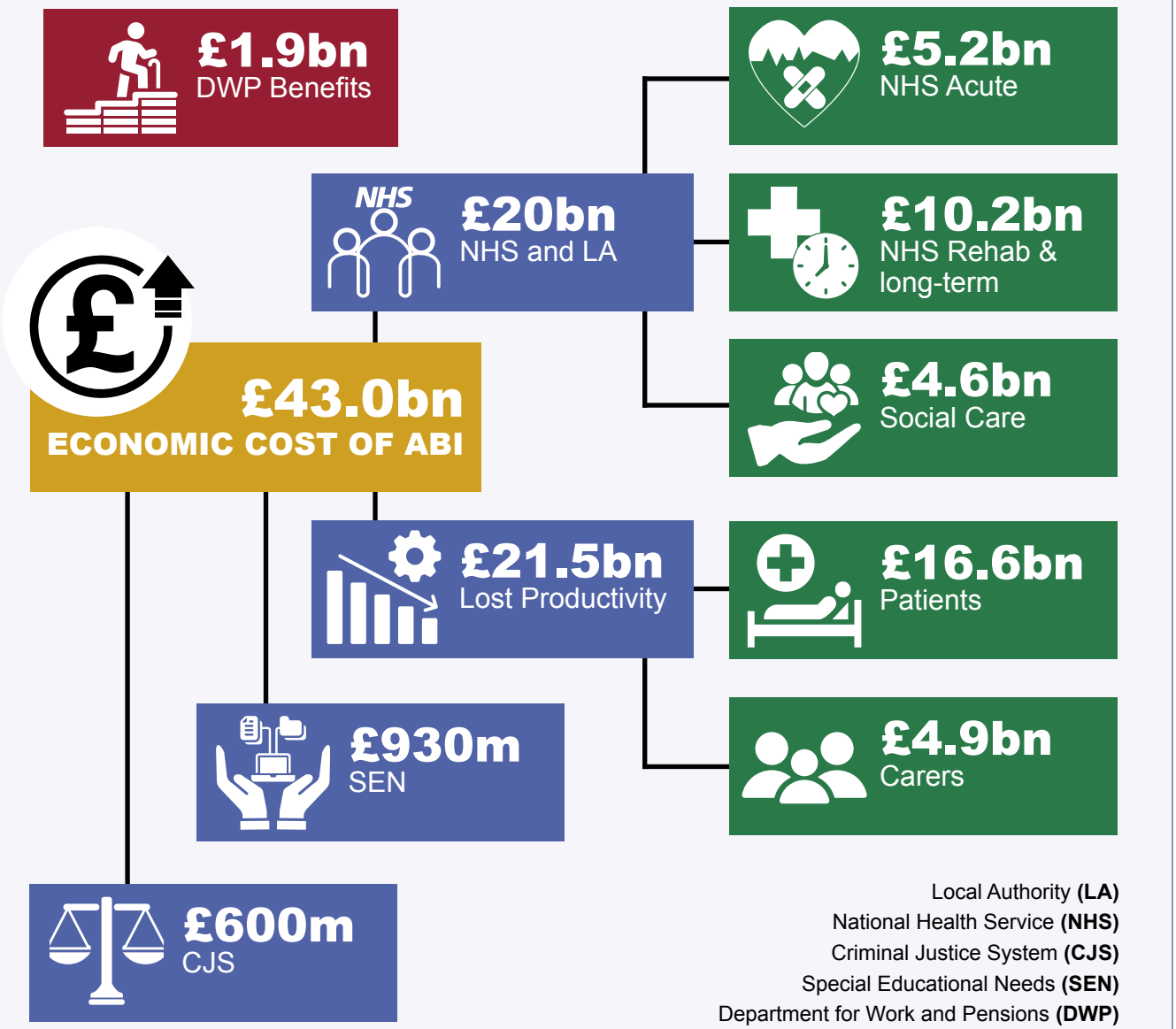


FIGURE 3: COST COMPARISONS FOR ABI

FIGURE 4: ANNUAL COST OF ABI IN THE UK: COST COMPARISONS

The diagram below (Figure 4) shows how the economic cost is broken down across different areas.



These costs include all emergency care, diagnostic, therapeutic and support services provided through the NHS. As discussed in the Technical Appendices there are several studies which provide estimates for these, and a range of costs is available. We have used conservative estimates for TBI, stroke and brain tumour updated to current prices. These reflect hospital-based care in the first instance and ongoing rehabilitation and care costs. Research shows that whilst the cost of rehabilitation for severe traumatic brain injury in particular can reach nearly £43,000, it is also a large cost-saver in the long term, amounting to savings of around £680,000 per patient, according to research by Turner-Stokes[1].

These figures produce a Benefit Cost Ratio (BCR) of 16:1, which would provide significant Value for Money across healthcare, social services and the justice system.

A similar cost benefit ratio is found in the Full Business Case (2022) prepared by the new National Rehabilitation Centre, which is due to open later in the year, treating around 800 patients with a capital investment of around £100m. It states that: “the national clinical model roll out delivers a cost benefit ratio of 16.53[:1], in net present social value”.

Cost of social care

As well as the cost of NHS acute and ongoing treatment there are also costs associated with personal social care either as day care or residential. We have estimated this to cost £4.6bn annually for those with TBI, stroke and brain tumour; £3.2bn of this total is attributed to stroke patients.

Productivity loss from people with ABI

Productivity losses from illness and early death are the largest subset of the economic costs at £16.6bn. This represents the total time taken off work when someone becomes ill, undergoes treatment, rehabilitation and aftercare. This is calculated using research which provides assumptions on the duration of absence from the labour market (sick-leave) and the proportion of patients who return to work, compared to working-age people in the same age groups. We use labour market participation rate data to estimate what the proportion of each age group, by sex, would be in the labour market before, or without, ABI. We have had to make assumptions where no data is available – for example we assume those over 60 years of age are much less likely to return to the labour market than the younger groups. We also calculate less productivity loss in the first two years after ABI as it is assumed some short-term illness is covered by other workers and patients receive sick pay, so have less of a wage loss.

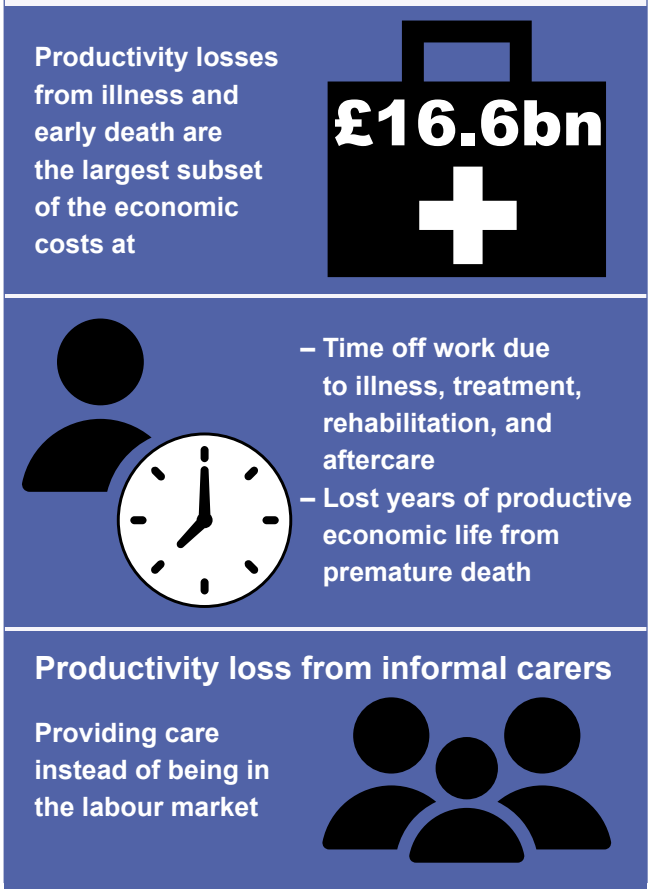
It also includes all the years of productive economic life that are lost when someone of working-age dies early due to ABI. This is calculated using the life expectancies by sex and age of each patient group and aggregated, compared to the life expectancy they would have had without brain injury.

Productivity loss from informal carers

There are also large costs borne to individuals and society from informal carers being out of the labour market and providing care. These costs are calculated using the same method as for patients who are ill; assuming the carers are the same characteristics (age groups, labour market participation rates) as individuals with ABI but with average population life expectancies.

We know that there must be additional costs caused by ABI that accumulate to the public purse. In areas of criminal justice, education, and homelessness we know ABI plays a part in adding cost over and above a world without ABI. The lack of data and information collected means that we are unable to attribute all the additional spend by councils and national governments, as well as charities, specifically to ABI causes. Two of these areas are set out below and are included in the main costing, the third – homelessness – is less robust and more assumptive, owing to a lack of data, so left out of the main costing.

FIGURE 5: PRODUCTIVITY LOSSES FROM PEOPLE WITH ABI



Special Educational Needs (SEN) costs

In 2024 there were 1.9m children in the UK with identified special educational needs (SEN) indicating they require special educational provision above the standard. Whilst many children with ABI will be in this group, ABI is chronically under-identified within UK schools, and the Department for Education currently have no data on these figures. This is because there is no SEN category for ABI, and schools are forced to record children with ABI under more general categories such as Moderate Learning Difficulty, Social, Emotional and Mental Heath, or simply, Other! As a result, the current model uses data based on

the number of children the number of children of school-age with ABI. On this basis, we calculate the cost of SEN as a result of ABI to be in the order of £930m annually. This compares to funding to local authorities of £10.7bn in 2024-25; just under 10% of the total SEN funding!

Costs to the Criminal Justice System

We know that ABI is over-represented in criminal justice populations, however precise prevalence estimates are difficult to make due to the widespread under-identification of the condition, and the variety in assessment techniques. However, best available estimates indicate that around 60%[2] of the UK prisoner population have some form of ABI. The prison system in the UK costs £6.2bn[10] according to published government records. Studies suggest that people with a history of ABI may be more likely to be criminalised[11]. This over-representation is well established, but the causal mechanism is complex. Some risk factors co-occur for both brain injury and incarceration – for example, poverty, being male, and being disposed to risk-taking behaviour. This association could occur by coincidence, but brain injury in groups who are already vulnerable to justice system contact could impact on social support networks, as well as increase the likelihood of inappropriate responses to social situations, creating a 'double hazard' for criminalisation. Brain injury can also impact an individual's ability to succeed in traditional or mainstream education and employment settings without adaptations, which might precede CJS contact. Individuals with brain injury in the CJS are more likely than other prisoners to also live in socio-economic deprivation. Paediatric brain injury can increase vulnerability to substance use problems in later life, and an eroded capacity for self-regulation and socialisation can lead to vulnerability to exploitation by organised crime groups. So, brain injury in the context of existing adversity, can compound problems and increase the risk of being criminalised. The complexity of this link contributes to the complexity of estimating the economic impact of ABI on CJS costs.

We have approached this in two ways. Firstly, it costs £53,801[12], on average, to house an adult prisoner for a year and if we assume that TBI results in 10% of our patient numbers having an increased propensity to commit serious crime then we estimate an annual cost because of TBI of £600m.

Secondly, we could use the estimate that a child with a TBI in contact with the youth justice system is on average in prison five years more than a child without TBI, and so over five years there is an additional £250,000 owing to ABI. The new prisoner population in the UK is estimated to be around 70,000 annually though many of these will be short-term sentences. We know 60% are on sentences of less than one year, so 30,000 prisoners are on sentences of over one year. If we then assume 10% of these have ABI that has affected their criminalisation – over and above their other characteristics which might also affect their likelihood to commit crime – we have an additional cost of £784m a year (so a high end of the range).

The burden of economic costs

What these calculations clearly show is that society bears the largest costs of ABI through productivity losses (this, of course, it would be even larger if unpaid work was included). We can see those direct costs borne by the NHS (£15.4bn) are significant but actually account for 35%, just over one third of the total figure. With another £4.6bn being spent on social care, by local authorities, the public sector contributes around half the total spend. We can also see here that there are very few, if any costs assumed to fall on employers as the economy replaces workers when sick employees, and their informal carers, are absent. Whilst there might be some frictional costs associated with this disruption in the workplace – recruitment and training costs for instance – overall these are minimal. Loss of productivity through illness and early death to patients and to carers, whilst caring, amounts to £21.5bn, half the total costs and is borne by the individuals themselves through loss of wages, as well as the wider economy through loss of consumption spend and productivity.

Costs not included in the main economic costing

Cost of mental health services and psychiatric stays

Experiencing an ABI often results in patients experiencing poor mental health and may result in requiring psychiatric care. We have costs of periods of this type of care from the Unit Costs of Health

and Social Care programme (2022 – 2027)[15] but we lack data of use by condition and so are unable to apportion costs to ABI types. We also expect, as is the case in many healthcare services, there is high unmet demand for mental health and psychiatric services so the actual cost will not be reflective of the required level of support.

Cost of unpaid work

We know that society benefits from unpaid work – usually in the home or childcare but also in the form of volunteering. Research[16] has shown that this can be as much as 90% of the cost of paid work lost from illness. If this were the case with this patient group we could expect another £15.0bn annually from the costs of unpaid work lost, and from the carers group £4.9bn.

Homelessness

Research shows that people experiencing homelessness have a high rate of TBI[13] and issues associated with it. In the UK, Brainkind has estimated nearly half of those homeless have reported a history of TBI, this is more than twice the rate in the rest of the population[14]. There is no suitable data collection on the costs incurred by people accessing homeless services and the impact of ABI in order to establish and estimate for this additional cost. We know it is an additional cost and intertwined with issues around addiction and trauma also stemming from ABI.

FIGURE 6: THE TRUE COST OF ACQUIRED BRAIN INJURY (ABI) IN THE UK

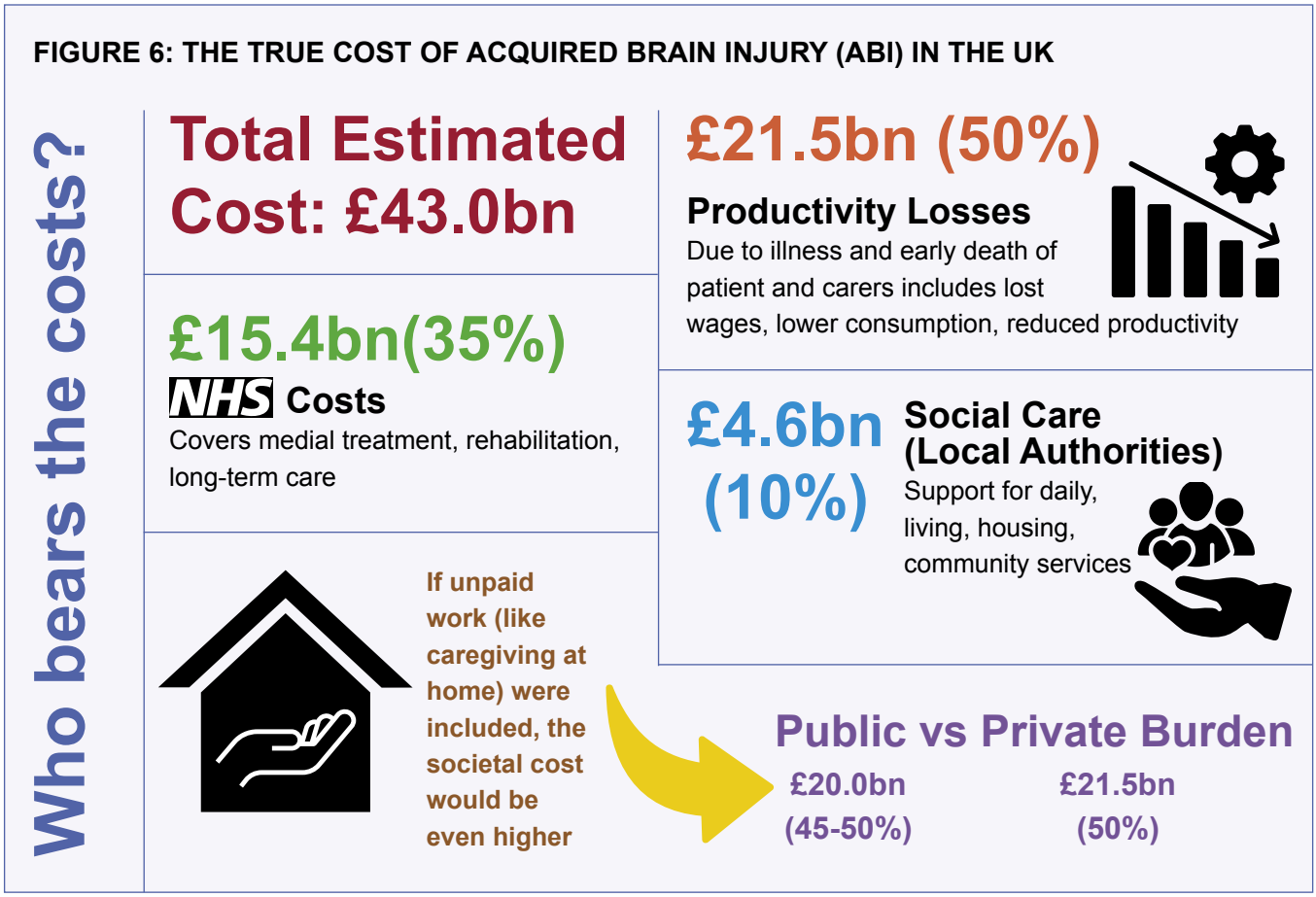
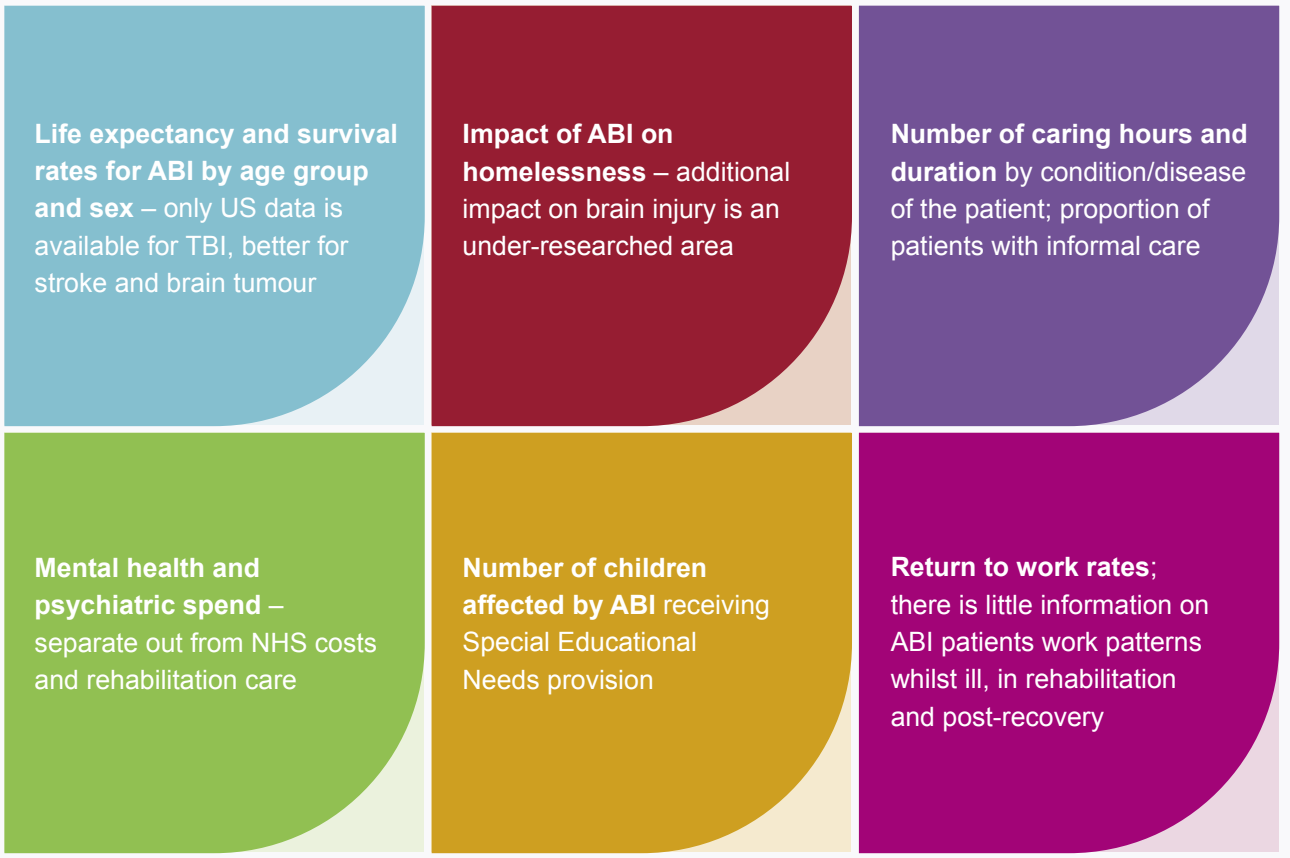


FIGURE 7: FURTHER AREAS FOR DATA AND RESEARCH WHICH WOULD HAVE AIDED THIS STUDY



CASE STUDY

Annie's Story

The long-term impact of ABI

Annie Ricketts was a successful executive who earned a six-figure salary. After falling off a horse, she eventually ended up homeless, living out of a car and barely able to function.

Annie experienced a catastrophic life change following a TBI at 36 years of age. Prior to the injury, Annie's career trajectory was exceptional: she was on track to take a tech company to an IPO, had recently founded her own consultancy business and lived a financially secure lifestyle. She maintained a high quality of life and supported a teenage daughter.

In July 2000, Annie sustained a severe TBI following a fall from a horse during a supervised ride. Negligence was alleged, but the opportunity for legal redress was lost due to procedural delays and the death of the stable owner. The impact on Annie's health was immediate and profound. Medical records show she was left unconscious in Salisbury District NHS A&E for nine hours without treatment and later discharged with nothing more than a handwritten diagnosis of a brain injury—without scans, support, or explanation. No follow-up care was arranged.

The lack of appropriate medical intervention and social support in the early stages had cascading consequences. Annie was unaware she held private medical insurance that would have covered rehabilitation costs and private personal injury insurance that would have covered her income. As her cognitive function deteriorated, she lost the ability to manage finances, apply for support, or advocate for herself. She ended up homeless, living in her car, unable to hold down minimum-wage cleaning jobs due to the effects of her injury.

From 2000 to 2018, Annie lived in a cycle of poverty and instability. Tenants illegally occupied her home, and legal battles led to repossession. She lost other properties through financial problems, exacerbated by her cognitive impairments. Despite being diagnosed with severe brain injury and later fibromyalgia, neuropathic pain, and chronic kidney disease, Annie received minimal benefits for over a decade. The loss to the UK economy from her inability to work—not just in terms of tax contributions but also the cost of emergency services, housing support, benefits, and long-term health care—is likely to run into hundreds of thousands of pounds.

Annie's experience exposes multiple systemic failures: misdiagnosis and miscommunication in A&E, lack of rehabilitation planning, inadequate safeguarding, and failures in benefit assessments. These shortcomings not only devastated Annie's life but also highlight broader economic inefficiencies in how TBI is managed in the UK. Her story underscores the critical importance of early intervention, integrated care pathways, and long-term support in reducing the socioeconomic burden of brain injuries.

Despite her challenges, Annie has contributed voluntarily to supporting others with brain injuries. However, ongoing vulnerability has limited her ability to re-engage fully with society. As of 2024, she remains isolated with few friends, with her home on the market due to continued exploitation and a need for personal safety.

This case illustrates how the absence of structured support following TBI can lead to a complete economic and social collapse for individuals—and a substantial, avoidable cost to the state.

> **"It took four years to see a neuropsychologist. I was sent home from hospital to a house that the medical staff knew was empty, with no support. No adult to supervise. Left hospital with a piece of paper that says 'you have a severe TBI' – that was the extent of the discharge plan."**

WELLBEING IMPACT OF ACQUIRED BRAIN INJURY

Wellbeing costs

ABI has a number of wide-ranging and long-term impacts on the wellbeing and quality of life of individuals with ABI, on their families and those around them. Our calculations reveal that the annual total figure put on the wellbeing costs associated with ABI is £91.5bn.

This figure is not a cash value which is spent, but rather a representation of the human costs, calculated in a consistent way with the costs to the economy estimated above. It represents the loss of wellbeing experienced by ABI individuals and those close to them. It is double the estimated economic cost, demonstrating the significant, and often unrecognised, impact that ABI has on the UK population. Figure 8 shows how this total figure is broken down across different areas.

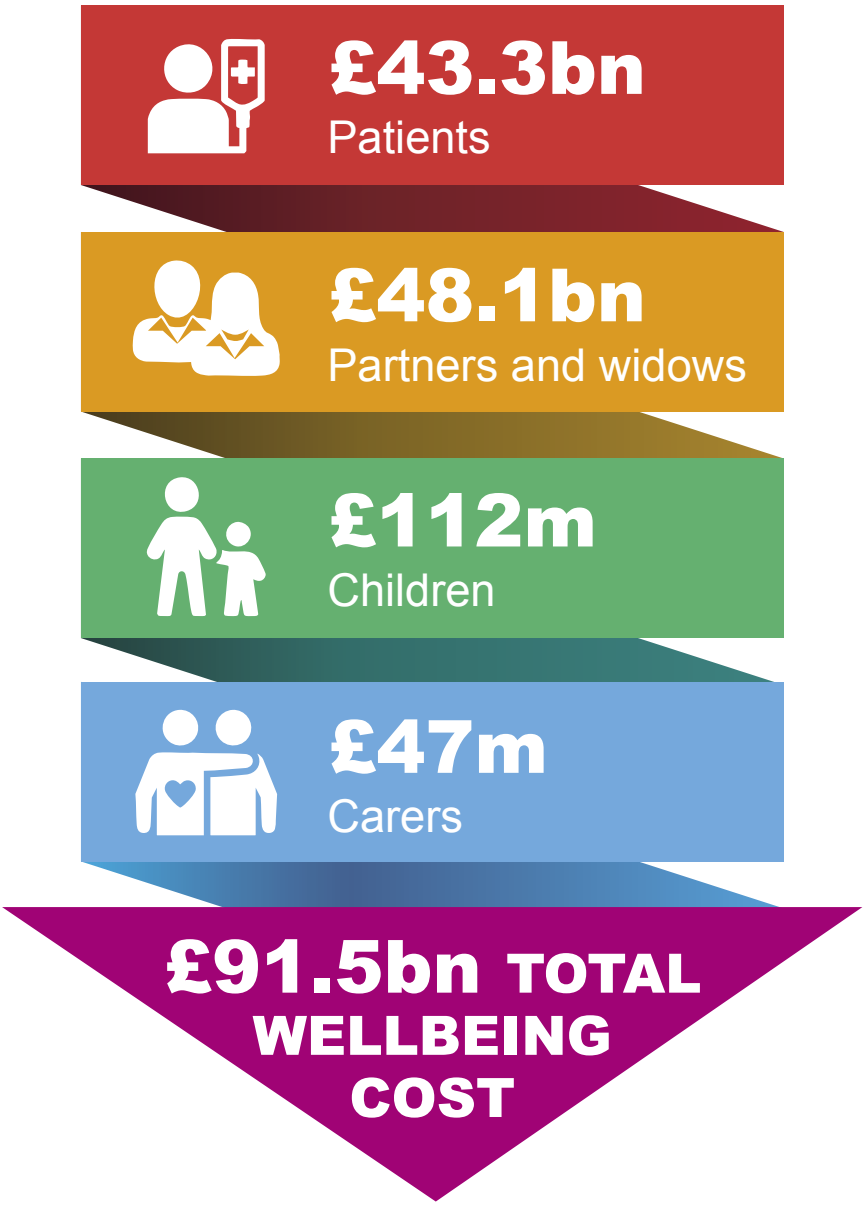


FIGURE 8: BREAKDOWN OF THE WELLBEING COSTS

The wellbeing costs attributed to the individuals' illness and mortality have been calculated with high levels of confidence, although of course there are assumptions and averages included in these figures. These, and the corresponding partner's costs, are annual totals over the duration of the illness/condition. The costs attributed to the wellbeing loss of informal carers and children of those with ABI are calculated with lower levels of confidence and are per year of impact – because it is unknown how long the impact affects children and carers; and in most cases should be considered an underestimate. In any case they should be viewed as indicative and comparable.

Illness and early death

The wellbeing costs attributed to the individuals' illness and early mortality has been estimated at £43.0bn in 2024. Of these human costs of experiencing illness and poor health related to ABI, the majority is calculated from those experiencing stroke at £24.2bn of the total. Those with a brain tumour have a high loss of wellbeing despite lower numbers of individuals owing to the high mortality rates; they account for 27% of the patient impact despite being 10% of the incidence.

This cost is a calculation based on the percentage reduction in a person's Quality of Life (QoL) from the ABI, through to either the end of treatment or end of life[17]. It comprises the average impact on mobility, self-care, usual activities, pain/discomfort and anxiety/depression[18] and is multiplied by the incidence in the population. Including only these impacts is an underestimate of the full psychological impacts of ABI, which are discussed below under the 'non-monetised impacts' on individuals.

The figure assumes some loss of wellness (e.g. illness or disability) for the remainder of the person's life, with the greatest impact for up to eight years after the initial diagnosis and a smaller impact for the following years. It is worth noting that this eight-year dip in wellbeing may be an overestimate for some patients, e.g. those who observe little to no impact once their condition is controlled or treatment has finished. For others, however, it may be an underestimate, as there are cases where people continue to experience the impacts for many years. But overall, the drop in impacts at eight years, with continued, smaller impacts for the remaining years, is considered a reasonable assumption.

Non-monetised impacts of the individual's illness

These monetised impacts mask the depth of emotions and psychological impacts which are associated with serious illness. The model and these figures do not include the differentiated states with deeper levels of psychological distress which are masked by averages, or the wellbeing impacts which are not included in the current measurement of Quality of Life (QoL), the QALY.

Beyond these fluctuations, there are likely to be wider psychological impacts which are not captured through the measurement of quality of life which is currently used in the UK. As described above, the questionnaire used to assess the QALYs, used for the monetised Quality of Life (QoL) impacts[19], asks individuals about their mobility, self-care, usual activities, pain/discomfort and anxiety/depression. There are likely to be further impacts on wellbeing, which are not captured by this scale. For example the Brazier *et al* (2022)[20] review informed the development of a holistic measure for health and wellbeing suggested that control, identity and social connections could also usefully be measured. Research[21] shows that ABI impacts many other areas of people's lives including relationships and behaviour, propensity for addiction, levels of positive mood and energy level: impacts which may only be partially captured by the Quality of Life (QoL) scale and the associated monetisation.

Feeling that you have the freedom to choose what you do in your life has an impact on your wellbeing[22]; it can impact your life satisfaction, positive mood and protects against depression. This control or autonomy can be affected, and its loss mitigated, through brain injury itself and the treatment and recovery, as well as the quality of the interactions around these.

Loss of life

As well as illness and rehabilitation periods we have estimated the loss of wellbeing from early death. This is calculated by assigning a monetary value to a 'year of life' and multiplying that by the number of years of life which would have otherwise been lived. Life expectancy data for TBI and survival rate data for stroke and brain tumour, by sex and age group, has been used to estimate the number of related deaths each year. This gives the number of years of lost life. For example, a 60 year-old man would normally be expected, on average, to live another 22.7 years in England whereas the data[23] show if he suffered a TBI this would be reduced, on average, to 15 years, so 7.7 years are lost. Each year

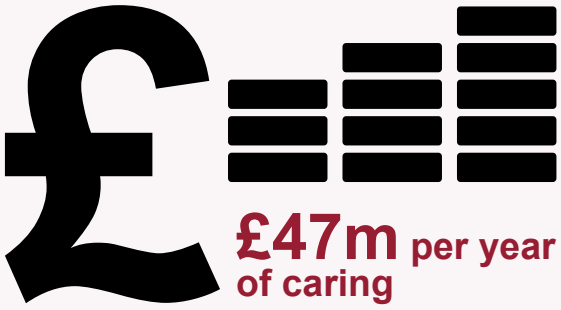
lost, compared to the average life expectancy, is valued with the current UK government 'value of a statistical life year', which equals £70,000 in 2019 prices. This value is used in a broad range of policy areas, including environmental, transport, as well as health economics.[24]

Informal carers

The total cost associated with loss of life satisfaction amongst carers of people with ABI is estimated to be £47m per year of caring.[25] This is likely to be an underestimate since it assumes that carers are caring for only one year, whereas in reality many may do so for longer than that. It is also an 'average' figure, which does not reflect differences in the amount of time per week the person spends caring[26] or take into account gender differences (e.g. MacDonald and Powdthavee, 2018, find that females are more adversely affected by informal caregiving than men[27]). As with the economic costs, we have assumed the characteristics of the carer population are the same as the patient – which may both over and underestimate the impacts.

We know from the Census there are over 5.8m informal carers in the UK, the majority of whom are women. Carers UK's State of Caring 2025[28] report identifies that many carers feel isolated and anxious, 61% worry about their own financial state and 44% had put off their own health issues whilst caring for a relative or friend. Most research indicates that caring is associated with poorer physical and mental health[29]. Carers can feel burdened and sometimes resentful of their role, isolated from others and experiencing increased loneliness and lower happiness.[30] Carers also report unexpected changes and a sense of being permanently on call which result in more constant levels of stress and anxiety[31]. Unpaid caregiving can lead to a scarcity of time and challenges balancing the time required for caregiving and other work and family commitments[32]. Parental wellbeing is hugely impacted by childhood acquired brain injury and many parents cannot return to work for sometime and often work reduced hours.

FIGURE 9: THE IMPACT OF CAREGIVING FOR PEOPLE WITH ACQUIRED BRAIN INJURY (ABI)



£47m per year of caring

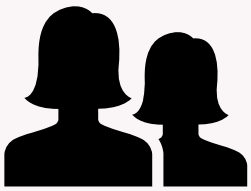
The total cost associated with loss of life satisfaction amongst carers of people with ABI

61% Worry about their own financial state

Carers UK's State of Caring 2025 report identifies that many carers feel isolated and anxious

44% Put off their own health issues

Most research indicates that caring is associated with poorer physical and mental health



There are over **5.8m** informal carers in the UK, the majority of whom are women

Most report a sense of being permanently on call which result in more constant levels of stress and anxiety

Unpaid caregiving can lead to challenges balancing the time required for caregiving, work and family

Partners' wellbeing

The total cost of the loss of life satisfaction amongst partners of those with TBI, stroke and brain tumour is £48.1bn.[33] This is a combined figure, covering both the 'spillover' effect in loss of mental wellbeing from the patient to their partner and impact of widowhood. We have been careful not to double-count partners and carers and have removed partners who are assumed to be carers (as they appear in the carer figures).

Wellbeing evidence from Australia has shown that when the mental health of an individual improves, there is a 'spillover' of 15% to the partner (Frijters and Mervin, 2014)[34]. The wellbeing impact on partners assumes that this spillover effect also holds true in the UK and that there is a degree of spillover when wellbeing drops rather than improves[35]. It should be noted; these are estimations based on rough assumptions and proxies. They are estimated purely to give an idea of the scale of effect rather than provide reliable evidence of the observed impacts on wellbeing. However, this is likely to be a conservative estimate, since there is no evidence of the duration of any spillover impacts in life satisfaction terms and the impacts on partners may continue for longer than one year, up to the years of duration of the illness.

In the case of death, Lucas *et al*. (2003) found that the person's partner typically exhibits sharp declines in life satisfaction in the year surrounding spousal loss (−0.86 Life Satisfaction points on a 0-10 scale), with evidence suggesting that life satisfaction takes up to eight years to return back to pre-loss levels. Based on findings in the paper, this has been incorporated in the model (an increase of 0.1 points per year). These are of course averages; evidence shows that some people never return to pre-widowhood levels. Others return to their 'baseline' or pre-widowhood levels earlier than this average.

Children's wellbeing

The monetised wellbeing cost of the impact on children of ABI patients is calculated as £112m. This calculation is based on a number of assumptions, where further evidence could improve the analysis. It estimates the impact of the parents' illness but does not include the impact of their early death because the data to enable this is not available.

Evidence[36] suggests that children of ABI patients are impacted through both mental wellbeing and behaviour. To take a conservative estimate, we can assume that impacts may be strongest for children of school age, in particular secondary school age. Using figures that allow us to estimate the age and number of children affected[37], we take a conservative assumption that 20% of ABI patients have children of a relevant age for evidenced psychological impacts.

We have used available evidence on levels of distress amongst children with a parent who has received a cancer diagnosis[38] as a proxy to conservatively estimate that around 40% of children are impacted by anxiety and this holds for one year after the ABI. Since this is to be averaged over a full year, we apply the disability weight associated with mild anxiety which is 0.03 (GBD, 2019). This may be a conservative assumption. Although all children are likely to be impacted by this diagnosis, we have only included the proportion reporting 'high' and 'severe' levels of distress. In addition, impacts are assumed for one year, yet there could be longer term impacts.[39] Brain Injury is also associated with increased risk of suicide in adolescents and adults (including in prison)[40],[41].

CASE STUDY

Dave's story

The hidden impact of childhood brain injury

Dave Alsbury's life began with great promise. A bright, athletic, and creative child, he won a scholarship to a private school and excelled in mathematics. But from the age of three, he suffered a series of undiagnosed and untreated traumatic brain injuries (TBIs) from road accidents, a cricket injury, and a serious motorcycle crash at 16 years of age. These TBIs set Dave on a path of escalating challenges that were never fully recognised by the NHS or public services.

Raised in a difficult household, Dave and his sister Dr Alyson Norman shared the same unstable environment. While Alyson became a successful psychologist specialising in brain injuries, Dave's life descended into addiction, homelessness, and eventually suicide. The full extent of his injuries only became clear through a posthumous Safeguarding Adults Review.

"I remember going numb," Alyson recalls. "I had always put my brother's issues down to poor family background and often wondered what led him to go down such a destructive path whilst my sister and I, despite having similar experience, had not. Despite my professional knowledge, I had been flying blind."

Research by the Danish Research Institute of Suicide Prevention, which analysed seven million TBI cases over 34 years, found that TBIs double the risk of suicide. Even survivors of mild injuries were 81% more likely to take their own lives.

Despite his history of head injuries and clear cognitive issues, Dave was never given adequate neurorehabilitation or mental health support. He struggled with memory, executive function, emotional regulation, and communication—especially in noisy settings. His behaviours, including obsessive hoarding and inappropriate social interactions, were classic signs of brain injury, yet went unrecognised.

"On one occasion, he superglued a lone stiletto on the wall above his doorway," Alyson wrote. "When I suggested it should be thrown away as it served no useful purpose, he became agitated and said to me, 'I have no purpose, are you going to throw me away?"

By the age of 21, Dave was using heroin and had attempted suicide. After overdosing with friends, one left him outside A&E in a wheelbarrow. A 1993 car crash that left him in a coma marked a turning point. After six months in hospital, he was discharged with minimal support. Though he technically could cook and wash, he couldn't sense hunger or smell, so often forgot to eat—relying on Post-it notes like 'cook dinner at 6pm'.

Repeated rejections from Adult Social Care led to despair. Although charities like Headway offered support, the lack of wraparound care meant any stability was short-lived. Alyson, who had become his carer at 12 years of age, also felt unsupported. She stresses that childhood TBIs are often mislabelled as behavioural problems rather than neurological injuries. Her academic review of 600 Serious Case Reviews found that brain injury is a hidden factor in one third of them.

Dave's case is far from isolated. TBIs affect around 300,000 people in the UK and are linked to higher rates of addiction, homelessness, and imprisonment—60% of prisoners have experienced a TBI. Yet, neurorehabilitation services remain fragmented and underfunded.

Even after his death, a representative from the NHS Trust told Alyson, "the problem with your brother's case was we just don't see people like him". She replied that they had—but hadn't known what to look for.

"Since my brother's death in 2014, I have become used to telling his story," Alyson says. "But what's harder to tell is my own, as a young girl forced into a carer's role, unsupported and unheard. My work today aims to prevent as many cases like Dave's as we can."

Despite his history of head injuries and clear cognitive issues, Dave was never given adequate neurorehabilitation or mental health support.

TECHNICAL APPENDICES

Appendix A

Methodology of the Incidence-based Economic Cost Model

All costs are driven by the number of patients in each year presenting at hospital, in the HES, and the various unit costs or average costs of services. Incidence costs are defined as the costs of delivering care to a homogeneous cohort of patients, in this case 3 cohorts – for each of TBI, stroke and brain tumour, fixed in the year of their diagnosis or incident and followed through with survival or life expectancy data to give a duration of illness or early death. In every year following the diagnosis, incidence costs include only patients who survive the previous year, mortality data being used. Therefore, the costs in one year account for all the costs associated with that cohort's subsequent years of ill health.

We have modelled the identified economic costs where data is available. Where it is not, robust assumptions are evidence-based and use the latest research. The model enables variables to be altered to show the impacts of different assumptions and sensitivity analysis will test the analysis for robustness.

Data

The cost model uses the most recent academic research and government data on which to base modelling and provide robust estimates. The methodology follows HM Treasury Green Book[42] and The Aqua Book[43] standards for analysis and modelling. The table on the next page outlines the inputs, sources, calculations, and outputs.

INPUTS	SOURCES	VARIABLES	CALCULATIONS	OUTPUTS
Number of people with ABI annually at hospital	HES incidence data	By UK nation, age group and sex	For each group in each nation, we apply a proportion to convert from hospital episodes to patients. These are: TBI 90%, stroke 76.9% and brain tumour 55%. TBI and brain tumour sourced from Headway statistics notes, stroke from the evidence that each stroke patient has 1.3 hospital trips on average	The numbers of TBI, stroke and brain tumour patients in 2023/24, by age and sex for each UK nation
Survival rates and life expectancy	Life expectancy TBI from (Brooks *et al*., 2016), Survival and mortality rates for stroke from ONS stroke mortality and brain tumour from Cancer Research UK	By age and sex	Applied to numbers to reduce patient numbers owing to early deaths, to calculate additional deaths and duration of ill health owing to ABI	Number of additional deaths, used to calculate economic cost of productivity loss and wellbeing costs of early mortality. Provides end points for costs incurred during illness
Costs of NHS treatments and services over lifetime	Several sources from research and literature – see below	By ABI category	Applied to incidence numbers, using the range of costs available	Costs of treatments and NHS care over the lifetime
Costs of social care	Unit costs of Health and Social Care 2024 Manual – Kent Academic Repository	By age group	Applied to proportion requiring social care	Costs of social care over the lifetime
Numbers of informal carers annually per patient		By age, same characteristic as patients	Used for calculating costs of carers' lost labour – we assume that every patient has 0.5 of a carer, or a carer for 20 hours a week	Intermediary output for other calculations on cost of informal care through labour market productivity loss

INPUTS	SOURCES	VARIABLES	CALCULATIONS	OUTPUTS
Labour Market data on patients and their carers – including employment rates, wages	Labour Force Survey, Annual Survey for Hours and Earnings research estimates	By age and sex	Multiplying the wages, lost hours, and employment rates to establish the cost of lost labour market participation to the individual and their informal carers	Lost labour market productivity over the illness period and through early death for those below SPA
Costs of DWP benefits (transfer)	DWP systematic review 2019 DWP data sources – May 2024 Benefit expenditure tables	By sex, age – over under SPA	The amount of IB, PIP and other disability benefits (health-related UC) is assumed to be an average Attendance Allowance assigned to ABI carers is assumed Similarly, the amount of Carer's Allowance is assumed	Costs of a range of DWP benefits paid to patients and carers attributable to ABI patients and carers

Inputs and sources

Where possible we have used sources which are most aligned with the patient group being costed – so for TBI, stroke and brain tumour patients separately. Assumptions are required and are based on the latest research – though in many cases these are many years old. Where a range of assumptions is more appropriate (to account for uncertainty) these have been used, with the assumption being easily changed for testing in the Excel model.

UK data has been used where possible, although in some cases English-only data is available and so it has been prorated to cover the entire UK, using the regional distribution of ABI incidence. For example, this is the case for survival rates of stroke patients which are for England and Wales only. We have produced a breakdown of costs by UK nations.

Annual cost and the attributable year

The costs are worked out as a 'typical year', or an 'annual cost', using 2023-24 data and uprating the costs which are in previous years using the appropriate uprating method – e.g. earnings uprated by wage inflation, health costs by GDP etc.

Calculations and derivations

Costs of NHS acute care and ongoing care

There are several sources from research and studies which have tried to calculate the costs of hospital treatment.

THE TABLE BELOW SHOWS WHAT WE HAVE USED AND SOURCES:

ABI CATEGORY	TYPE OF COST	2024/25 PRICES ESTIMATE	ORIGINAL PRICE AND YEAR	SOURCE
TBI	Acute	£24,443.47	£15,462 (2008)	Determinants of hospital costs associated with traumatic brain injury in England and Wales – Morris – 2008 – Anaesthesia
	Ongoing	£67,810.00	£42,894 (2018)	Estimated Life-Time Savings in the Cost of Ongoing Care Following Specialist Rehabilitation for Severe Traumatic Brain Injury in the United Kingdom – PMC
Stroke	Per patient in first 12 months	£17,762.24	£13,265.31 (2015)	https://eprints.lse.ac.uk/102489/4/Estimated_societal_costs_of_stroke_in_the_UK.pdf
	Subsequent Years	£20,995.88	£15,680.27 (2015)	https://eprints.lse.ac.uk/102489/4/Estimated_societal_costs_of_stroke_in_the_UK.pdf
Brain Tumour	Inpatient	£20,676.77	£18,792.85 (2019)	The Cost of Treating Adult Glioblastoma Patients in England – PMC
	Ongoing outpatient care	£8,311.05		The Cost of Treating Adult Glioblastoma Patients in England – PMC

Social care costs

Whilst we have good unit cost data on social care and good aggregate data on expenditure by local authorities, we are lacking some of the data which would attribute this to those with ABI. We therefore use the following assumptions on costs and the proportion of the patient group requiring social care.

ABI CATEGORY	% REQUIRING SOCIAL CARE	ANNUAL COST	SOURCE
TBI	20%	£50,000	Median from The unit costs of health and social care 2024 (for publication)_Final.pdf
Stroke	50%	£58,934.22	Estimated societal costs of stroke in the UK based on a discrete event simulation – PMC
Brain Tumour	17%	£50,000	https://www.nuffieldtrust.org.uk/sites/default/files/2017-01/social-care-for-cancer-survivors-full-report-web-final.pdf

Employment and productivity effects

The most widely used methodology for calculating productivity losses in cost of illness studies is the human capital approach. This approach has a long history in economic and health services research as a robust and reliable method to calculate the expected life-time output that would have been realised had the disease or death been avoided. This methodology includes estimates for both work that is paid for through wages and activities that are not paid such as caring duties or housework. These are calculated using data from the Labour Force Survey and Annual Survey of Hours and Earnings, multiplying by the annual incidence. Using this we establish the cost to the UK Economy of the loss of employment and loss of productivity resulting from ABI sickness, periods of treatment and removal from the labour market. This is also estimated for informal carers – assumptions about the impact on the labour market participation of informal carers coming from research estimates. Because the human capital method can overestimate productivity losses, given workers can be replaced, we have used conservative estimates. We also account for gender and age disparities (the HC method tends to overestimate using male and average age of worker) by breaking down the data by gender and age to ensure the estimates are specific to the ABI patient population.

THE MAIN ASSUMPTIONS USED ARE SET OUT BELOW:

TYPE OF ABI	DAYS OUT OF LABOUR MARKET EACH OF FIRST TWO YEARS	RETURN TO WORK RATES	EVIDENCE
TBI	50	50%	Mixed – differing by age and severity
Stroke	100	50%	Return to work after young stroke (Edwards, Kapoor, Linkewich, Swartz, 2018)
Brain Tumour	100	38%	Moderating factors in return to work and job stability after traumatic brain injury.(Kreutzer, J.S., Marwitz, J.H., Walker, W., Sander, A., Sherer, M., Bogner, J., Fraser, R., & Bushnik, T. (2003)
After 60 years of age (all ABI)	150	25%	Would expect more of those near SPA to take early retirement

We have also presented the corresponding costs of 'unpaid' work that is lost through illness and caring. This is calculated using a study[44] which covers all European countries and shows the relationship between paid and unpaid loss of work owing to cancer. This shows the UK ratio to be 1:0.9, so the unpaid loss of work is equivalent to 90% of the cost of the paid loss. This is not condition specific and is not as robust as other estimates, so we have left out of totals but shown for completeness.

Economic transfers

We were asked to quantify the cost to DWP of benefits claimed by those with ABI. Whilst these are possible to calculate, an economic cost model should not include economic transfers of resources between people (e.g. benefit payments and taxes). These types of payments – transfers – pass purchasing power from one person to another and do not involve the consumption of resources. Transfers benefit the recipient and are a cost to the donor and therefore do not make society as a whole better or worse off.

We calculate the cost to DWP/Government of benefits paid to ABI patients, but these sit alongside the overall cost model. These figures add weight to the arguments showing the costs of ABI but as they are transfers they should not be included in the economic cost to the UK.

Discount rates

The annual costs are calculated over the lifetime of the individual with ABI and brought into today's prices; this is called a 'present value' basis. To do this a 'discount rate', accounting for future inflation, needs to be applied. The public sector discount rate adjusts for social time preference, defined as the value society attaches to present, as opposed to future, consumption. It is based on comparisons of utility across different points in time or different generations.

The Green Book discount rate, known as the Social Time Preference Rate (STPR), for use in UK government appraisal is set at 3.5% in real terms. This rate has been used in the UK since 2003. Exceptions to the use of the standard STPR include for risk to health and life values. The recommended discount rate for risk to health and life values is 1.5%. This is the discount rate which has been applied for the wellbeing costs.

Sensitivity analysis

Sensitivity analysis is essential to establish the robustness of estimates and the extent to which the variables affect the costs. In this case, how the various elements of the cost model contribute to the overall outputs. Testing of the variables and the assumptions has been carried out using standard scenario analysis and testing of extremes.

Quality assurance

The model has been fully checked and separate estimates compared to existing sources and previous work. The overall costs have also been compared to other work to assess the validity of the estimates.

Appendix B

Further detail on calculating the wellbeing costs

There are many different measures to assess the wellbeing and Quality of Life (QoL) of individuals with ABI, survivors, carers, and family members; some of these measures are better than others at capturing the full impacts, including the psychological impacts. However, because the focus of this part of the work is on monetisation, we need to choose a measure which may not be perfect for capturing all the impacts nor completely specific for the UK but can be monetised in a consistent manner with wider appraisal in the UK government.

The Green Book Supplementary Guidance on Wellbeing (2021) states that, "where direct evidence on QALY/DALY impacts is available, this approach is recommended for appraisal. Using SWB values in addition would pose a significant risk of double counting". For this reason, we are using Disability Adjusted Life Years (DALY)/QALY measures for patients and Life Satisfaction (on a 0-10 scale) for carers, partners and children, multiplied by the value of a QALY and the value of a WELLBY[45] which are used for government appraisal in the UK. Where changes in Life Satisfaction are stated in this paper, these are always Life Satisfaction on a 0-10 scale, unless described otherwise.

OVERVIEW TABLE: INPUTS, ASSUMPTIONS, SOURCES, AND CALCULATIONS

INPUTS	ASSUMPTIONS	SOURCES	CALCULATIONS AND NOTES
Quality of Life impact on people diagnosed with ABI: central estimate	Various, TBC	Disability weights referenced in the Green Book Guidance for UK appraisal, Stouthard *et al* (1997) Disability weights from GBD (2019)	Reduction in Quality of Life (QoL) compared to general population applied to number of patients and number of years in this condition, multiplied by value of a statistical life year (consistent with valuation in the UK) Number of years of lost life multiplied by value of a statistical life year and discounted
Yearly Life satisfaction impact on carers	0.22[46] WELLBYs	Assumption, based on estimates of the life satisfaction impact on informal carers: MacDonald and Powdthavee (2018)	Translated from 1-7 scale to 0-10 scale and multiplied by number of informal carers to obtain WELLBYs Multiplied by value of a WELLBY and discounted
Life satisfaction impact on partners following illness	15% spillover 1.08 drop in WELLBYs	Assumption, based on spillover effect (Mervin and Frijters, 2014) and LS impact of drop in self-assessed health (Frijters *et al*, 2014), moving from healthy to poor self-rated health	15% of 1.08 for partners of patients with severe illness Assume proportionate difference in WELLBYs as with QALYs 15% x 0.28 decrease in Life Satisfaction for partners of ABI patients Multiplied by value of a WELLBY and discounted

INPUTS	ASSUMPTIONS	SOURCES	CALCULATIONS AND NOTES
Life satisfaction impact on partners in case of death	0.86 WELLBYs, reducing 0.1 points per year[47]	Assumption, based on impact of spousal loss: Lucas *et al* (2003)	The number of deaths associated with diagnosis in given year were estimated, across the following 40+ years Multiplied by average number of partners and WELLBY impact across the following 8 years The impact of widowhood was calculated in present value terms, to estimate the total 'widowhood' wellbeing impacts of those with a diagnosis in this year[48]
Number of partners impacted	61.3% of patients, based on average number of people in a partnership or cohabiting (50.6% plus 13.1%)	ONS release "Families and households in the UK: 2020" and 2022[49] population estimates by marital status and living arrangements[50]	Average number of partners. Assume that informal carers are primarily the partners of patients in the more severe cases Calculate how many affected partners are in addition to informal carers, for each ABI group
Quality of Life (QoL) impact on children following diagnosis	0.03 QALY loss	Assumption, based on disability Weight of 'Mild Anxiety' from GBD (2019)	Multiplied by number of children impacted, applied for 1 year Multiplied by value of QALY and discounted for future years
Number of children impacted	1.92 mean number of children	ONS release for mean number of children[51] Assumptions for number of children in school age	Incidence numbers x 15% x mean number of children[52] x 40% of children
Discount rate	1.5%	HMT Green Book	Applied across QALY and WELLBY impacts
Value of a WELLBY	£13,000 in 2019 prices[53]	HMT Green Book Supplementary Guidance[54]	Multiplied across WELLBY impacts
Value of a Statistical Life Year	£70,000 in 2019 prices	HMT Green Book	Multiplied across QALY impacts

Additional notes on calculations: Illness and mortality calculations

– We assume that the calculated disability weights described in Stouthard *et al* (1997) apply for eight years. Then a lower disability weight is applied for the rest of a patient's life. This may be an overestimate for some patients, who observe little to no impacts, it may be an underestimate for others, who continue to experience impacts for many years. The drop in impacts at eight years, with continued, smaller impacts for the remaining years, is considered a reasonable assumption.

All impacts on wider family members

– Across the piece, these monetised estimates are exploratory. Although they follow the Green Book methodology for UK government appraisal, the evidence underpinning the figures is in many places based on assumptions. Better evidence on e.g. the wellbeing impacts on partners and children during the illness of a loved one, as well as evidence of the bereavement impact on children, could help improve the confidence in this analysis.
– Although the impacts on wider family members are clear, we need to exercise caution with the monetised figures, to avoid 'double counting'. According to government methodology papers, the value of the statistical life year, i.e. the monetised impact of a patient's illness and death incorporates "losses to society as well as losses that are borne by the victims themselves, their friends and relatives." [55] This could either be interpreted that the value of a Quality Adjusted Life Year incorporates these impacts on friends and relatives: when the value of a Quality Adjusted Life Year is used, the value on others is considered to be included. Another interpretation would be that the psychological distress that the potential impact on loved ones/dependants brings to the individual is distinct and additional to the effect on others (e.g. a mother feeling bad about the prospect of being unwell and unable to help her kids is separate from the impact that her kids experience). We include an assessment of what these values may be, if they were to be included, with caution that there could be an element of double counting.

Appendix C

Results tables

TABLE 1 ECONOMIC COSTING BY NATION, ABI TYPE AND BREAKDOWN (£BILLIONS, CURRENT PRICES):

REGION	TYPE OF ABI	EST. NUMBER PATIENTS	COST TO NHS OF ACUTE CARE	COST TO NHS OF REHAB/ LONG TERM-CARE	SOCIAL CARE	PRODUCTIVITY COST (PATIENTS)	PRODUCTIVITY COST (CARERS)	CRIMINAL JUSTICE SYSTEM	SEN/ EDUCATION	**TOTALS**
England	Head Injury	98,110	2.38	6.60	0.97	7.91	3.09	0.528	0.606	**22.10**
	Stroke	92,865	1.64	1.94	2.72	4.41	0.44		0.026	11.17
	Brain Tumour	21,332	0.44	0.18	0.18	2.13	0.65		0.164	3.75
	TOTAL	**212,306**	**4.46**	**8.72**	**3.88**	**14.46**	**4.18**	**0.528**	**0.797**	**37.02**
Scotland	Head Injury	6,707	0.24	0.65	0.10	0.95	0.37	0.036	0.070	**2.42**
	Stroke	8,339	0.14	0.17	0.24	0.33	0.03		0.002	0.91
	Brain Tumour	692	0.01	0.01	0.01	0.07	0.01		0.007	0.12
	TOTAL	**15,738**	**0.39**	**0.83**	**0.34**	**1.35**	**0.42**	**0.036**	**0.079**	**3.45**
Wales	Head Injury	3,902	0.09	0.25	0.04	0.27	0.08	0.021	0.028	**0.77**
	Stroke	5,594	0.10	0.12	0.16	0.14	0.04		0.001	0.56
	Brain Tumour	865	0.02	0.01	0.01	0.06	0.01		0.000	0.10
	TOTAL	**10,361**	**0.20**	**0.37**	**0.21**	**0.47**	**0.13**	**0.021**	**0.029**	**1.43**
NI	Head Injury	2,853	0.07	0.19	0.03	0.23	0.08	0.015	0.017	**0.63**
	Stroke	3,545	0.06	0.07	0.10	0.05	0.02		0.000	0.31
	Brain Tumour	696	0.01	0.01	0.01	0.07	0.01		0.007	0.13
	TOTAL	**7,094**	**0.15**	**0.28**	**0.14**	**0.34**	**0.11**	**0.015**	**0.025**	**1.07**
UK	Head Injury	111,572	2.77	7.70	1.14	9.36	3.62	0.600	0.722	**25.92**
	Stroke	110,343	1.94	2.30	3.23	4.92	0.53		0.029	12.95
	Brain Tumour	23,584	0.49	0.20	0.20	2.33	0.69		0.178	4.10
	TOTAL	**245,499**	**5.21**	**10.20**	**4.56**	**16.62**	**4.85**	**0.600**	**0.929**	**42.96**

Note: The data provided for Wales show some unexpected figures in age groupings, with many missing cases. This report has adjusted age splits to match the overall totals.

TABLE 2 WELLBEING COSTING BY NATION, ABI TYPE AND BREAKDOWN (£BILLIONS, CURRENT PRICES):

REGION	TYPE OF ABI	EST. NUMBER PATIENTS	PATIENTS	CARERS (1 YR)	PARTNERS & WIDOWS	CHILDREN (1 YR)	**TOTALS**
England	Head Injury	98,110	7.05	0.021	2.43	0.042	**9.54**
	Stroke	92,865	19.97	0.015	24.54	0.046	44.57
	Brain Tumour	21,332	8.61	0.004	13.58	0.009	22.21
	TOTAL	**212,306**	**35.63**	**0.040**	**40.55**	**0.097**	**76.31**
Scotland	Head Injury	6,707	0.86	0.003	0.42	0.003	**1.28**
	Stroke	8,339	2.42	0.001	1.74	0.004	4.16
	Brain Tumour	692	1.03	0.000	0.22	0.000	1.24
	TOTAL	**15,738**	**4.30**	**0.004**	**2.37**	**0.007**	**6.69**
Wales	Head Injury	3,902	0.35	0.001	0.45	0.002	**0.80**
	Stroke	5,594	1.00	0.001	2.17	0.003	3.17
	Brain Tumour	865	0.40	0.000	0.37	0.000	0.77
	TOTAL	**10,361**	**1.74**	**0.002**	**2.99**	**0.005**	**4.75**
NI	Head Injury	2,853	0.32	0.001	0.15	0.001	**0.47**
	Stroke	3,545	0.89	0.001	1.74	0.002	2.63
	Brain Tumour	696	0.38	0.000	0.25	0.000	0.62
	TOTAL	**7,094**	**1.58**	**0.002**	**2.13**	**0.003**	**3.72**
UK	Head Injury	111,572	8.57	0.025	3.44	0.048	**12.08**
	Stroke	110,343	24.28	0.018	30.19	0.055	54.54
	Brain Tumour	23,584	10.41	0.004	14.42	0.010	24.85
	TOTAL	**245,499**	**43.26**	**0.047**	**48.05**	**0.112**	**91.46**

Note: The data provided for Wales show some unexpected figures in age groupings, with many missing cases. This report has adjusted age splits to match the overall totals.

ENDNOTES

1. Gupte *et al*. (2019)
2. Yoon and Bushnell, (2023)
3. Arambula *et al*., (2019)
4. Statistics | Headway
5. The Green Book (2022) – GOV.UK: Transfers of resources between people (e.g. gifts, taxes, grants, subsidies or social security payments) should be excluded from the overall estimate of Net Present Social Value (NPSV). Transfers pass purchasing power from one person to another and do not involve the consumption of resources. Transfers benefit the recipient and are a cost to the donor and therefore do not make society as a whole better or worse off.
6. WHO definition: Quality of Life as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns.WHOQOL – Measuring Quality of Life| The World Health Organisation
7. The Green Book: appraisal and evaluation in central government – GOV.UK
8. Turner-Stokes *et al*., (2019)
9. Farrer, T. J., & Hedges, D. W. (2011), Williams *et al*. (2010), Shiroma, Fergyson and Pickelsimer, (2010)
10. https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/publicspending/datasets/esatable11annualexpenditureofgeneralgovernment
11. Williams *et al*., (2018)
12. costs-per-place-per-prisoner-2022-2023-summary.pdf
13. Jubinville, W., Ducharme, R., Hendryckx, C., Roy, L., & Bottari, C. (2025).
14. Dtfoundation-briefing-2pp_web.pdf
15. Unit Costs of Health and Social Care 2024 Manual – Kent Academic Repository
16. Paid and unpaid productivity losses due to premature mortality from cancer in Europe in 2018 – Ortega□Ortega – 2022 – International Journal of Cancer – Wiley Online Library
17. To calculate the percentage reduction in a person's quality of life from different injuries, disability weights were used. Stouthard *et al* (1997) was chosen since this source is differentiated by condition, enabling a match with the incidence numbers. We also draw from GBD (2019) for estimates of impacts when patients.
18. I.e. the measurement of a Quality Adjusted Life Year (QALY) using EQ-5D, the measure which is used to inform health treatment decisions. Central disability weight values are taken throughout and compared to the norm for the average population, who have existing injuries, illnesses, and conditions.
19. EQ-5D
20. https://www.valueinhealthjournal.com/article/S1098-3015(22)00083-3/fulltext
21. Holloway and Tasker, (2019)
22. Steckermeier, L.C.(2021).
23. We have used US Life expectancy data from (Brooks *et al*., 2016) as no suitable UK data exists for TBI. Mortality data for Stroke comes from the ONS Mortality from Stroke data, published May 2022, and Brain Tumour from Cancer Research 'Survival for brain and spinal cord tumours'.
24. This value is not lost productivity, which is calculated in the economic costs above, but rather a proxy valuation of the human costs for a year of life lost.
25. We have used the central estimate of WELLBY value (£13,000 in 2019 prices).
26. In general, studies suggest that negative effects on health and quality of life are worse for those caring for 20 or more hours per week or co-resident care (Legg, *et al*., 2013).
27. This can be explained largely by the fact that, compared to male caregivers, female caregivers are significantly more likely to be primary caregivers; provide more intensive and complex care; have difficulty with care provision and balancing caregiving with other family and employment responsibilities; have relatively little formal caregiving support; (in comparison, males are more likely to split their time between full-time employment and caregiving and, hence, are more likely to obtain formal and informal assistance with caregiving). Females suffer from poorer emotional health secondary to caregiving (see Table 7's results). As such, it should come as no surprise that we find a stronger statistically significantly

negative effect of informal caring for women than for men (e.g., Pinquart and Sorensen, 2003).

28. State of Caring and Mental Health, 2025
29. Smith, *et al*., 2014; Powdthavee, *et al*., 2018, Schulz, *et al*., 2020; Ervin, *et al*., 2022
30. What Works Centre for Wellbeing (2019).When we sing it sounds like there are more of us: Findings from the first cohort of the Carer's Music Fund. CMF Insight document series. Spirit of 2012
31. Bowes, A., Dawson, A., & Ashworth, R. (2020).
32. The caregiving stress process model (Pearlin, *et al*., 1990) and time-scarcity models (Strazdins, *et al*., 2011) propose several mechanisms through which unpaid caregiving can impact mental health.
33. The range represents the low and high WELLBY value in 2019 prices, of £10-16k (£13k central estimate)
34. https://www.sciencedirect.com/science/article/abs/pii/S0277953614001063
35. This approach requires a figure of the Life Satisfaction impact of types of ABI, which is not available. A very rough proxy estimation has been used, taking an idea from the drop in life satisfaction of 1.08 associated with moving from healthy to poor physical health (self-rated). This is likely to be a fitting proxy for severe ABI, but potentially an overestimate for less severe cases.
36. For example, The effect of parental traumatic brain injury on parenting and child behavior – PubMed
37. See Technical Annex
38. Cancer being used as a proxy. Evidence from Australia has shown that 31% of the offspring reported high distress; 10% displayed severe distress and that the highest distress for offspring is soon after diagnosis
39. For example, the impact of mother's mental illness on their children is known to be associated with lower wellbeing in childhood and later life, Clark, Andrew, Flèche, Sarah, Layard, Richard, Powdthavee, Nattavudh and Ward, George. (2018)
40. Chang *et al*., (2019)
41. Chen *et al*., (2022)
42. The Green Book (2022) – GOV.UK (www.gov.uk)
43. The Aqua Book: guidance on producing quality analysis for government – GOV.UK (www.gov.uk)
44. Paid and unpaid productivity losses due to premature mortality from cancer in Europe in 2018 – Ortega□Ortega – 2022 – International Journal of Cancer – Wiley Online Library
45. 1 point change in Life Satisfaction on a 0-10 scale: £13k in 2019 prices
46. Converting from a 7-point scale to the 11-point scale required for monetisation.
47. Lucas' linear model indicated that people report a 0.935-point drop in satisfaction during the 1st year of widowhood and then increase at a linear rate of 0.101 points per year.
48. This was then applied across the following years, based on incidence numbers
49. https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2022
50. Population estimates by marital status and living arrangements, England and Wales – Office for National Statistics (ons.gov.uk)
51. Childbearing for women born in different years, England and Wales – Office for National Statistics
52. Women in England and Wales born in 1975 who completed their childbearing years in 2020, had on average 1.92 children (Childbearing for women born in different years, England, and Wales – Office for National Statistics (ons.gov.uk)). Standardised mean age of mother at childbirth is 30.9 in 2021 (Births in England and Wales: summary tables – Office for National Statistics (ons.gov.uk)) and was 29.1 in 2005, 28.5 in 2000. This means that a proportion of patients in the age ranges 15-44, 45-54 and part of 55-64 could be of a relevant age: we assume half of the group to 54. Since the rough proportion of ABI cases in the age groups up to 54 is 30%, we assume that this holds for 15% of the group.
53. 2019 values used for value of a WELLBY, and value of a Statistical Life Year have been uprated to 2024 prices to maintain consistency with economic costs
54. https://www.gov.uk/government/publications/green-book-supplementary-guidance-wellbeing
55. WebTag guidance TAG Unit A4.1 Social Impact Appraisal

REFERENCES

Arambula, S.E, Reinl E.L., El Demerdash, N., McCarthy, M.M. and Robertson, C.L. (2019). Sex differences in pediatric traumatic brain injury. Experimental Neurology, 317, pp.168–179. doi:https://doi.org/10.1016/j.expneurol.2019.02.016.

Aziz, N.A., Pindus, D.M., Mullis, R., Walter, F.M. and Mant, J. (2016). Understanding stroke survivors' and informal carers' experiences of and need for primary care and community health services—a systematic review of the qualitative literature: protocol: Table 1. BMJ Open, [online] 6(1), p.e009244. doi:https://doi.org/10.1136/bmjopen-2015-009244.

Bowes, A., Dawson, A., & Ashworth, R. (2020). Time for care: Exploring time use by carers of older people. Ageing & Society, 40(8), 1735-1758. doi:10.1017/S0144686X19000205

Brazier, J., Peasgood, T., Mukurai, C. *et al* (2022) The EQ-HWB: Overview of the Development of a Measure of Health and Wellbeing and Key Results, Value in Health, ISPOR VOLUME 25, ISSUE 4, P482-491, APRIL 2022 DOI:https://doi.org/10.1016/j.jval.2022.01.009

Briggs, A. D. (2018). Estimating comparable English healthcare costs for multiple diseases and unrelated future costs for use in health and public health economic modelling. Plus One, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0197257.

Brooks, J., Shavelle, R., Strauss, D., Hammond, F. and Harrison-Felix, C. (2016). Long-Term Survival After Traumatic Brain Injury. Part II: Life Expectancy. Archives of Physical Medicine and Rehabilitation, 97(10), p.e6. doi:https://doi.org/10.1016/j.apmr.2016.08.014.

Carmichael Fiona, C. S. (2003). The Opportunity Cost of informal care: does gender matter? Journal of Health Economics, Vol 22 Issue 5 781-803.

Chang, H.-K., Hsu, J.-W., Wu, J.-C., Huang, K.-L., Chang, H.-C., Bai, Y.-M., Chen, T.-J. and Chen, M.-H. (2019). Risk of attempted suicide among adolescents and young adults with traumatic brain injury: A nationwide longitudinal study. Journal of Affective Disorders, [online] 250, pp.21–25. doi:https://doi.org/10.1016/j.jad.2019.02.059.

Changik., J. (2014). Cost-of-illness studies: concepts, scopes, and methods. Clin Mol Hepatol, 20(4):327-37.

Chen, F., Chi, J., Niu, F., Gao, Q., Mei, F., Zhao, L., Hu, K., Zhao, B. and Ma, B. (2022). Prevalence of suicidal ideation and suicide attempt among patients with traumatic brain injury: A meta-analysis. Journal of Affective Disorders, [online] 300, pp.349–357. doi:https://doi.org/10.1016/j.jad.2022.01.024.

Clark, Andrew, Flèche, Sarah, Layard, Richard, Powdthavee, Nattavudh and Ward, George. The Origins of Happiness: The Science of wellbeing over the Life Course, Princeton: Princeton University Press, 2018. https://doi.org/10.1515/9781400889129

Department of Health. (2013). DH Documentation for Wider Societal Benefits. Retrieved from NICE guidance: https://www.nice.org.uk/Media/Default/About/what-we-do/NICE-guidance/NICE-technology-appraisals/DH-Documentation-for-Wider-Societal-Benefits.pdf

DE TANTI, A., BRUNI, S., BONAVITA, J., ZADRA, A., CIAVARELLA, M., CANNAVÒ, G. and SAVIOLA, D. (2024a). Long-term life expectancy in severe traumatic brain injury: a systematic review. European Journal of Physical and Rehabilitation Medicine, [online] 60(5). doi:https://doi.org/10.23736/s1973-9087.24.08461-2.

DE TANTI, A., BRUNI, S., BONAVITA, J., ZADRA, A., CIAVARELLA, M., CANNAVÒ, G. and SAVIOLA, D. (2024b). Long-term life expectancy in severe traumatic brain injury: a systematic review. European Journal of Physical and Rehabilitation Medicine, [online] 60(5). doi:https://doi.org/10.23736/s1973-9087.24.08461-2.

Edwards, J.D., Kapoor, A., Linkewich, E. and Swartz, R.H. (2017). Return to work after young stroke: A systematic review. International Journal of Stroke, 13(3), pp.243–256. doi:https://doi.org/10.1177/1747493017743059.

Ervin, J. *et al*., (2022). Longitudinal association between informal unpaid caregiving and mental health amongst working age adults in high-income OECD

countries: A systematic review. EClinicalMedicine, 53(101711)

Farrer, T.J. and Hedges, D.W. (2011). Prevalence of traumatic brain injury in incarcerated groups compared to the general population: A meta-analysis. Progress in Neuro-Psychopharmacology and Biological Psychiatry, 35(2), pp.390–394. doi:https://doi.org/10.1016/j.pnpbp.2011.01.007.

Goldman, L., Siddiqui, E.M., Khan, A., Jahan, S., Rehman, M.U., Mehan, S., Sharma, R., Budkin, S., Kumar, S.N., Sahu, A., Kumar, M. and Vaibhav, K. (2022). Understanding Acquired Brain Injury: A Review. Biomedicines, 10(9), p.2167. doi:https://doi.org/10.3390/biomedicines10092167.

Gupte, R., Brooks, W., Vukas, R., Pierce, J. and Harris, J. (2019). Sex Differences in Traumatic Brain Injury: What We Know and What We Should Know. Journal of Neurotrauma, 36(22), pp.3063–3091. doi:https://doi.org/10.1089/neu.2018.6171.

Gustavsson, A., Svensson, M., Jacobi, F., Allgulander, C., Alonso, J., Beghi, E., Dodel, R., Ekman, M., Faravelli, C., Fratiglioni, L., Gannon, B., Jones, D.H., Jennum, P., Jordanova, A., Jönsson, L., Karampampa, K., Knapp, M., Kobelt, G., Kurth, T. and Lieb, R. (2011). Cost of disorders of the brain in Europe 2010. European Neuropsychopharmacology, [online] 21(10), pp.718–779. doi:https://doi.org/10.1016/j.euroneuro.2011.08.008.

Global Burden of Disease 2021: Findings from the GBD 2021 Study | Institute for Health Metrics and Evaluation. [online] Available at: https://www.healthdata.org/research-analysis/library/global-burden-disease-2021-findings-gbd-2021-study.

HM Treasury. (2021, July). Wellbeing guidance for appraisal: supplementary green book guidance. Retrieved from Hm Treasury: Wellbeing Guidance for Appraisal:

HM Treasury. (2022, November 18). Guidance: the Green Book (2022). Retrieved from Gov.uk: The Green Book (2022) – GOV.UK

Headway (2019). Statistics. [online] Headway.org.uk. Available at: Statistics | Headway

Holloway, M. and Tasker, R. (2019). The Experiences of Relatives of People with Acquired Brain Injury (ABI) of the Condition and Associated Social and Health Care Services. Journal of Long-Term Care, 0(2019), p.99. doi:https://doi.org/10.31389/jltc.20.

http://fyra.io (n.d.). Long-Term Survival Prognosis After Stroke. [online] Practical Neurology. Available at: https://practicalneurology.com/articles/2020-feb/long-term-survival-prognosis-after-stroke.

James, S.L., Theadom, A., Ellenbogen, R.G., Bannick, M.S., Montjoy-Venning, W., Lucchesi, L.R., Abbasi, N., Abdulkader, R., Abraha, H.N., Adsuar, J.C., Afarideh, M., Agrawal, S., Ahmadi, A., Ahmed, M.B., Aichour, A.N., Aichour, I., Aichour, M.T.E., Akinyemi, R.O., Akseer, N. and Alahdab, F. (2019). Global, regional, and National Burden of Traumatic Brain Injury and Spinal Cord injury, 1990–2016: a Systematic Analysis for the Global Burden of Disease Study 2016. The Lancet Neurology, [online] 18(1), pp.56–87. doi:https://doi.org/10.1016/s1474-4422(18)30415-0.

Janssen B., Szende A. Springer; Netherlands (2014). Population norms for the EQ-5D. Self-reported population health: an international perspective based on EQ-5D.

Jones, K., Weatherly, H.A., Chalkley, M., Dargan, A., Findlay, D., Gao, M., Hinde, S., Markham, S., Smith, D., Teo, H., Birch, S. and Castelli, C. (2024). Unit Costs of Health and Social Care programme (2022 – 2027) | The new home for the Unit Costs of Health and Social Care report. [online] Available at: https://www.pssru.ac.uk/unitcostsreport/.

Jubinville, W., Ducharme, R., Hendryckx, C., Roy, L. and Bottari, C. (2025). Barriers, facilitators, and solutions to the care of people experiencing homelessness with traumatic brain injury in Quebec, Canada: clinicians' and concerned parties' perspectives. Disability and Rehabilitation, pp.1–10. doi:https://doi.org/10.1080/09638288.2025.2496359.

Kanso, N., Mauricaite, R., Calvez, K.L. and Williams, M. (2022). The Cost of Treating Adult Glioblastoma Patients in England. Neuro-Oncology, 24(Supplement_4), pp.iv2–iv2. doi:https://doi.org/10.1093/neuonc/noac200.006.

Lannin, N.A., Crotty, M., Cameron, I.D., Chen, Z., Ratcliffe, J., Morarty, J. and Turner-Stokes, L. (2024a). Cost efficiency of inpatient rehabilitation following acquired brain injury: the first international adaptation of the UK approach. BMJ Open, [online] 14(12), pp.e094892–e094892. doi:https://doi.org/10.1136/bmjopen-2024-094892.

Lannin, N.A., Crotty, M., Cameron, I.D., Chen, Z., Ratcliffe, J., Morarty, J. and Turner-Stokes, L. (2024b). Cost efficiency of inpatient rehabilitation following acquired brain injury: the first international adaptation of the UK approach. BMJ Open, [online] 14(12), pp.e094892–e094892. doi:https://doi.org/10.1136/bmjopen-2024-094892.

Lawrence, T., Helmy, A., Bouamra, O., Woodford, M., Lecky, F. and Hutchinson, P.J. (2016). Traumatic brain injury in England and Wales: prospective audit of epidemiology, complications, and standardised mortality. BMJ Open, [online] 6(11). doi:https://doi.org/10.1136/bmjopen-2016-012197.

Legg, L. *et al*., (2013). Is informal caregiving independently associated with poor health? A population-based study. Journal of epidemiology and community health, 67(1), pp. 95-97.

Lucas, R. E., Clark, A. E., Georgellis, Y. and Diener, E. (2003). Re-examining adaptation and the set point model of happiness: reactions to changes in marital status. Journal of Personality and Social Psychology, 84, 3, 527–39.CrossRefGoogle ScholarPubMed

Majdan, M., Plancikova, D., Brazinova, A., Rusnak, M., Nieboer, D., Feigin, V. and Maas, A. (2016). Epidemiology of traumatic brain injuries in Europe: a cross-sectional analysis. The Lancet Public Health, [online] 1(2), pp.e76–e83. doi:https://doi.org/10.1016/s2468-2667(16)30017-2.

McDonald R, Powdthavee N. (2018) The shadow prices of voluntary caregiving: using panel data of wellbeing to estimate the cost of informal care. IZA DP No. 11545, 2018.

MEDIAmaker (n.d.). Brain injury and the criminal justice system. [online] www.headway.org.uk. Available at: https://www.headway.org.uk/supporting-you/brain-injury-identity-card/brain-injury-and-the-criminal-justice-system/.

Menon, D. (2018). Time for Change, Acquired Brain Injury, and neurorehabilitation all-party parliamentary group. [online] Available at: https://cdn.ymaws.com/ukabif.org.uk/resource/resmgr/campaigns/appg-abi_report_time-for-cha.pdf.

Ministry of Justice (2024). Costs per place and costs per prisoner by individual prison HM Prison & Probation Service Annual Report and Accounts 2022-23 Management Information Addendum Ministry of Justice Information Release. [online] Available at: https://assets.publishing.service.gov.uk/media/65f4229810cd8e001136c655/costs-per-place-per-prisoner-2022-2023-summary.pdf.

OECD. (2013, December). Extension of work on expenditure by disease, age, and gender. Retrieved from OECD: https://www.oecd.org/els/health-systems/Extension-of-work-on-expenditure-by-disease-age-and-gender_Final-Report.pdf

OECD. (2016, April). Expenditure by disease, age, and gender focus. Retrieved from OECD: https://www.oecd.org/els/health-systems/Expenditure-by-disease-age-and-gender-FOCUS-April2016.pdf

Parsonage, M. (2016). REPORT an Economic Analysis Traumatic Brain Injury and Offending. [online] Available at: https://www.centreformentalhealth.org.uk/wp-content/uploads/2018/09/Traumatic_brain_injury_and_offending.pdf.

Patel, A., Berdunov, V., Quayyum, Z., King, D., Knapp, M. and Wittenberg, R. (2020). Estimated societal costs of stroke in the UK based on a discrete event simulation. Age and Ageing, 49(2), pp.270–276. doi:https://doi.org/10.1093/ageing/afz162.

Pearlin, L. I., Mullan, J. T., Semple, S. J. & Skaff, M. M., (1990). Caregiving and the Stress Process: An Overview of Concepts and Their Measures. The Gerontologist, 30(5), pp. 583-594

Romain, G., Mariet, A.-S., Jooste, V., Duloquin, G., Thomas, Q., Durier, J., Giroud, M., Quantin, C. and Béjot, Y. (2019). Long-Term Relative Survival after Stroke: The Dijon Stroke Registry. Neuroepidemiology,

pp.1–8. doi:https://doi.org/10.1159/000505160.

Salomon, J.A., Vos, T., Hogan, D.R., Gagnon, M., Naghavi, M. Mokdad, A. *et al*. (2012) Common values in assessing health outcomes from disease and injury: disability weights measurement study for the Global Burden of Disease Study 2010 DOI:https://doi.org/10.1016/S0140-6736(12)61680-8

Scholten, A.C., Haagsma, J.A., Panneman, M.J.M., van Beeck, E.F. and Polinder, S. (2014). Traumatic Brain Injury in the Netherlands: Incidence, Costs and Disability-Adjusted Life Years. PLoS ONE, 9(10), p.e110905. doi:https://doi.org/10.1371/journal.pone.0110905.

Schulz, R. *et al*., (2020). Family Caregiving for Older Adults. Annual review of psychology, Volume 71, pp. 635-659

Shiroma, E.J., Ferguson, P.L. and Pickelsimer, E.E. (2010). Prevalence of Traumatic Brain Injury in an Offender Population: A Meta-Analysis. Journal of Correctional Health Care, 16(2), pp.147–159. doi:https://doi.org/10.1177/1078345809356538.

Smith, L. *et al*., (2014). Mental and physical illness in caregivers: results from an English national survey sample. The British journal of psychiatry: the journal of mental science, 205(3), pp. 197-203.

Stouthard, M. E. (1997). Disability weights for diseases in the Netherlands. Retrieved from https://pure.uva.nl/ws/files/3238153/3276_ddw.pdf

Spiers, G. F. *et al*., (2021). What are the consequences of caring for older people and what interventions are effective for supporting unpaid carers? A rapid review of systematic reviews. BMJ open, 11(9).

Steckermeier, L.C. The Value of Autonomy for the Good Life. An Empirical Investigation of Autonomy and Life Satisfaction in Europe. Soc Indic Res 154, 693–723 (2021). https://doi.org/10.1007/s11205-020-02565-8

Turner-Stokes, L., Dzingina, M., Shavelle, R., Bill, A., Williams, H. and Sephton, K. (2019). Estimated Life-Time Savings in the Cost of Ongoing Care Following Specialist Rehabilitation for Severe Traumatic Brain Injury in the United Kingdom. Journal of Head Trauma Rehabilitation, 34(4), pp.205–214. doi:https://doi.org/10.1097/htr.0000000000000473.

Uysal, S., Hibbard, M.R., Robillard, D., Pappadopulos, E. and Jaffe, M. (1998). The Effect of Parental Traumatic Brain Injury on Parenting and Child Behavior. Journal of Head Trauma Rehabilitation, 13(6), pp.57–71. doi:https://doi.org/10.1097/00001199-199812000-00007.

Vandergriendt, C. (2024). Outlook and Life Expectancy After a Stroke. [online] Healthline. Available at: https://www.healthline.com/health/stroke/stroke-prognosis#influencing-factors.

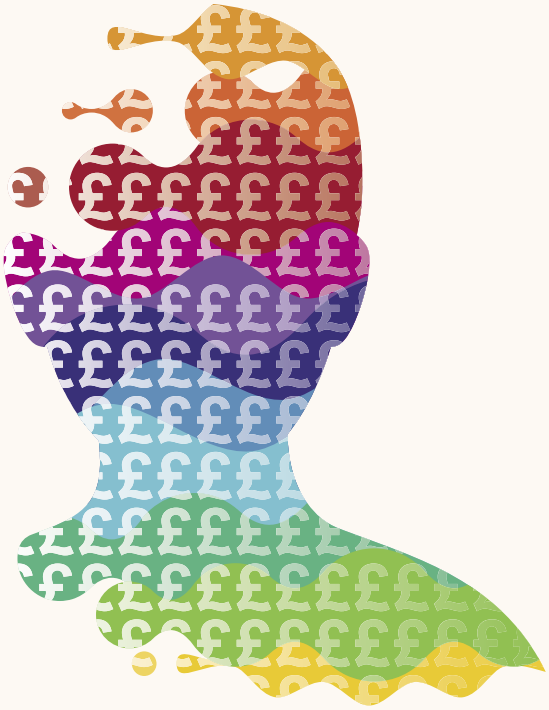
Wafa, H.A., Wolfe, C.D.A., Bhalla, A. and Wang, Y. (2020). Long-term trends in death and dependence after ischaemic strokes: A retrospective cohort study using the South London Stroke Register (SLSR). PLOS Medicine, 17(3), p.e1003048. doi:https://doi.org/10.1371/journal.pmed.1003048.

Williams, W.H., Chitsabesan, P., Fazel, S., McMillan, T., Hughes, N., Parsonage, M. and Tonks, J. (2018). Traumatic brain injury: a potential cause of violent crime? The Lancet Psychiatry, [online] 5(10), pp.836–844. doi:https://doi.org/10.1016/s2215-0366(18)30062-2.

Williams, W.H., Mewse, A.J., Tonks, J., Mills, S., Burgess, C.N.W. and Cordan, G. (2010). Traumatic brain injury in a prison population: Prevalence and risk for re-offending. Brain Injury, 24(10), pp.1184–1188. doi:https://doi.org/10.3109/02699052.2010.495697.

Wolffbrandt, M.M., Kruse, M., Fin Biering-Sørensen, Schow, T. and Norup, A. (2024). Children with Parents or Siblings with Acquired Brain or Spinal Cord Injury: A Nationwide Register-Based Cohort Study on Long-Term Socioeconomic Consequences. [online] doi:https://doi.org/10.2139/ssrn.4894821.

Yoon, C.W. and Bushnell, C.D. (2023). Stroke in Women: A Review Focused on Epidemiology, Risk Factors, and Outcomes. Journal of Stroke, 25(1), pp.2–15. doi:https://doi.org/10.5853/jos.2022.03468.



The Cost of Acquired Brain Injury to the UK Economy

RIGHT TO REHAB

TIME TO INVEST IN REBUILDING LIVES AFTER BRAIN INJURY

UKABIF

The United Kingdom Acquired Brain Injury Forum

UKABIF is a registered charity number 1128284 and a company limited by guarantee registered in England and Wales
Company Number: 6520608. Address of the Company's Registered Office: 124 City Road, London, EC1V 2NX