

Stroke and Health Inequalities An Evidence Summary

October 2025

Author: Thoreya Swage

Acknowledgments:

Carolyn Smith, Bodleian Health Care Libraries, University of Oxford, UK for search methods, search strategies and choice of databases.

Anna Beckett, editor

This literature summary was undertaken as part of a National Institute for Health Research grant, Invention for Innovation.

Contents

1	Summary	2
2	Introduction	5
3	Prevalence and incidence.....	8
4	Access to healthcare.....	15
5	Outcomes of care.....	17
6	Experience of care.....	22
7	Religion and health beliefs	24
8	Shared decision-making.....	26
9	Conclusions.....	27
	Appendix A:Methodology and search strategy	29
	Appendix B: Findings by health inequality group	30
	Appendix C: Bibliography.....	47

1 Summary

This report outlines what is known about mechanical thrombectomy and stroke, and health inequalities, with particular emphasis on findings relevant to the UK. It explores prevalence of stroke in different groups, and what is known about access, experience and outcomes of healthcare for stroke. It does this as a first step in understanding how strokes might impact on different groups, and to provide an initial point of reference for anyone with a specific interest in a particular group, or looking to understand where the major gaps are in the current literature.

Stroke is a clinical syndrome of presumed vascular origin characterised by rapidly developing signs of focal or global disturbance of cerebral functions which last longer than 24 hours or leads to death.^[1] A stroke can be caused by occlusion of the blood vessels or bleeding in the brain. The major risk factors are high blood pressure, diabetes, atrial fibrillation, high cholesterol, age, lifestyle factors, family history, and transient ischaemic attack.^{[2], [3]}

In the UK there are over 100,000 strokes occurring each year with approximately 1.3 million people living with stroke at an estimated aggregate societal cost of £26 billion per year, including £8.6 billion for NHS, and social care (see section 3).^{[4],[5]} The number of finished hospital admission episodes of strokes in England has risen nearly every year since 2008,^[6] and are projected to rise further.^{[7], [8]}

Although stroke is most likely in older people (aged 70+), there are an increasing number of admissions among people aged 50-69 (see section 3.2) which may be associated with a number of factors including better detection, and reporting, hypertension, obesity, poor diet, and lack of exercise.^[9] There are different risk factors for men, and women, and events such as divorce can increase the risk of a stroke.

Stroke is a leading cause of death, and disability causing around 38,000 deaths each year in the UK (see section 5).^[10] For people who survive there can be significant impacts including severe disability,^[11] loss of sight,^[12] difficulties in verbal, and written communication (aphasia),^[13] and dementia.^[14] Post stroke depression is common,^[15] and stroke survivors experience long-term emotional, physical, and socioeconomic difficulties after their stroke.^[12]

Women, people living in areas with high deprivation, and Black and Asian people are at risk of worse outcomes. Stroke can also be a serious complication associated with pregnancy. There was limited evidence in the literature reviewed about outcomes for other health inequality groups (see chapter 5).

When a stroke occurs it is important that the patient is able to access care quickly.^[16] The evidence (chapter 4) suggests that stroke may be identified more quickly in some groups than in others, and this in turn impacts on how quickly people are able to access the care they required. Specifically, younger people, women, and Black people may not access treatment as quickly.

Many of the papers identified in the review were not based on UK data. While there were extensive studies into prevalence, and mortality, there was significantly less insight into the access, experiences, and morbidity of stroke in different UK populations. An overview of the findings is included in Table 1 below, and are colour coded to indicate the strength of evidence: this review found limited high-quality evidence, particularly beyond age, gender, race, and deprivation.

Table 1: Key evidence for each group included in the review

	Prevalence/outcomes	Access	Experience
Age	Higher incidence, higher mortality. Increasing incidence in people aged 50 – 79.	Younger people may experience delays in diagnosis.	Qualitative evidence young people were asked insensitively about drug use. Initial tests not always correct.
Sex/gender	More male admissions than female in UK since 2014 (before 2014 the reverse was true). Different risk factors for male/female.	Women may experience delays accessing care.	Men and women have different symptoms. Inconsistency in vision services for women.
Deprivation / employment / poverty	Low income and income inequality predict stroke, severe stroke and mortality.	People in most deprived areas of England are less likely to receive oral anticoagulant therapy.	Inconsistency in vision services for low socioeconomic status.
English not first language / low literacy / Poor health literacy	Lower education may be associated with greater stroke risk .	No UK evidence.	Inconsistency in vision services for people with low education.
Gender reassignment	Hormonal therapy in male to female transgenders may confer cardiovascular risks.	No UK evidence.	No UK evidence.
Sexual orientation	Gay people may be at greater risk .	No UK evidence.	No UK evidence.
Pregnancy/maternity	Stroke is a serious complication of pregnancy, associated with high morbidity and mortality.	Low awareness of pregnancy related strokes may result in delays in receiving care.	No UK evidence.
Marriage / civil partnership	Divorce may be associated with a higher risk of stroke, especially in men. Mortality risk for single people.	No UK evidence.	No UK evidence.
Race / ethnicity	Black, and Asian people at higher risk of stroke than White people, and at risk of worse outcomes.	Black people experience late hospital arrivals and low rates of mechanical thrombectomy.	Inconsistency in vision services for Black people.
Asylum seeker / refugee	Refugee experience may be a risk factor.	No UK evidence.	No UK evidence.

Disability	Pre-stroke multimorbidity may be a predictor of stroke mortality.	People with disabilities do not receive equitable access to treatment.	No UK evidence.
Mental health and substance use	Pre-existing severe mental health, and drug use associated with both higher risk of stroke.	Rehab for patients with pre-stroke cognitive impairments is influenced by gaps in clinician knowledge, and service constraints.	Loneliness is common post-stroke.
Rural / urban / coastal	No UK evidence.	Use of helicopter is cost-effective if it reduces travel time by 60+ minutes.	No UK evidence.
Homelessness	CVD, including stroke, in the homeless population has high prevalence, incidence, and 1-year mortality risk.	No UK evidence.	No UK evidence.
Criminal justice	CVD is leading cause of mortality in prisons in England, and Wales.	No UK evidence.	No UK evidence.

2 Introduction

This review examines the literature, and grey literature on mechanical thrombectomy, and stroke with respect to health inequalities focussing on prevalence, and incidence, access to healthcare, outcomes of care, experience of care, religion, and health beliefs, and shared decision-making.

As there is not extensive research available into stroke, and health inequalities, we have included potentially lower quality data, but have included caveats where findings should be treated with extra caution. We have not undertaken a full assessment of the quality of evidence as the aim was to undertake a pragmatic review to identify what evidence exists, enabling people to deep dive into the audiences that are most relevant to them.

Full details of the approach to the literature searches, and inclusion criteria are included in Appendix A.

The main report body is split into the following chapters:

- introduction including important definitions.
- stroke prevalence, and incidence.
- access to healthcare for stroke, including speed of access to a diagnosis.
- outcomes of care for stroke.
- experiences of care for stroke, including experiences after discharge.

Each chapter has an overview, and then takes the evidence for each health inequality group in turn where information was available. At the end of each chapter there is a summary of the 'missing' health inequality groups for which no evidence was identified in the literature searches. Finally, in Appendix B the same data is restructured by inequality group (i.e. prevalence, outcomes, access, and experience for each group) for readers interested in a particular protected characteristic or vulnerable group.

2.1 Definition of stroke

Stroke is a clinical syndrome of presumed vascular origin characterised by rapidly developing signs of focal or global disturbance of cerebral functions which last longer than 24 hours or leads to death. ^[1] A stroke can be caused by occlusion of the blood vessels or bleeding in the brain. The major risk factors are high blood pressure, diabetes, atrial fibrillation, high cholesterol, age, lifestyle factors, family history, and transient ischaemic attack. ^[2] ^[3] People living with HIV have an elevated risk of cardiovascular disease (CVD) , particularly heart failure and stroke. ^[17] , ^[18]

There are three different types of stroke: ^[19]

- Ischaemic stroke – caused by a blockage cutting off the blood supply to the brain.
- Haemorrhagic stroke – caused by bleeding in or around the brain.
- Transient ischaemic attack (TIA) also known as a mini-stroke – the same as a stroke, but symptoms last less than 24 hours.

The most common experiences of a stroke reported by stroke survivors are numbness, and weakness on one side of the body, but stroke symptoms can vary in severity, and in presentation.

^[20]

2.2 What are health inequalities?

According to NHS England “Health inequalities are unfair, and avoidable differences in health across the population, and between different groups within society. These include how long people are likely to live, the health conditions they may experience, and the care that is available to them.”^[21]

This review sought evidence relating to the following characteristics, chosen as they include the protected characteristics as stated in the equality act (2010). They also focus on the Government guidance on health disparities and health inequalities (Oct 2022):

- Age
- Sex
- Deprivation/employment/poverty
- Literacy/education and English not first language
- Gender / sexual orientation
- Pregnancy/marriage
- Race and ethnicity¹
- Religion / belief
- Asylum seekers / refugees
- Disability
- Mental illness & substance use
- Geography – urban/rural
- Homeless
- Criminal Justice system

There are two important considerations when reading this report: firstly, that these characteristics are often found in combination, and this intersectionality can exacerbate health inequalities further. The report addresses each one separately, but it is important to note this might understate the inequalities experienced by some individuals.

Secondly, the ability to report on health inequalities relies on these characteristics being captured in the relevant datasets. NHS coding of demographic information, specifically race, is not consistent, and therefore has the potential to introduce error into patient’s records. Recent work by the Office for National Statistics has demonstrated that of those recorded as White British in health admin data sources, more than 96% reported the same ethnicity in the National Census. However for Black, and mixed ethnicity records the level of congruence was significantly lower.^[22] Missing or incorrect data might also apply for other demographic information, including disability,^[23] and other social determinants of health.^[24]

2.3 NHS Stroke services

NHS England has published a toolkit (RightCare Stroke Toolkit) which aims to support local health systems to understand the priorities in stroke prevention, identification, acute care, and rehabilitation.^[25]

2.3.1 Organisation of services

The 2024 national clinical guidelines for stroke^[4] makes recommendations for the organisation of stroke services including:

- pre-hospital emergency services should be configured to maximise the delivery of timely acute treatments to the local population. The Getting It Right First Time (GIRFT) stroke report recommends an On Scene Time of less than 30 min for English ambulance services.^[16]
- the mainstay of treatment for acute stroke at a population level, remains specialist stroke unit care resulting in saving lives, reducing long-term brain damage, disability, and healthcare costs.^{[26], [27]}

¹ The approach used to report on race and ethnicity in this report follows the Government style guide <https://www.ethnicity-facts-figures.service.gov.uk/style-guide/writing-about-ethnicity/>

- community stroke rehabilitation services, including delivery of early supported discharge should be provided in a timely way following hospital discharge.

A robust governance infrastructure should be in place to monitor the quality of stroke services delivered which should include:

- hyperacute, acute, and rehabilitation stroke services providing specialist medical, nursing, and rehabilitation staffing levels matching the recommendations of the guidelines. Rehabilitation should be available seven days a week, with initial assessment taking place by Occupational Therapists, Physiotherapists, and Speech and Language Therapists within 24 hours of admission.
- a stroke rehabilitation unit should have access to a consultant specialising in stroke rehabilitation (medical or non-medical, i.e., nurse or therapist, where professional regulation permits).
- a service providing early supported discharge and community stroke rehabilitation should comprise a multidisciplinary core team structure.
- the intensity, and duration of intervention provided by the community stroke rehabilitation team should be established between the stroke specialist, and the person with stroke and be based on clinical need tailored to goals.

There is a variation in the delivery of the six-month review which provides a holistic, systematic review of the ongoing needs faced by stroke survivors in England. The provider organisation may be a driving factor in this variation. ^[28]

2.3.2 Access to mechanical thrombectomy

Thrombectomy is an emergency procedure performed by a specialist team who use specialised equipment to physically remove the clot from the artery in the brain in order to restore the blood supply. If mechanical thrombectomy is not feasible, there is no known better alternative treatment to remove or dissolve the clot. ^[29] It is estimated that approximately 15% of admitted UK stroke patients are eligible for thrombectomy. ^[30]

An article in the British Journal of Hospital Medicine states that only 2% of patients with ischaemic stroke in the UK currently receive Mechanical Thrombectomy (MT) which means that over 7000 eligible patients per year miss out. Currently there are only 24 neuroscience centres in the UK that could be capable of performing mechanical thrombectomy, and very few of those provide a continuous 24/7 service. This means that most potentially eligible patients will present first to a hospital without these facilities. Currently MT is performed by interventional neuroradiologists. In other countries this workforce is expanded by the use of trained interventional cardiologists. ^[31]

2.3.3 Rehabilitation services

The guidelines ^[4] state rehabilitation, and recovery should include support including face-to-face, telerehabilitation, and self-directed practice. Where appropriate:

- people with motor recovery goals undergoing rehabilitation after a stroke should receive a minimum of three hours of motor therapy a day at least five days out of seven at an effective dose.
- healthcare professionals should select screening tools, and assessments for psychological, and cognitive problems appropriate to the needs of the person with stroke.
 - Between 20-50 hours of intensive speech, and language therapy may be considered from three months after stroke for those who can tolerate high-intensity therapy.
 - healthcare professionals should use a validated measure in their assessment of post-stroke fatigue at regular intervals.

- people with stroke should be considered to have the potential to benefit from rehabilitation at any point after their stroke based on need.

As one quarter of all strokes are recurrent, secondary prevention should be delivered as soon as possible. Prevention should be continued long term through a comprehensive, and personalised approach, addressing multiple vascular risk factors including the management of blood pressure, lipid lowering treatment, and atrial fibrillation.

3 Prevalence and incidence

3.1 Overview

There has been a downward trend in the global age standardised stroke incidence, prevalence, and mortality rates observed globally between 1990 to 2021. ^[32] In the UK, there are over 100,000 strokes occurring each year with approximately 1.3 million people living with stroke at an estimated aggregate societal cost of £26 billion per year, including £8.6 billion for NHS, and social care. ^[4], ^[5] The number of finished hospital admission episodes of strokes in England has risen nearly every year since 2008. ^[6]

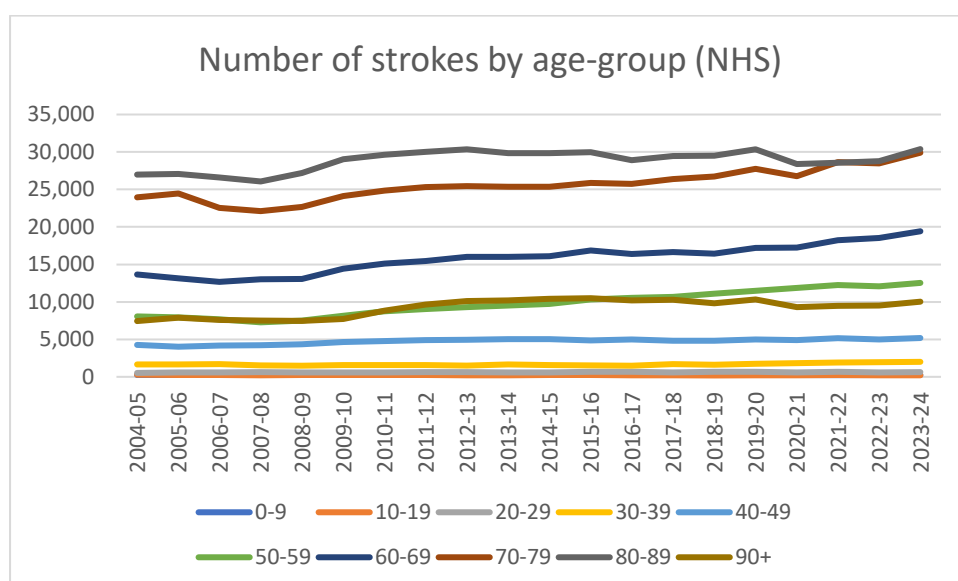
Between 2015, and 2035, the number of strokes in the UK per year is projected to increase by 60%, and the number of stroke survivors is projected to rise to 2.1 million by 2035. ^[7], ^[8] The increase in admissions among ages 50-59 may be associated with a number of factors including better detection, and reporting, hypertension, obesity, poor diet, and lack of exercise. ^[9]

3.2 Age

The incidence of initial stroke is higher in older populations, ^[33] as is the risk of recurrence 10 years after the event. ^[34] A study in Oxford demonstrated that stroke incidence in people younger than 55 years was increasing between 2002-2010 vs 2010-2018, while there was a decrease in strokes among those aged over 55 years across a similar time period. ^[35] A systematic review has also identified increasing incidence of stroke in younger people. ^[36]

The chart below (Figure 1) shows a gradual increase in the number of hospital admissions for strokes overall (using counts of Finished Admission Episodes). Historically the 80 to 89 year old age group experienced the majority of incidents, but in line with the findings above, the percentage of the hospital admissions for strokes occurring in people aged between 50, and 80 is increasing. ^[6]

Figure 1: Number of strokes by age-group ^[6]



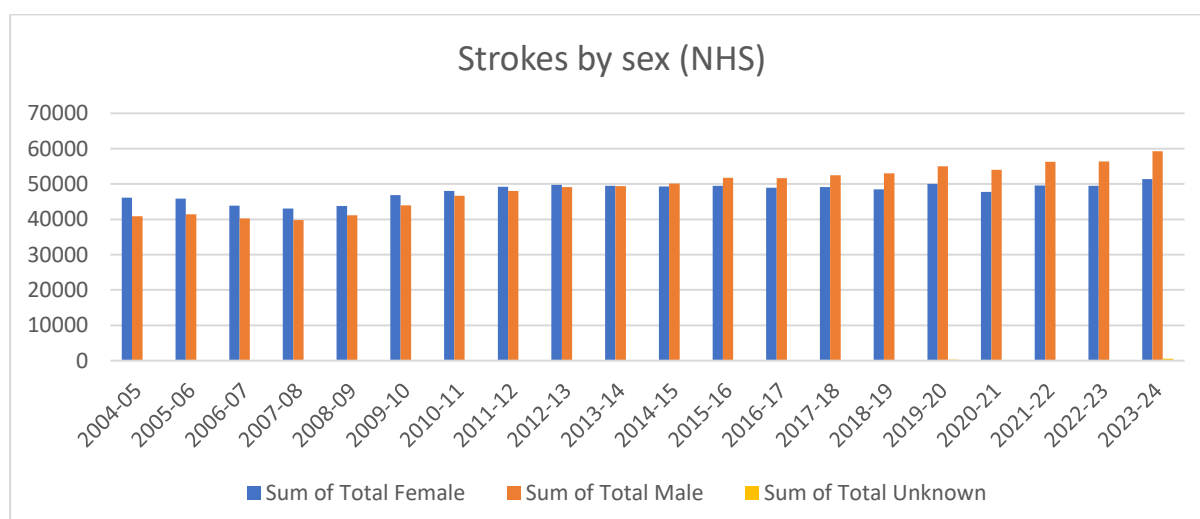
Approximately 5 - 15% of all ischaemic strokes occur in young adults. The key features of the disease, including incidence, risk factors, underlying causes, mortality, outcomes, as well as long-term risks of recurrent events are different from those for older patients. ^[37]

3.3 Sex / Gender

A UK Biobank cohort study found the rate of any stroke in men is 13.96 per 10,000 person-years compared with 8.66 in women. ^[38] There has been a downward trend in stroke incidence, prevalence, and mortality rates observed globally between 1990 to 2021, and the sex gap reduced in this period. ^[32] Subarachnoid haemorrhage (SAH) tends to be more common in women than in men. ^[39]

The NHS hospital episode data ^[6] (Figure 2) shows that in terms of raw number of admissions, until 2013-14 females experienced more strokes than males, but since 2014 this has reversed and the gap appears to be widening with more men experiencing strokes each year.

Figure 2: NHS hospital admissions for stroke by sex ^[6]



Specific risk factors are more strongly associated with the risk of stroke in women. ^[38] These include:

- hypertension. ^[38]
- smoking. ^[38]
- low socioeconomic status. ^[38]
- experience early menopause (<40 years old) compared with women who experienced the transition to menopause between 50, and 54 years old. ^[40]

Diabetes is associated with a higher incidence of ischaemic stroke, and atrial fibrillation in haemorrhagic stroke in women. ^[38]

Other risk factors for stroke that are unique to women include:

- the effect of endogenous hormones such as early age at menarche and low Dehydroepiandrosterone levels. ^[41]
- exogenous oestrogens (e.g. the contraceptive pill, and transgender oestrogens' and pregnancy related exposures). ^[41]
- pregnancy (see 3.8 below).
- non-hormonal risk factors:
 - a pre-stroke disability.
 - atrial fibrillation.
 - obesity.
 - widowed.
 - being alone. ^{[39], [42]}

A review of the role of psychosocial factors and stroke showed that these were associated with an increased risk of ischaemic, and haemorrhagic stroke in populations of all ages and were more predominant in women. The psychosocial factors included job strain, psychological interpersonal, and behavioural stress, and social deprivation. ^[43]

Male-specific characteristics increasing stroke risk include medical androgen deprivation therapy for ischaemic, and erectile dysfunction. ^[44]

3.4 Deprivation/employment/poverty

Cohort studies have demonstrated low income, and income inequality are predictors of incident stroke, ^{[45], [46]} and mortality, ^{[47], [48], [49], [50]} with lower net income predicting a more severe stroke. ^[51]

3.5 Literacy/health literacy/education/English not as first language

Lower education level is associated with increased stroke risk in mid-age women, and is mainly explained by lifestyle and physiological factors. ^[52] A meta-analysis has shown that stroke risk increases with lower education. ^[53]

3.6 Gender reassignment

Hormonal therapy in male to female transgenders may confer cardiovascular risks in this population. ^[54] A review on Gender Affirming Hormone therapy found that the use of some oestrogens in trans women induces an increased risk of myocardial infarction, and stroke. However, another study found that the risk is irrespective of being in receipt of Gender Affirming Hormones. ^{[55],[56]} The higher risk may be due to the potential impact of poor mental health, chronic stress, and discrimination on cardiovascular health. ^[55]

Alteration of cardiometabolic parameters, such as hypertension are observed in trans gender persons, including younger subjects, undergoing Gender Affirming Hormone therapy. ^[57] The thrombosis risk of hormone therapy in adolescent, and young adult populations was found to be high in an American study, however thrombosis incidents were rare. ^[58]

Studies have shown that female to male people treated with testosterone do not have an increased risk of cardiovascular (CVD) after 15 years of follow up. ^[59]

Transgender individuals have high rates of undiagnosed, and untreated comorbidities, such as hypertension, and dyslipidaemia, which increase the risk for CVD. ^[60]

3.7 Sexual orientation

The evidence about sexual orientation is mixed. According to the LGBTQ Institute, older women who identify as gay or bisexual have a higher prevalence of stroke, heart attacks, and other health conditions compared with women who identify as heterosexual. ^[61] Another study showed that lesbian women reported lower rates of heart attack, but bisexual women had higher rates of stroke than heterosexual women. ^[62]

Gay men, and bisexual women have a higher prevalence of hypertension than their heterosexual counterparts of the same sex. Bisexual women may also be at higher risk for undertreated hypertension than heterosexual women. ^[63]

Lesbian, gay, and bisexual individuals experience significant health disparities related to social stressors. A study showed an excess of psychosocial, and behavioural risk factors (e.g. mental distress, depression, smoking, and alcohol misuse) for CVD in sexual minority women. Sexual minority men displayed higher rates of psychosocial risk factors for CVD. ^[62]

Young adults who identify as lesbian, gay or bisexual may be more susceptible to stroke, and heart disease than their heterosexual peers. ^[64]

3.8 Pregnancy

Stroke is a serious complication of pregnancy, associated with high morbidity, and mortality. Recurrence of stroke occurs in a small proportion of patients, and the risk is highest during the initial three months. ^[65] There is an increase in the prevalence of several stroke risk factors among pregnant women, particularly advanced age, hypertensive disorders of pregnancy, diabetes, and obesity. ^[66]

Stroke associated with pregnancy, and post-partum occurs in about 30 per 100,000 deliveries, ^[67] with the highest-risk time period for maternal stroke being the immediate postpartum period. ^[68] The relative risk of suffering from haemorrhagic stroke is three times higher than ischaemic stroke during peripartum, and postpartum periods when compared with antenatal period. ^{[69] , [70] , [71] [72]}

Infertility, and recurrent stillbirths are associated with an increased risk of non-fatal ischaemic stroke, and fatal haemorrhagic stroke, whilst recurrent miscarriages are associated with increased risk of fatal or non-fatal stroke, both haemorrhagic and ischaemic. ^[73]

Women who have experienced miscarriage or stillbirth early in life have an increased risk of stroke in later life. ^[74] Similarly, preeclampsia, and hypertension in pregnancy are a risk factor for later-life stroke. ^{[75], [76]}

3.9 Marriage/Civil partnership

A Danish study found that divorce is associated with higher risk of stroke, especially in men, and that living in marriage or as unmarried or widower has little or no impact on the risk of stroke. ^[77] Stroke mortality risk may be higher for people who had never married, as well as for those who have experienced divorce, and bereavement. ^[78]

3.10 Ethnicity

White patients are at increased risk of mortality, and post intervention intracerebral haemorrhage following a stroke compared with Black patients, ^[79] but they are less likely to experience a stroke. A report by the Commission on Race and Ethnic Disparities found that ^{[80], [81]}:

- Black people in the UK have 1.5 to 2.5 times greater risk of having a stroke than White people.
- people from the Asian population have a risk for stroke about 1.5 times greater than White people, particularly those in the Pakistani and Bangladeshi ethnic groups.
- people of Chinese origin have lower risk of stroke than White people.

Data from the stroke register in London from 1995 to 2010 showed that while stroke incidence decreased by 40% for White people during that period it did not decrease for Black people. ^[82]

The Bradford Stroke Study found 155 first ever strokes per 100,000 person-years for Pakistani people in the region compared with 101 for White people. ^[83] Between 2005-2012 the Roma Support Group, a voluntary sector organisation, reported that 60% of the Roma population in touch with them had poor physical health including CVD. ^[84]

3.10.1 Genetic and disease-related risk factors related to ethnicity

Literature reviewed identified a number of genetic, and disease-related risk factors for stroke for Black and Asian people:

- **Lipoprotein (a):** Stroke in Black populations is highly heritable and influenced by genetic determinants underlying cardiovascular risk factors. ^[85] Lipoprotein (a) is a specific risk factor for stroke in Black people. Lipoprotein (a) levels are higher in Black compared with White people, and is genetically determined. ^[86]
- **Type 2 diabetes:** Black people who are found to have a greater risk of having type 2 diabetes, and abnormal lipid traits have an increased risk of ischaemic stroke. ^[87]
- **Systemic Lupus Erythematosus (SLE):** SLE is an autoimmune condition that mainly affects women. It is more common in Black, and Asian women than White women. SLE can cause kidney damage leading to hypertension which is a risk factor for stroke. ^[88] There is an elevated stroke risk among Black, and Hispanic people who had SLE compared with White people. ^[89]
- **Sickle Cell Disease (SCD):** SCD is found at a low frequency in all populations, the highest prevalence occurring in Black people. SCD also occurs in families originating from the Middle

East, India, and the eastern Mediterranean, with increasing numbers of cases in mixed-race families.^[90] The prevalence of stroke in Asian patients with sickle cell anaemia is 5% with a range from 1% to 41%.^[91] There is a four-fold higher risk of incident stroke associated with use of oral contraceptives in women with SCD.^[92]

3.10.2 Lifestyle factors related to ethnicity

The literature reviewed found that Black, Asian, and Chinese people who experienced a stroke had similar or lower prevalence of drinking alcohol and smoking compared with White people, and that they can have earlier onset of stroke as demonstrated in the examples below.

The Pakistani people who experienced a stroke in the Bradford study were significantly younger and had more obesity and diabetes mellitus. They were less likely to have atrial fibrillation, be ex- or current smokers, or drink alcohol above the recommended level compared with White people.^[83] Another study found that Asian people generally experience ischaemic stroke approximately nine years earlier than White people.^[93]

Chinese ischaemic stroke patients have younger onset of stroke compared to White people. They have similar prevalence of hypertension, diabetes, smoking, and alcohol misuse, and significantly lower prevalence of atrial fibrillation, ischaemic heart disease, and hypercholesterolemia.^[94]

3.11 Asylum seekers/refugees

According to a 2022 systematic review, refugee experience is an independent risk factor for CVD.^[95] This may be particularly the case in the younger refugee population.^[96]

3.12 Disability

Pre-stroke multimorbidity is highly prevalent, and is an independent predictor of death after stroke.^[97] A Taiwanese cohort study found that stroke rates are higher among people with disabilities, such as a balance disorder, and intractable epilepsy, compared to the general population, and people with dementia, and multiple disabilities are associated with a higher stroke risk and death rate.^[98]

3.13 Mental illness and substance use

Pre-existing Severe Mental Illness is associated with higher risks of mortality, and further vascular events following a stroke.^[99]

For people with bipolar disorder or depression, living in an area with higher deprivation conveys a greater absolute risk of ischaemic heart disease, and stroke.^{[100], [101]}

Drug use is associated with stroke, especially in young people. The major classes of drugs linked to stroke are cocaine, amphetamines (including amphetamine type stimulants), heroin, morphine, cannabis, and new synthetic cannabinoids, along with androgenic anabolic steroids (AASs). These drugs can cause both ischaemic, and haemorrhagic stroke.^{[102], [103], [104]}

Social isolation substantially increases the risk of stroke,^{[33], [105]} and the risk that the first event is fatal before reaching hospital, particularly among people who live alone. This may be due to the absence of immediate help in responding to an acute heart attack or stroke.^[106]

3.14 Geography

A Canadian study found that risk factors were more prevalent, and less likely to be controlled in rural than in urban residents without prior stroke. In those with prior stroke, risk factor prevalence, and treatment were similar. ^[107]

3.15 Homeless

CVD including stroke in the homeless population has high prevalence, incidence, and 1-year mortality risk post-diagnosis. There was shown to be a high burden of risk factors in the UK and USA. ^[108] , ^[109] Homeless young stroke patients have significant comorbidities, increased hospitalisation rates, and adverse clinical outcomes. ^[110]

Risk factors for stroke can lead to elevated CVD or stroke risk in homeless people including:

- cocaine use in high-risk populations such as homeless women. ^[111]
- mental health conditions, particularly among males, and those diagnosed with substance dependence. ^[112]
- predictors of developing recurrent stroke, and subsequent death within the homeless veteran population in the US include hypertension, diabetes, and renal disease. ^[113]

3.16 Criminal justice system

Literature reviewed included limited information about strokes in the UK criminal justice system. People who experience incarceration in the USA have a heightened risk for cardiovascular disease (CVD) including stroke, ^[114] and CVD is a leading cause of mortality in prisons in England and Wales. ^[115] The burden of CVD in the American prison population is greater in Black, and Latina women, and Black men compared to White women and men, respectively. ^[116]

4 Access to healthcare

When a stroke occurs, it is important that the patient is able to access care quickly (Section 2.3.1). The evidence in this section suggests that stroke may be identified more quickly in some groups than in others, and this in turn impacts on how quickly people are able to access the care they required.

4.1 Age

There was limited evidence in the literature reviewed about the impact of age on access to healthcare for stroke. An Australian article suggests that young people experience delays in early recognition, and treatment of stroke which can result in many years of disability with associated social and financial burden.^[117] Similarly, it is possible that diagnosis of stroke in young people with Sickle Cell Disease can be delayed by the presence of similar symptoms such as headaches, and seizures due to SCD.^[118]

For older people, the South London stroke register has demonstrated that people aged 75 or more years are less likely to have brain imaging following a stroke, but are more likely to receive occupational therapy or physiotherapy as part of their rehabilitation.^[119]

4.2 Sex / Gender

There is some evidence, mostly from the USA, that women may be more likely to experience delays accessing care for stroke. A meta-analysis found that older women are less likely to seek help in when they experience a stroke.^[120] Women, especially older women and those living alone, are more likely to experience delays in receiving reperfusion therapy (including thrombectomy) than men.^[121] Additionally, women are less likely to be evaluated by stroke specialists, and to undergo standard diagnostic testing compared with men.^[122] This may be due to women presenting with stroke mimics or non-traditional stroke symptoms which can be misdiagnosed.^[123]

A Scottish population based study found women are less likely to receive antihypertensives,^[124] lipid-lowering drugs, or oral anticoagulants after discharge following a stroke.^[125] In the USA, the rate of Mechanical Thrombectomy (MT) has increased in both men and women by nearly 30-fold in the nine years preceding the publication of pivotal clinical trials on MT in 2015 with a 12% higher likelihood for women to receive MT after ischemic stroke.^[126]

4.3 Deprivation/employment/poverty

There was limited evidence in the literature reviewed. People at risk of stroke living in the most deprived areas of England are less likely to receive oral anticoagulant therapy than people living in the least deprived areas.^[127] People living in deprived areas in the USA are more likely to have delays,^[128] or lower rate of admission to hospital and lower access to care.^[119]

4.4 Literacy, health literacy education/English not as first language

There was limited evidence in the literature reviewed. Swedish studies have shown that university-educated patients are more likely to be treated with reperfusion therapy for stroke than patients with secondary or primary education.^[129],^[130]

4.5 Sexual orientation/ gender reassignment

There was limited evidence in the literature reviewed. A small American cohort study found that sexual, and gender minority people are more likely to have recurrent strokes, and delay their presentation to hospital. ^[131]

4.6 Pregnancy

There was limited evidence in the literature reviewed. A meta-analysis found low awareness of pregnancy related strokes may result in delays in receiving care. ^[66]

4.7 Ethnicity

Several studies have found that Black people experience late hospital arrivals, and low thrombolysis, and mechanical thrombectomy rates ^[132] following a stroke compared to White people, ^{[133], [133], [134]}. They are also less likely to be treated for post stroke complications. ^[135] These disparities were not fully explained by sociodemographic or stroke-related factors. ^[133]

Similarly, a Danish study found that immigrants had lower chances of early stroke unit admission, and received fewer individual early stroke care processes such as dysphagia screening, physiotherapy, and occupational therapy than Danish-born residents. ^[136]

Generally, Black people have lower access to poststroke care. ^[137]

4.8 Disability

A systematised review found that people with disabilities do not receive equitable access to treatment ranging from being admitted to stroke units to receiving post-stroke rehabilitation. ^[138] This includes people in stroke rehabilitation with pre-existing cognitive impairments. ^[139] Insights from bioethics, disability rights, health law into the context of prevailing research, and clinical practices show that disability drives decisions to withhold acute stroke interventions, and may perpetuate disparate health outcomes, and undermine ethically resilient stroke care. ^[140]

A review examining the use of mechanical thrombectomy for acute ischaemic stroke in patients with pre-morbid disability has shown that there is the potential for a substantial proportion of these patients to return to their pre-morbid state, but they experience a greater rate of treatment-related complications. ^[141] A small USA study found persons with pre-existing disabilities represented over one-third of acute stroke presentations, but accounted for a far smaller proportion of those receiving endovascular thrombectomy, and thrombolysis. ^[142]

4.9 Mental illness and substance use

There was limited evidence in the literature reviewed. Clinicians' decision-making about ongoing rehabilitation for patients with pre-stroke dementia/cognitive impairments is influenced by gaps in their knowledge, and by service constraints. ^{[143], [139]} People with dementia who have had a stroke are less likely to be prescribed antihypertensives. ^[124]

4.10 Geography

It is important that patients experiencing a stroke are treated quickly, and ideally in a specialist stroke unit (see 2.3.1). Modelling has demonstrated that for patients eligible for mechanical thrombectomy in remote English hospitals using a helicopter may be cost-effective when travel time is reduced by at least 60 minutes compared with ground emergency medical services. ^[144]

A Canadian study found that patients from rural areas were less likely than those from urban areas to receive stroke unit care, brain imaging within 24 hours, carotid imaging, and consultations from neurologists, physiotherapists, occupational therapists, and speech and language therapists. They were also less likely to be transferred to inpatient rehabilitation facilities following a stroke. ^[145]

4.11 Homeless

An American study surveying a homeless population in Chicago found a high prevalence of poor stroke awareness during the covid-19 pandemic. In addition, dietary habits worsened, and physical activity levels decreased during this time. ^[146]

4.12 Missing evidence

The literature searches did not find any data about stroke access related to:

- marriage/civil partnership.
- asylum seekers/refugees.
- Roma/travellers.
- people in the criminal justice system.

The searches also did not find any relevant UK data about stroke access in the following groups:

- homeless
- literacy/health literacy/education/English not as first language
- sexual orientation/ gender reassignment

5 Outcomes of care

Stroke is a leading cause of death, and disability causing around 38,000 deaths each year in the UK. ^[10] For people who survive there can be significant impacts:

- in the UK, over 20% of patients leaving hospital after a stroke will be severely disabled. ^[11]
- 60% of people who have a stroke have some loss of sight as a result, and experience long-term emotional, physical, and socioeconomic difficulties after their stroke. ^[12]
- people who experience profound difficulties in verbal, and written communication (aphasia) following a stroke experience social exclusion. ^[13]
- the incidence of dementia is nearly 50 times higher in the year after a major stroke compared with that in the general population. The 5-year risk of dementia post stroke is associated with age, event severity, previous stroke, dysphasia, baseline cognition, low education, pre-morbid dependency, leucoaraiosis (brain white matter changes seen on imaging), and diabetes. ^[14]
- post stroke depression is common, affecting approximately one in three stroke survivors. However, it is not always identified. ^[15] The presence of depression after stroke increases stroke mortality 35-fold, highlighting the importance of identifying, and treating depression among stroke survivors. ^[36]

The Stroke Association notes that although the physical effects of stroke can be seen easily, the hidden effects are less obvious to others such as cognition (e.g. memory and concentration problems as well as fatigue), mental health (e.g. anxiety, depression and lack of confidence) and emotional impact (e.g. feeling frustrated, lonely and nervous). ^[147] The wider impacts of stroke affect every part of a person's life including important relationships, the ability to get back to work, social life and independence. ^[148]

Moral support from friends and family immediately after stroke is associated with decreases in later depression levels, and increases in activities of daily living. ^[149] Similarly, a small study has shown that the Wellbeing After Stroke (WATERs) intervention which includes, 9-weekly, structured online group sessions, reduces self-reported depression in stroke survivors. ^[150]

Different models of care can impact on outcomes:

- Integrated Stroke Delivery Networks (ISDNs) bring together providers, patient voice representatives, and commissioners of stroke services from across the whole of the stroke pathway including pre-hospital, rehabilitation, and life after stroke. Research shows that networked stroke services deliver significant improvements in patient outcomes. ^[151]
- Integrated Community Stroke Services (ICSS) aim to improve the quality of stroke services in the community, and address health inequalities. Prior to the introduction of ICSS, early supported discharge was shown to reduce long-term dependency, and admission to institutional care. This service was only provided for up to six weeks and was suitable for up to 40% of patients. ICSSs aim to provide multidisciplinary support to all stroke patients up to six months post stroke with an option to re-refer. The service aims to be available to all stroke survivors so that patients would not be left without access to specialist services during the period of time that is crucial for their recovery.

Different treatments also impact outcomes:

- Endovascular thrombectomy is of benefit to most patients with acute ischaemic stroke caused by occlusion of the proximal anterior circulation. ^[152]
- Mechanical thrombectomy contributes to a significant reduction in disability rate compared to the best medical treatment alone. ^[153] Anticoagulation status in patients who have an acute ischaemic stroke does not affect the outcome of MT. ^[154]

A post covid-19 qualitative study into telehealth assessment by speech, and language therapists working with people with aphasia found that a number of factors facilitated the intervention including good internet connectivity, access to a helper, adapted assessments, preparation, and training people with aphasia to use telehealth platforms. Barriers included reduced control over the environment, having a cognitive impairment, aphasia severity, low beliefs in competence using technology, and challenges with managing the emotional needs of people with aphasia during a telehealth assessment. A strong therapeutic relationship, offering choice, and flexibility in assessment administration, promoted a positive patient experience. ^[155]

5.1 Age

There was limited evidence in the literature reviewed. A nationwide cross-sectional study in the United States found that older patients with fewer comorbidities who have a stroke have better outcomes after endovascular thrombectomy. ^[156]

A Welsh study found people with a history of stroke in the previous 12 months who moved to a care home were at higher risk of another stroke and mortality. These individuals were frequently not prescribed medications for secondary stroke prevention. ^[157]

Younger stroke survivors living in the community experience higher levels of anxiety. ^[158] Walking speed is a strong predictor for return to employment for young adults, under the age of 65, who have had a stroke. ^[159]

5.2 Sex / Gender

Women appear to have poorer physical, and mental outcomes than men. They have higher mortality which is attributable to advanced age, greater stroke severity, worse pre-stroke status, and higher prevalence of atrial fibrillation. ^[39] They also have poorer functional recovery, and lower quality of life (QOL) than men after stroke. ^[39], ^[160]

Women have worse post-stroke cognitive outcomes than men with contributing factors being a higher prevalence of being widowed, older age at stroke onset, worse pre-stroke functional, and cognitive status, and lower educational attainment. ^[39]

Women are more likely to have a significantly higher prevalence, incidence, or symptoms of depression post stroke than men, and have worse anxiety. ^[39] Being female and having depression confers an increased susceptibility to post stroke fatigue. ^[161] Sexual dysfunction is a commonly seen disorder in women with stroke, and is influenced by the severity of disease, level of dependence, and accompanying depression. ^[162]

5.3 Deprivation/employment/poverty

There is an association between socioeconomic deprivation and poorer outcomes ^[82] in short- and long-term functional recovery, ^[163] mortality, ^[164] and health related quality of life after stroke. ^[165]

Stroke survival is reduced in patients from low-income groups compared to patients from high-income groups. ^[166], ^[167], ^[168], ^[169]

Other outcomes that are poorer for people living in deprived areas or with low income include:

- individuals from low socioeconomic backgrounds have more difficulty returning to work following mild stroke than individuals from higher socioeconomic backgrounds. ^[170]
- patients from high inequality neighbourhoods are less likely to be independent. ^[171]
- the risk of dementia is higher in people with backgrounds of socioeconomic deprivation who experience cardiovascular events. ^[172]
- stroke survivors living in deprived areas experience higher levels of anxiety. ^[158]
- a French study found people living in deprived areas had a greater chance of paralysis, and aphasia at the end of hospitalisation, and a higher possibility of death at one year after stroke. ^[173]

Being discharged as recommended is associated with a higher likelihood of independence at follow-up. In the USA, greater income inequality, and Asian race are associated with a lower likelihood of being discharged as recommended. ^[171] Addressing lifestyle factors (e.g. through the use of education) after stroke could help to reduce the risk of stroke recurrence, and improve outcomes in patients with low socioeconomic deprivation. ^[174]

5.4 Literacy/health literacy/education/English not as first language

There was limited evidence in the literature reviewed. A small Italian study found education level is inversely associated with mortality in people who experience stroke. ^[175]

5.5 Pregnancy

There was limited evidence in the literature reviewed. An Australian cohort study found women with a stroke history are more likely to have an early-term delivery, and a pre-labour caesarean. [176]

5.6 Marriage/civil partnership

There was limited evidence in the literature reviewed and the findings are mixed. A Danish study found that one-week, and one-month fatality from stroke was lower among the unmarried, divorced, and widowed than among the married stroke patients. [177] In contrast, a Chinese study found that not being married was associated with all adverse stroke outcomes (including all-cause mortality, stroke recurrence, stroke disability) in patients with acute ischaemic stroke. [178]

Depression in patients is a risk factor for marital dissatisfaction in the first few months following stroke. [179] About two-thirds of couples are able to retain or regain the relationship closeness within marriage post stroke. The relationship closeness, and a couple's ability to collaborate contributes to the stroke survivor's recovery, and to the satisfaction with life of the stroke survivor, and the spouses. [180]

5.7 Ethnicity

There was limited high quality evidence in the literature reviewed, but it consistently found worse outcomes in people from Black, and Asian ethnic minority groups. For example, Black people experience poorer functional outcomes up to five years after stroke. [133] , [181] There is a higher prevalence and frequency of depression in Black people following a stroke, and lower likelihood of receiving mental health services. [182] Similarly, Asian people had lower mental health summary scores from the health-related quality of life tool one year after their stroke. [183] A small Chinese study found there was a high frequency of depressive, and anxiety symptoms among Chinese stroke survivors. [184]

Some of the literature seeks to explain these differences, and reasons given include:

- **sickle cell trait:** a small study involving Black stroke patients from Nigeria found that stroke had a worse 30-day mortality and outcome in patients with sickle cell trait than in patients with normal adult haemoglobin. [185]
- **poor dietary practices:** a small USA survey found Black people eating a poor diet (e.g. ready meals etc), after a stroke exposed them to a higher risk of poor poststroke outcomes. [186]
- **deprivation:** the impact of socio-economic deprivation on stroke care, and survival may be stronger in Black patients than in White patients. [187] , [188]
- **unobservable factors:** different rates of depression may be related to unobservable factors such as social stigma, lack of available care, inability to clearly identify depressive symptoms, and potentially greater resilience to overcome the negative impact of the condition. [182]

A Danish study comparing Danish-born, and migrants' survival from stroke showed that all migrants had better survival than Danish-born indicating that migrants may not always be disadvantaged in health. [189]

5.8 Disability

There was limited evidence in the literature reviewed, and the conclusions are mixed. A small UK study found pre-existing comorbidities can compromise recovery post-stroke including significantly increased risk of poststroke adverse outcomes (e.g. higher mortality, and institutionalisation), as well as a longer length of stay on hyperacute stroke units, and higher level

of care on discharge. ^[190] A small study found people living in the USA with a long-term disability who have had a stroke reported significantly higher pain, fatigue, and decreased physical function compared to other stroke survivors. ^[191]

In contrast, a 12 year observational follow up study of people who had a disability before their stroke found that the increase in limitations experienced a year after the stroke was less pronounced for those with slight to severe premorbid disability compared with those reporting none. ^[192]

Another UK study found patients with stroke with premorbid disability have higher mortality, institutionalisation, and costs if they accumulate additional disability because of the stroke, so concluded it was important to ensure acute interventions were not withheld from people with disabilities. ^[193]

5.9 Mental illness and substance use

There was limited evidence in the literature reviewed, but mental illness, and specifically depression may result in worse stroke outcomes. The combination of prior stroke and depression is associated with higher all-cause mortality than either condition alone. ^[15] Higher levels of pre-stroke fatalism, and depressive symptoms are also associated with worse functional, and instrumental activities of daily living post stroke. ^[194] The 5-year risk of dementia post stroke is associated with a number of factors including baseline cognition, pre-morbid dependency, and diabetes. ^[14]

5.10 Geography - urban/rural/coastal

A couple of studies in the USA have shown that there is a higher stroke mortality in rural areas compared to urban areas which may be due to the higher burden of stroke risk factors in these areas. ^[195] , ^[196] Interventions, such as specifically delineated stroke ready plans, mobile stroke units, and access to telestroke services, have improved triage, and health outcomes of acute stroke patients in rural areas. ^[197]

The levels of physical activity in people post stroke living in rural/semi-rural communities in England is insufficient to meet current guidelines. The barriers to increasing activity include fear of falling, pain, fatigue, poor knowledge about safely increasing physical activity, and unhelpful beliefs about exercise. ^[198]

5.11 Homeless

All the literature identified related to homelessness in the United States. A study that looked specifically at homeless cancer survivors found that they tended to be younger in 2017 than in 2007, with higher prevalence of cardiovascular risk factors and hospitalisations related to major adverse cardiac and cerebrovascular events. However, they also tend to have improved in-hospital outcomes. ^[199] Homeless patients have a longer length of stay which is likely related to challenges in safely discharging this population. ^[200]

The impact of some interventions on outcomes are noted:

- receipt of any level of primary care outpatient visits was associated with a reduction in the odds of recurrent stroke within the homeless veteran population. ^[113]
- homeless ischaemic stroke patients who receive intravenous thrombolysis are not at an increased risk of developing post-thrombolytic intracranial haemorrhage, or in-hospital death. ^[201]

5.12 Carers

A small study has shown that healthcare professionals identified the need for additional training and resources to equip them to better support carers. ^[202]

5.13 Missing evidence

The literature searches did not find any data about stroke access related to:

- sexual orientation/ gender reassignment.
- asylum seekers/refugees.
- people in the criminal justice system.

The searches also did not find any relevant UK data about stroke in the following groups:

- homeless.
- literacy/health literacy/education/English not as first language.
- pregnancy.

6 Experience of care

In a small scale qualitative evaluation, patients with stroke receiving treatment from English hyperacute stroke units reported many positive aspects of care including a good experience in the hospital. The disadvantages of travelling further to attend a specialist centre were perceived to be outweighed by the opportunity to receive the best quality care. However, discharge into the community was viewed less positively. ^[203]

Long-term needs of stroke survivors are often not adequately addressed, and a systematic review ^[204] found many patients are dissatisfied with care post-discharge from hospital. A focus group study has shown that after discharge people with stroke have reported changes such as feelings of abandonment, experiences of unequal access to health care services, barriers to accessing appropriate treatment, and support including difficulties in communicating one's needs, and lack of coherent follow-up. ^[205]

Patients consistently identify unmet needs related to rehabilitation, information/education and support. ^[206] Half of stroke survivors feel that they need support, (e.g. physiotherapy, speech and language therapy) for longer, and more frequently. A quarter feel that they failed to receive enough support when they needed it most. ^[207]

This section is dominated by examples related to eyecare, as one large-scale study ^[208] looked at access to this service across a number of health inequality groups.

6.1 Age

There was limited evidence in the literature reviewed. In a qualitative study, younger people or people who had previously been fit reported insensitive questions about drug use which was an upsetting experience. Sometimes initial tests failed to pick up a stroke in this age group. ^[209] Older stroke survivors face inconsistency in eye care provision, together with variability in the assessment, and management of visual disorders. ^[208]

6.2 Sex / Gender

There was limited evidence in the literature reviewed. Women who experience a stroke tend to present with non-focal symptoms, such as generalised nonspecific weakness, mental status change, and confusion, more than men, who more commonly present with ataxia, and dysarthria. ^[210]

Women stroke survivors face inconsistency in eye care provision, together with variability in the assessment, and management of visual disorders. ^[208] A small scale study in London found that Asian, and Black women may under report their need for assistance for stroke rehabilitation services. ^[211]

6.3 Deprivation/employment/poverty

There was limited evidence in the literature reviewed. Stroke survivors of lower socioeconomic status face inconsistency in eye care provision, together with variability in the assessment, and management of visual disorders. ^[208]

6.4 Literacy/health literacy/education/English not as first language

There was limited evidence in the literature reviewed. Stroke survivors with low education face inconsistency in eye care provision, together with variability in the assessment, and management of visual disorders. ^[208]

6.5 Ethnicity

There was limited evidence in the literature reviewed. Black stroke survivors face inconsistency in eye care provision, together with variability in the assessment, and management of visual disorders. ^[208] A meta-synthesis found that Blacks of West African origin who require physical assistance struggle emotionally as they value independence, and do not want to be a burden to others. ^[212]

6.6 Mental illness and substance use

There was limited evidence in the literature reviewed. One study based on a UK survey found that loneliness is a common experience following stroke and stroke support groups may protect against this through mutual social support and the development of collective goals. ^[213]

6.7 Carers

Care for people who have had a stroke is often provided by women both inside the home, and when patients are within institutions. Women who serve as caregivers to stroke patients may be at higher risk of experiencing burden, and its negative effects, including emotional strain, anxiety, and/or depression. ^[214]

A systematic review of the experiences of carers of stroke survivors undergoing inpatient rehabilitation ^[215] identified seven themes:

- feeling overwhelmed with emotions.
- being recognised as a stakeholder in recovery.
- desire to be heard and informed.
- persisting for action, and outcomes.
- being legitimate clients.

- navigating an alien culture, and environment.
- managing the transition home.

A study showed that parents of children who have had a stroke are concerned about the effects of the event on the child's psychological, cognitive, and social well-being. There are also significant impacts on parents' own well-being, and on the family. ^[216] Post-stroke emotionalism, a common neurological symptom of stroke characterised by frequent crying episodes not under usual social control, may significantly increase strain on carers. ^[217]

For carers, about 85% do not get the information, and support they need to help them in their caring role, whilst 87% feel at least one negative emotion, (e.g. stress or exhaustion) when their loved one has a stroke. Over time carers experience a reduction in their health and wellbeing. ^[218]

Unmet needs in stroke care-givers range from information needs, including information about cognitive impairment, ^[219] education, and training, ^[220] to support in caring for the stroke survivors, and caring for themselves. ^[221] , ^[222] , ^[223] This can cause uncertainty in the abilities of carers to navigate caregiving responsibilities, managing finances, ^[224] and how to plan for the future. ^[225]

Accessing services demands effort, and persistence on carers' part. If carers believe services are unsatisfactory or that they, rather than formal services, should be providing support for stroke survivors, they are unlikely to persist in their efforts. Cultural, and language differences add to the challenges Black, and Asian group carers face. ^[226]

A survivor's quality of life after a stroke is associated with their caregiver's burden, anxiety, and depression. ^[227] Psychological interventions can be helpful in reducing the caregivers' burden, depressive and anxious symptoms. ^[228]

6.8 Missing evidence

The literature searches found very limited information about experiences of care for stroke and did not find any data about stroke access related to:

- sexual orientation/ gender reassignment.
- pregnancy.
- marriage/civil partnership.
- disability.
- asylum seekers/refugees.
- Roma/travellers.
- geography.
- homeless.
- people in the criminal justice system.

7 Religion and health beliefs

Severity of physical limitations alone does not influence perceptions of self-rated health among stroke survivors. Self-rated health in stroke survivors is a multidimensional construct shaped by changes in health status occurring after the stroke, individual characteristics, and social context. ^[229]

A small quantitative study in a predominantly Catholic country looking at depression, and quality of life in stroke survivors and their care partners found that the role of spirituality was important. The survivor's spirituality significantly moderated the association between care partner

depressive symptoms, and survivor physical, and psychological quality of life. The care partner's own level of spirituality was significantly positively associated with their physical quality of life. ^[230] An American study also found that that church environments may play an important role in supporting healthy eating, and physical activity. ^[231] Another small study examining the role of spirituality, and post-stroke aphasia recovery found that the participants who considered themselves spiritual reported improvements in communication during post-stroke recovery. ^[232]

This section includes some information about adherence to statin treatment, on the assumption that this is driven by health beliefs. However, all the information comes from a Swedish study using administrative data ^[233] so it is now known why adherence was lower in some groups.

7.1 Sex / Gender

All the literature was based on small scale studies. A small study of American Black women reported that the use of religion, and faith helped them to cope with life after stroke. ^[234] Similarly, a small scale qualitative study ^[235] found that women were more likely than men to use spiritual, and religious activities as a coping strategy, and perceive their emotional state as the cause of pain following a stroke. Other studies found spiritual belief that a higher power will assist in coping with illness or disability is associated with better mental health, (but not physical health) ^[236] and reduces emotional distress following stroke. ^[237]

A Swedish study found adherence to statin treatment, assessed by looking at whether a prescription was filled, is less common among women post stroke. ^[233]

7.2 Literacy/health literacy/education/English not as first language

There was limited evidence in the literature reviewed. A Swedish study found adherence to statin treatment after stroke is less common among people with a university education ^[233]

7.3 Ethnicity

According to Singh et al ^[212] Black people of West African origin come from a culture where the norm is only to visit the hospital when someone is very sick. These individuals are from a culture that rarely seek preventative healthcare or services for mild symptoms because it is “like looking for illness to escape family responsibilities,” and “associated with lazy men”. Instead of seeking immediate medical attention after the onset of acute stroke symptoms, people in this group sometimes hide their symptoms, or attempt to “sleep them off,” or rely on prayers, social networks or religious networks, or use folk/home remedies to facilitate their recovery.

Cultural beliefs can also impact long-term self-management of stroke symptoms ^[212] (e.g. illnesses such as a stroke) are perceived as disharmony resulting from demons, evil spirits, and supernatural phenomena. These beliefs can have implications on medication adherence, and management.

Limited information was found about other ethnic groups or cultures:

- a qualitative study found that positive perception of peer support is an effective strategy for Black men to change their health behaviour to reduce risks for heart disease, and stroke. ^[238]
- a scoping review found several cultural factors impact on the experiences of Asian patients, and their carers post stroke, including cultural beliefs about illness, and caregiving. ^[239]
- a qualitative study found cultural, and religious backgrounds influence stroke caregivers' experience, coping strategies, and self-sacrifice behaviour in people of Chinese origin. ^[240]

7.4 Religion

No literature identified explored the roles of specific religions in stroke. However, one small study found a significant shift of the circadian pattern of stroke onset time from the period between 6:00 a.m. and noon to that between noon and 6:00 pm during the month of Ramadan. ^[241]

7.5 Carers

There was limited high quality evidence in the literature reviewed. Older carers of stroke survivors from Black, Asian, and White British groups share many experiences of homecare, however language, and cultural difference may exacerbate common pressures, and stresses. ^[242] , ^[226] A small study into the experiences of Black African-Caribbean informal stroke carers revealed stereotypical assumptions about this group based on ethnicity which were unwarranted as there is diversity within ethnic groups. Individual contexts of ethnicity, culture, and religious beliefs shape expectations, and perceptions. ^[243]

Spirituality, and resilience following stroke may be essential factors in caregiver adjustment following stroke, but more evidence is needed. ^[244] According to a systematic review, spirituality plays an important role in improving the quality of life, and decreasing anxiety and depression of both stroke survivors, and their caregivers. ^[245]

A qualitative study found British Asian female carers of people who have had a stroke experience higher level of anxiety, and depression than their White counterparts. This stems from the carers' pre-existing physical ailments, their cultural and religious beliefs, and household arrangements. Carers' strain in extended households is exacerbated by the additional responsibility of caring for other dependent relatives. ^[246]

7.6 Missing evidence

The literature searches found very limited information about the relationship between religion, and health beliefs, and stroke and did not find any data related to:

- age.
- pregnancy.
- marriage/civil partnership.
- deprivation.
- literacy.
- sexual orientation/gender reassignment.
- disability.
- asylum seekers/refugees or Roma/travellers.
- mental illness and substance use.
- geography.
- homeless.
- people in the criminal justice system.

8 Shared decision-making

Studies on the shared decision-making process with patients with stroke in neurocritical care, cover life-sustaining treatments, palliative care, and end-of-life care, with life sustaining treatment decisions being most common. ^[247] The main impacts on carers of people with stroke include the effect on carer's emotional health, and the shifting of costs to unpaid carers when

introducing interventions. A UK-based Delphi study concluded this needs to be considered in decision-making.^[248]

A small cohort study found that active involvement in the acute decision-making process was preferred by approximately half of the patients with acute stroke, and most of them considered themselves capable of doing so. However, they experienced a limited degree of actual involvement.^[249] In the Stroke Patient Reported Experience Measures (PREMs) Survey 2022/23:^[250]

- 52% of patients surveyed said that they were involved in planning their therapy, and care whilst in hospital.
- 66% said that they were involved with decisions about leaving hospital.
- 55% said that they were involved in planning their therapy, and treatment after they left the stroke ward.

Clinician-identified facilitators of Shared Decision Making (SDM) with stroke patients include the clinician's motivation, expertise, and perception that it improves the clinical process, and patient outcomes. Patient-identified facilitators include continuity of care, good patient-physician relationships, trust, adequate time, involvement of various members of the healthcare team, encouraging patients to participate/ask questions (ideally discussing with the patient their preferences before starting treatment), providing sufficient information, using simple language, and patient involvement in the process.^{[251] , [252] , [253]}

Studies on shared decision-making show:

- that clinicians devote less effort to involve patients with lower education levels.^[254]
- aphasia post stroke may affect decision-making as practitioners are likely to have concerns about the capacity of an individual with a communication disability to participate in this process in a meaningful way.^[255]

Strategies effective in promoting shared decision-making include educating clinicians on communication techniques, agreements between healthcare professionals on roles and responsibilities for specific decision points in the treatment pathway, engaging multidisciplinary medical teams, incorporating trained decision coaches, and using tools (i.e., patient decision aids) at appropriate literacy, and numeracy levels to support patients in their cardiovascular decisions.^{[251] [256]}

There are several shared decision-making tools for stroke prevention in atrial fibrillation, but it is not clear whether they promote high-quality decisions.^[257] A decision aid, DOTT (Deciding On Treatments Together) which is integrated with the electronic health record system, to be used in primary care during clinical consultations between the healthcare professional, and stroke survivor, has been developed with the aim of facilitating SDM on personalised treatments leading to improved treatment adherence, and risk control.^[258]

9 Conclusions

Stroke affects over 100,000 people each year with approximately 1.3 million people living with this condition at a cost of £26 billion a year, including £8.6 billion for the NHS and social care. People with protected characteristics or other vulnerable groups are particularly affected with greater prevalence, and incidence of stroke, poorer access, and outcomes of care as well as poor experience.

There are gaps in the literature that are evident in groups including asylum seekers/refugees, Roma/travellers, sexual orientation/gender reassignment and, people in the criminal justice system.

There are gaps in the literature, with regard to access to healthcare (asylum seekers/refugees, marriage/civil partnership, Roma/travellers or people in the criminal justice system); outcomes of care (sexual orientation/ gender reassignment, asylum seekers/refugees, or people in the criminal justice system); experience of care (pregnancy, marriage/civil partnership, disability, asylum seekers/refugees, Roma/travellers, geography, homeless or people in the criminal justice system).

With regard to religion, and health beliefs there are gaps in the literature including age, pregnancy, marriage/civil partnership, deprivation, literacy, sexual orientation/gender reassignment, disability, asylum seekers/refugees, Roma/travellers, mental illness and substance misuse, geography, homeless or people in the criminal justice system.

Appendix A: Methodology and search strategy

Two searches were conducted of the literature and grey literature starting from 2000 to 2025 for papers written in English (UK and world-wide) for the following:

The nine Protected Characteristics identified in the Equality Act 2010 are:

- age
- sex
- disability
- sexual orientation
- gender reassignment
- ethnicity
- marriage and civil partnership
- religion or belief
- pregnancy

Other vulnerable population groups:

- carers
- people who are homeless
- people involved in the criminal justice system
- people with mental illness and /or who use substances
- low-income people or families
- people with poor literacy or health Literacy
- people living in areas of social deprivation
- people living in remote, rural, coastal or island locations
- refugees, asylum seekers, travellers

The search focussed on mechanical thrombectomy and stroke looking at:

- prevalence and incidence
- access to healthcare
- outcomes of healthcare
- experience of healthcare
- values/behaviours

Appendix B: Findings by health inequality group

For readers interested in health inequalities with respect to a specific group, this section takes the same information presented in the main body of the report but organises it differently.

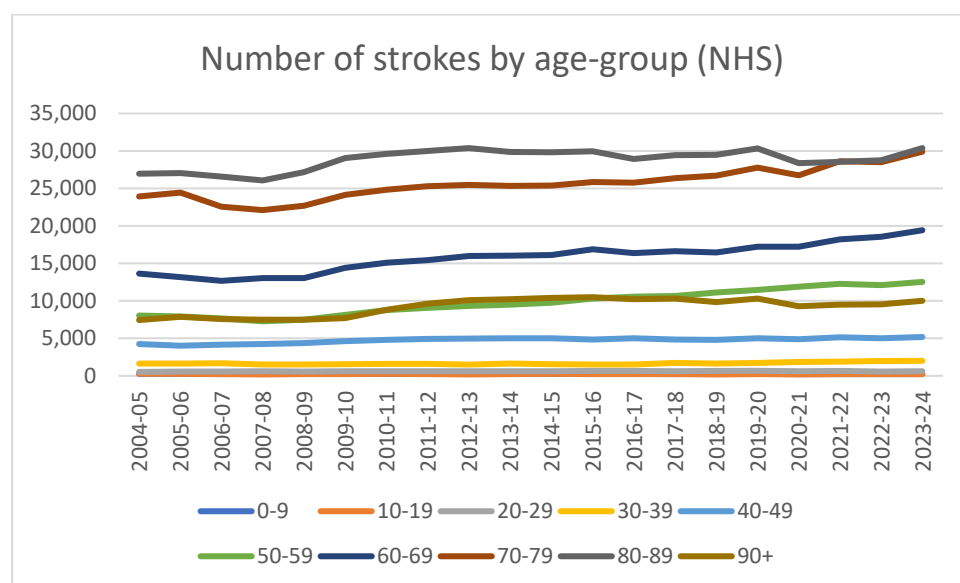
9.1 Age

9.1.1 Prevalence and incidence

The incidence of initial stroke is higher in older populations, ^[33] as is the risk of recurrence 10 years after the event. ^[34] A study in Oxford demonstrated that stroke incidence in people younger than 55 years was increasing between 2002-2010 vs 2010-2018, while there was a decrease in strokes among those aged over 55 years across a similar time period. ^[35] A systematic review has also identified increasing incidence of stroke in younger people. ^[36]

The chart below (Figure 3) shows a gradual increase in the number of hospital admissions for strokes overall (using counts of Finished Admission Episodes). Historically the 80 to 89 year old age group experienced the majority of incidents, but in line with the findings above, the percentage of the hospital admissions for strokes occurring in people aged between 50, and 80 is increasing. ^[6]

Figure 3: Number of strokes by age-group ^[6]



Approximately 5 - 15% of all ischaemic strokes occur in young adults. The key features of the disease, including incidence, risk factors, underlying causes, mortality, outcomes, as well as long-term risks of recurrent events are different from those for older patients. ^[37]

9.1.2 Access to healthcare

There was limited evidence in the literature reviewed about the impact of age on access to healthcare for stroke. An Australian article suggests that young people experience delays in early recognition, and treatment of stroke which can result in many years of disability with associated social and financial burden. ^[117] Similarly, it is possible that diagnosis of stroke in young people with Sickle Cell Disease can be delayed by the presence of similar symptoms such as headaches, and seizures due to SCD. ^[118]

For older people, the South London stroke register has demonstrated that people aged 75 or more years are less likely to have brain imaging following a stroke, but are more likely to receive occupational therapy or physiotherapy as part of their rehabilitation. ^[119]

9.1.3 Outcomes of care

There was limited evidence in the literature reviewed. A nationwide cross-sectional study in the United States found that older patients with fewer comorbidities who have a stroke have better outcomes after endovascular thrombectomy. ^[156]

A Welsh study found people with a history of stroke in the previous 12 months who moved to a care home were at higher risk of another stroke and mortality. These individuals were frequently not prescribed medications for secondary stroke prevention. ^[157]

Younger stroke survivors living in the community experience higher levels of anxiety. ^[158] Walking speed is a strong predictor for return to employment for young adults, under the age of 65, who have had a stroke. ^[159]

9.1.4 Experience of care

There was limited evidence in the literature reviewed. In a qualitative study, younger people or people who had previously been fit reported insensitive questions about drug use which was an upsetting experience. Sometimes initial tests failed to pick up a stroke in this age group. ^[209] Older stroke survivors face inconsistency in eye care provision, together with variability in the assessment, and management of visual disorders. ^[208]

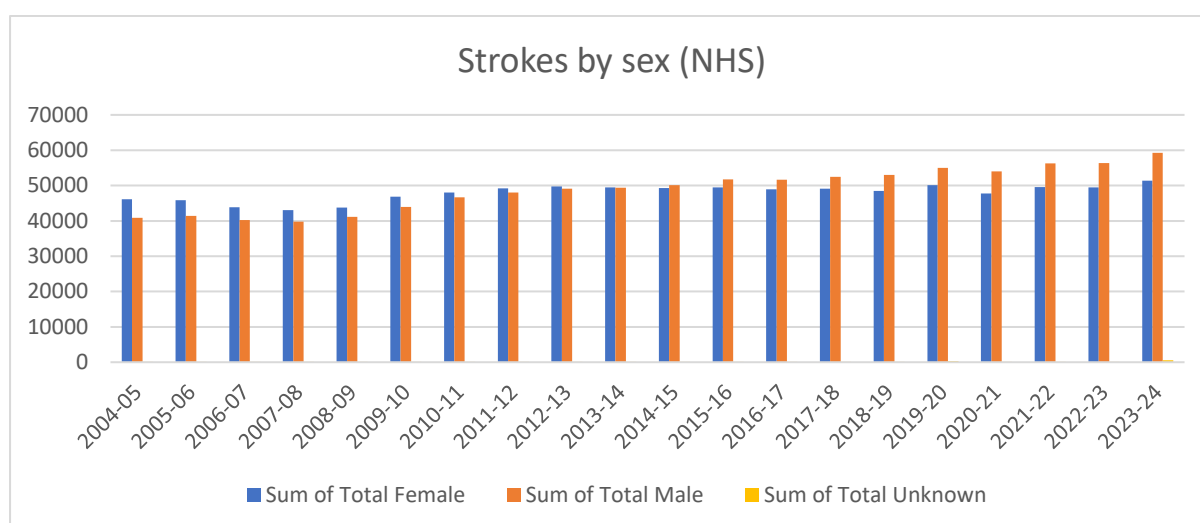
9.2 Sex / Gender

9.2.1 Prevalence and incidence

A UK Biobank cohort study found the rate of any stroke in men is 13.96 per 10,000 person-years compared with 8.66 in women. ^[38] There has been a downward trend in stroke incidence, prevalence, and mortality rates observed globally between 1990 to 2021, and the sex gap reduced in this period. ^[32] Subarachnoid haemorrhage (SAH) tends to be more common in women than in men. ^[39]

The NHS hospital episode data ^[6] (Figure 4) shows that in terms of raw number of admissions, until 2013-14 females experienced more strokes than males, but since 2014 this has reversed and the gap appears to be widening with more men experiencing strokes each year.

Figure 4: NHS hospital admissions for stroke by sex ^[6]



Specific risk factors are more strongly associated with the risk of stroke in women. ^[38] These include:

- hypertension. ^[38]
- smoking. ^[38]
- low socioeconomic status. ^[38]
- experience early menopause (<40 years old) compared with women who experienced the transition to menopause between 50, and 54 years old. ^[40]

Diabetes is associated with a higher incidence of ischaemic stroke, and atrial fibrillation in haemorrhagic stroke in women. ^[38]

Other risk factors for stroke that are unique to women include:

- the effect of endogenous hormones such as early age at menarche and low Dehydroepiandrosterone levels. ^[41]
- exogenous oestrogens (e.g. the contraceptive pill, and transgender oestrogens' and pregnancy related exposures). ^[41]
- pregnancy (see 3.8 below).
- non-hormonal risk factors:
 - a pre-stroke disability.
 - atrial fibrillation.
 - obesity.
 - widowed.
 - being alone. ^{[39], [42]}

A review of the role of psychosocial factors and stroke showed that these were associated with an increased risk of ischaemic, and haemorrhagic stroke in populations of all ages and were more predominant in women. The psychosocial factors included job strain, psychological interpersonal, and behavioural stress, and social deprivation. ^[43]

Male-specific characteristics increasing stroke risk include medical androgen deprivation therapy for ischaemic, and erectile dysfunction. ^[44]

9.2.2 Access to healthcare

There is some evidence, mostly from the USA, that women may be more likely to experience delays accessing care for stroke. A meta-analysis found that older women are less likely to seek help in when they experience a stroke. ^[120] Women, especially older women and those living alone, are more likely to experience delays in receiving reperfusion therapy (including thrombectomy) than men. ^[121] Additionally, women are less likely to be evaluated by stroke specialists, and to undergo standard diagnostic testing compared with men. ^[122] This may be due to women presenting with stroke mimics or non-traditional stroke symptoms which can be misdiagnosed. ^[123]

A Scottish population based study found women are less likely to receive antihypertensives, ^[124] lipid-lowering drugs, or oral anticoagulants after discharge following a stroke. ^[125] In the USA, the rate of Mechanical Thrombectomy (MT) has increased in both men and women by nearly 30-fold in the nine years preceding the publication of pivotal clinical trials on MT in 2015 with a 12% higher likelihood for women to receive MT after ischemic stroke. ^[126]

9.2.3 Outcomes of care

Women appear to have poorer physical, and mental outcomes than men. They have higher mortality which is attributable to advanced age, greater stroke severity, worse pre-stroke status, and higher prevalence of atrial fibrillation. ^[39] They also have poorer functional recovery, and lower quality of life (QOL) than men after stroke. ^[39], ^[160]

Women have worse post-stroke cognitive outcomes than men with contributing factors being a higher prevalence of being widowed, older age at stroke onset, worse pre-stroke functional, and cognitive status, and lower educational attainment. ^[39]

Women are more likely to have a significantly higher prevalence, incidence, or symptoms of depression post stroke than men, and have worse anxiety. ^[39] Being female and having depression confers an increased susceptibility to post stroke fatigue. ^[161] Sexual dysfunction is a commonly seen disorder in women with stroke, and is influenced by the severity of disease, level of dependence, and accompanying depression. ^[162]

9.2.4 Experience of care

There was limited evidence in the literature reviewed. Women who experience a stroke tend to present with non-focal symptoms, such as generalised nonspecific weakness, mental status change, and confusion, more than men, who more commonly present with ataxia, and dysarthria. ^[210]

Women stroke survivors face inconsistency in eye care provision, together with variability in the assessment, and management of visual disorders. ^[208] A small scale study in London found that Asian, and Black women may under report their need for assistance for stroke rehabilitation services. ^[211]

9.3 Deprivation/employment/poverty

9.3.1 Prevalence and incidence

Cohort studies have demonstrated low income, and income inequality are predictors of incident stroke, ^{[45], [46]} and mortality, ^{[47], [48], [49], [50]} with lower net income predicting a more severe stroke. ^[51]

9.3.2 Access to healthcare

There was limited evidence in the literature reviewed. People at risk of stroke living in the most deprived areas of England are less likely to receive oral anticoagulant therapy than people living in the least deprived areas. ^[127] People living in deprived areas in the USA are more likely to have delays, ^[128] or lower rate of admission to hospital and lower access to care. ^[119]

9.3.3 Outcomes of care

There is an association between socioeconomic deprivation and poorer outcomes ^[82] in short- and long-term functional recovery, ^[163] mortality, ^[164] and health related quality of life after stroke. ^[165]

Stroke survival is reduced in patients from low-income groups compared to patients from high-income groups. ^{[166], [167], [168], [169]}

Other outcomes that are poorer for people living in deprived areas or with low income include:

- individuals from low socioeconomic backgrounds have more difficulty returning to work following mild stroke than individuals from higher socioeconomic backgrounds. ^[170]
- patients from high inequality neighbourhoods are less likely to be independent. ^[171]
- the risk of dementia is higher in people with backgrounds of socioeconomic deprivation who experience cardiovascular events. ^[172]
- stroke survivors living in deprived areas experience higher levels of anxiety. ^[158]
- a French study found people living in deprived areas had a greater chance of paralysis, and aphasia at the end of hospitalisation, and a higher possibility of death at one year after stroke. ^[173]

Being discharged as recommended is associated with a higher likelihood of independence at follow-up. In the USA, greater income inequality, and Asian race are associated with a lower likelihood of being discharged as recommended. ^[171] Addressing lifestyle factors (e.g. through the use of education) after stroke could help to reduce the risk of stroke recurrence, and improve outcomes in patients with low socioeconomic deprivation. ^[174]

9.3.4 Experience of care

There was limited evidence in the literature reviewed. Stroke survivors of lower socioeconomic status face inconsistency in eye care provision, together with variability in the assessment, and management of visual disorders. ^[208]

9.4 Literacy/health literacy/education/English not as a first language

9.4.1 Prevalence and incidence

Lower education level is associated with increased stroke risk in mid-age women, and is mainly explained by lifestyle and physiological factors. ^[52] A meta-analysis has shown that stroke risk increases with lower education. ^[53]

9.4.2 Access to healthcare

There was limited evidence in the literature reviewed. Swedish studies have shown that university-educated patients are more likely to be treated with reperfusion therapy for stroke than patients with secondary or primary education. ^[129], ^[130]

9.4.3 Outcomes of care

There was limited evidence in the literature reviewed. A small Italian study found education level is inversely associated with mortality in people who experience stroke. ^[175]

9.4.4 Experience of care

There was limited evidence in the literature reviewed. Stroke survivors with low education face inconsistency in eye care provision, together with variability in the assessment, and management of visual disorders. ^[208]

9.5 Sexual orientation/ gender reassignment

9.5.1 Prevalence and incidence

Gender reassignment

Hormonal therapy in male to female transgenders may confer cardiovascular risks in this population. ^[54] A review on Gender Affirming Hormone therapy found that the use of some oestrogens in trans women induces an increased risk of myocardial infarction, and stroke. However, another study found that the risk is irrespective of being in receipt of Gender Affirming Hormones. ^{[55],[56]} The higher risk may be due to the potential impact of poor mental health, chronic stress, and discrimination on cardiovascular health. ^[55]

Alteration of cardiometabolic parameters, such as hypertension are observed in trans gender persons, including younger subjects, undergoing Gender Affirming Hormone therapy. ^[57] The thrombosis risk of hormone therapy in adolescent, and young adult populations was found to be high in an American study, however thrombosis incidents were rare. ^[58]

Studies have shown that female to male people treated with testosterone do not have an increased risk of cardiovascular (CVD) after 15 years of follow up. ^[59]

Transgender individuals have high rates of undiagnosed, and untreated comorbidities, such as hypertension, and dyslipidaemia, which increase the risk for CVD. ^[60]

Sexual orientation

The evidence about sexual orientation is mixed. According to the LGBTQ Institute, older women who identify as gay or bisexual have a higher prevalence of stroke, heart attacks, and other health conditions compared with women who identify as heterosexual.^[61] Another study showed that lesbian women reported lower rates of heart attack, but bisexual women had higher rates of stroke than heterosexual women.^[62]

Gay men, and bisexual women have a higher prevalence of hypertension than their heterosexual counterparts of the same sex. Bisexual women may also be at higher risk for undertreated hypertension than heterosexual women.^[63]

Lesbian, gay, and bisexual individuals experience significant health disparities related to social stressors. A study showed an excess of psychosocial, and behavioural risk factors (e.g. mental distress, depression, smoking, and alcohol misuse) for CVD in sexual minority women. Sexual minority men displayed higher rates of psychosocial risk factors for CVD.^[62]

Young adults who identify as lesbian, gay or bisexual may be more susceptible to stroke, and heart disease than their heterosexual peers.^[64]

9.5.2 Access to healthcare

There was limited evidence in the literature reviewed. A small American cohort study found that sexual, and gender minority people are more likely to have recurrent strokes, and delay their presentation to hospital.^[131]

9.5.3 Outcomes of care

The literature searches did not find any information.

9.5.4 Experience of care

The literature searches did not find any information.

9.6 Pregnancy

9.6.1 Prevalence and incidence

Stroke is a serious complication of pregnancy, associated with high morbidity, and mortality. Recurrence of stroke occurs in a small proportion of patients, and the risk is highest during the initial three months.^[65] There is an increase in the prevalence of several stroke risk factors among pregnant women, particularly advanced age, hypertensive disorders of pregnancy, diabetes, and obesity.^[66]

Stroke associated with pregnancy, and post-partum occurs in about 30 per 100,000 deliveries,^[67] with the highest-risk time period for maternal stroke being the immediate postpartum period.^[68] The relative risk of suffering from haemorrhagic stroke is three times higher than ischaemic stroke during peripartum, and postpartum periods when compared with antenatal period.^[69], ^[70], ^[71] ^[72]

Infertility, and recurrent stillbirths are associated with an increased risk of non-fatal ischaemic stroke, and fatal haemorrhagic stroke, whilst recurrent miscarriages are associated with increased risk of fatal or non-fatal stroke, both haemorrhagic and ischaemic.^[73]

Women who have experienced miscarriage or stillbirth early in life have an increased risk of stroke in later life.^[74] Similarly, preeclampsia, and hypertension in pregnancy are a risk factor for later-life stroke.^{[75], [76]}

9.6.2 Access to healthcare

There was limited evidence in the literature reviewed. A meta-analysis found low awareness of pregnancy related strokes may result in delays in receiving care.^[66]

9.6.3 Outcomes of care

There was limited evidence in the literature reviewed. An Australian cohort study found women with a stroke history are more likely to have an early-term delivery, and a pre-labour caesarean.^[176]

9.6.4 Experience of care

The literature searches did not find any information.

9.7 Marriage/civil partnership

9.7.1 Prevalence and incidence

A Danish study found that divorce is associated with higher risk of stroke, especially in men, and that living in marriage or as unmarried or widower has little or no impact on the risk of stroke.^[77] Stroke mortality risk may be higher for people who had never married, as well as for those who have experienced divorce, and bereavement.^[78]

9.7.2 Access to healthcare

The literature searches did not find any information.

9.7.3 Outcomes of care

There was limited evidence in the literature reviewed and the findings are mixed. A Danish study found that one-week, and one-month fatality from stroke was lower among the unmarried, divorced, and widowed than among the married stroke patients.^[177] In contrast, a Chinese study found that not being married was associated with all adverse stroke outcomes (including all-cause mortality, stroke recurrence, stroke disability) in patients with acute ischaemic stroke.^[178]

Depression in patients is a risk factor for marital dissatisfaction in the first few months following stroke.^[179] About two-thirds of couples are able to retain or regain the relationship closeness within marriage post stroke. The relationship closeness, and a couple's ability to collaborate contributes to the stroke survivor's recovery, and to the satisfaction with life of the stroke survivor, and the spouses.^[180]

9.7.4 Experience of care

The literature searches did not find any information.

9.8 Ethnicity

9.8.1 Prevalence and incidence

White patients are at increased risk of mortality, and post intervention intracerebral haemorrhage following a stroke compared with Black patients, ^[79] but they are less likely to experience a stroke. A report by the Commission on Race and Ethnic Disparities found that ^[80], ^[81]:

- Black people in the UK have 1.5 to 2.5 times greater risk of having a stroke than White people.
- people from the Asian population have a risk for stroke about 1.5 times greater than White people, particularly those in the Pakistani and Bangladeshi ethnic groups.
- people of Chinese origin have lower risk of stroke than White people.

Data from the stroke register in London from 1995 to 2010 showed that while stroke incidence decreased by 40% for White people during that period it did not decrease for Black people. ^[82]

The Bradford Stroke Study found 155 first ever strokes per 100,000 person-years for Pakistani people in the region compared with 101 for White people. ^[83] Between 2005-2012 the Roma Support Group, a voluntary sector organisation, reported that 60% of the Roma population in touch with them had poor physical health including CVD. ^[84]

Genetic and disease-related risk factors related to ethnicity

Literature reviewed identified a number of genetic, and disease-related risk factors for stroke for Black and Asian people:

- **Lipoprotein (a):** Stroke in Black populations is highly heritable and influenced by genetic determinants underlying cardiovascular risk factors. ^[85] Lipoprotein (a) is a specific risk factor for stroke in Black people. Lipoprotein (a) levels are higher in Black compared with White people, and is genetically determined. ^[86]
- **Type 2 diabetes:** Black people who are found to have a greater risk of having type 2 diabetes, and abnormal lipid traits have an increased risk of ischaemic stroke. ^[87]
- **Systemic Lupus Erythematosus (SLE):** SLE is an autoimmune condition that mainly affects women. It is more common in Black, and Asian women than White women. SLE can cause kidney damage leading to hypertension which is a risk factor for stroke. ^[88] There is an elevated stroke risk among Black, and Hispanic people who had SLE compared with White people. ^[89]
- **Sickle Cell Disease (SCD):** SCD is found at a low frequency in all populations, the highest prevalence occurring in Black people. SCD also occurs in families originating from the Middle East, India, and the eastern Mediterranean, with increasing numbers of cases in mixed-race families. ^[90] The prevalence of stroke in Asian patients with sickle cell anaemia is 5% with a range from 1% to 41%. ^[91] There is a four-fold higher risk of incident stroke associated with use of oral contraceptives in women with SCD. ^[92]

Lifestyle factors related to ethnicity

The literature reviewed found that Black, Asian, and Chinese people who experienced a stroke had similar or lower prevalence of drinking alcohol and smoking compared with White people, and that they can have earlier onset of stroke as demonstrated in the examples below.

The Pakistani people who experienced a stroke in the Bradford study were significantly younger and had more obesity and diabetes mellitus. They were less likely to have atrial fibrillation, be ex- or current smokers, or drink alcohol above the recommended level compared with White people.

^[83] Another study found that Asian people generally experience ischaemic stroke approximately nine years earlier than White people. ^[93]

Chinese ischaemic stroke patients have younger onset of stroke compared to White people. They have similar prevalence of hypertension, diabetes, smoking, and alcohol misuse, and significantly lower prevalence of atrial fibrillation, ischaemic heart disease, and hypercholesterolemia. ^[94]

9.8.2 Access to healthcare

Several studies have found that Black people experience late hospital arrivals, and low thrombolysis, and mechanical thrombectomy rates ^[132] following a stroke compared to White people, ^{[133], [133], [134]}. They are also less likely to be treated for post stroke complications. ^[135] These disparities were not fully explained by sociodemographic or stroke-related factors. ^[133]

Similarly, a Danish study found that immigrants had lower chances of early stroke unit admission, and received fewer individual early stroke care processes such as dysphagia screening, physiotherapy, and occupational therapy than Danish-born residents. ^[136]

Generally, Black people have lower access to poststroke care. ^[137]

9.8.3 Outcomes of care

There was limited high quality evidence in the literature reviewed, but it consistently found worse outcomes in people from Black, and Asian ethnic minority groups. For example, Black people experience poorer functional outcomes up to five years after stroke. ^[133], ^[181] There is a higher prevalence and frequency of depression in Black people following a stroke, and lower likelihood of receiving mental health services. ^[182] Similarly, Asian people had lower mental health summary scores from the health-related quality of life tool one year after their stroke. ^[183] A small Chinese study found there was a high frequency of depressive, and anxiety symptoms among Chinese stroke survivors. ^[184]

Some of the literature seeks to explain these differences, and reasons given include:

- **sickle cell trait:** a small study involving Black stroke patients from Nigeria found that stroke had a worse 30-day mortality and outcome in patients with sickle cell trait than in patients with normal adult haemoglobin. ^[185]
- **poor dietary practices:** a small USA survey found Black people eating a poor diet (e.g. ready meals etc), after a stroke exposed them to a higher risk of poor poststroke outcomes. ^[186]
- **deprivation:** the impact of socio-economic deprivation on stroke care, and survival may be stronger in Black patients than in White patients. ^[187], ^[188]
- **unobservable factors:** different rates of depression may be related to unobservable factors such as social stigma, lack of available care, inability to clearly identify depressive symptoms, and potentially greater resilience to overcome the negative impact of the condition. ^[182]

A Danish study comparing Danish-born, and migrants' survival from stroke showed that all migrants had better survival than Danish-born indicating that migrants may not always be disadvantaged in health. ^[189]

9.8.4 Experience of care

There was limited evidence in the literature reviewed. Black stroke survivors face inconsistency in eye care provision, together with variability in the assessment, and management of visual disorders. ^[208] A meta-synthesis found that Blacks of West African origin who require physical assistance struggle emotionally as they value independence, and do not want to be a burden to others. ^[212]

9.9 Asylum seekers/refugees

9.9.1 Prevalence and incidence

According to a 2022 systematic review, refugee experience is an independent risk factor for CVD. ^[95] This may be particularly the case in the younger refugee population. ^[96]

9.9.2 Access to healthcare

The literature searches did not find any information.

9.9.3 Outcomes of care

The literature searches did not find any information.

9.9.4 Experience of care

The literature searches did not find any information.

9.10 Disability

9.10.1 Prevalence and incidence

Pre-stroke multimorbidity is highly prevalent, and is an independent predictor of death after stroke. ^[97] A Taiwanese cohort study found that stroke rates are higher among people with disabilities, such as a balance disorder, and intractable epilepsy, compared to the general population, and people with dementia, and multiple disabilities are associated with a higher stroke risk and death rate. ^[98]

9.10.2 Access to healthcare

A systematised review found that people with disabilities do not receive equitable access to treatment ranging from being admitted to stroke units to receiving post-stroke rehabilitation. ^[138] This includes people in stroke rehabilitation with pre-existing cognitive impairments. ^[139] Insights from bioethics, disability rights, health law into the context of prevailing research, and clinical practices show that disability drives decisions to withhold acute stroke interventions, and may perpetuate disparate health outcomes, and undermine ethically resilient stroke care. ^[140]

A review examining the use of mechanical thrombectomy for acute ischaemic stroke in patients with pre-morbid disability has shown that there is the potential for a substantial proportion of these patients to return to their pre-morbid state, but they experience a greater rate of treatment-related complications. ^[141] A small USA study found persons with pre-existing disabilities represented over one-third of acute stroke presentations, but accounted for a far smaller proportion of those receiving endovascular thrombectomy, and thrombolysis. ^[142]

9.10.3 Outcomes of care

There was limited evidence in the literature reviewed, and the conclusions are mixed. A small UK study found pre-existing comorbidities can compromise recovery post-stroke including significantly increased risk of poststroke adverse outcomes (e.g. higher mortality, and institutionalisation), as well as a longer length of stay on hyperacute stroke units, and higher level of care on discharge.^[190] A small study found people living in the USA with a long-term disability who have had a stroke reported significantly higher pain, fatigue, and decreased physical function compared to other stroke survivors.^[191]

In contrast, a 12 year observational follow up study of people who had a disability before their stroke found that the increase in limitations experienced a year after the stroke was less pronounced for those with slight to severe premorbid disability compared with those reporting none.^[192]

Another UK study found patients with stroke with premorbid disability have higher mortality, institutionalisation, and costs if they accumulate additional disability because of the stroke, so concluded it was important to ensure acute interventions were not withheld from people with disabilities.^[193]

9.10.4 Experience of care

The literature searches did not find any information.

9.11 Mental illness and substance use

9.11.1 Prevalence and incidence

Pre-existing Severe Mental Illness is associated with higher risks of mortality, and further vascular events following a stroke.^[99]

For people with bipolar disorder or depression, living in an area with higher deprivation conveys a greater absolute risk of ischaemic heart disease, and stroke.^{[100], [101]}

Drug use is associated with stroke, especially in young people. The major classes of drugs linked to stroke are cocaine, amphetamines (including amphetamine type stimulants), heroin, morphine, cannabis, and new synthetic cannabinoids, along with androgenic anabolic steroids (AASs). These drugs can cause both ischaemic, and haemorrhagic stroke.^{[102], [103], [104]}

Social isolation substantially increases the risk of stroke,^{[33], [105]} and the risk that the first event is fatal before reaching hospital, particularly among people who live alone. This may be due to the absence of immediate help in responding to an acute heart attack or stroke.^[106]

9.11.2 Access to healthcare

There was limited evidence in the literature reviewed. Clinicians' decision-making about ongoing rehabilitation for patients with pre-stroke dementia/cognitive impairments is influenced by gaps in their knowledge, and by service constraints.^{[143], [139]} People with dementia who have had a stroke are less likely to be prescribed antihypertensives.^[124]

9.11.3 Outcomes of care

There was limited evidence in the literature reviewed, but mental illness, and specifically depression may result in worse stroke outcomes. The combination of prior stroke and depression is associated with higher all-cause mortality than either condition alone.^[15] Higher levels of pre-stroke fatalism, and depressive symptoms are also associated with worse functional, and instrumental activities of daily living post stroke.^[194] The 5-year risk of dementia post stroke is associated with a number of factors including baseline cognition, pre-morbid dependency, and diabetes.^[14]

9.11.4 Experience of care

There was limited evidence in the literature reviewed. One study based on a UK survey found that loneliness is a common experience following stroke and stroke support groups may protect against this through mutual social support and the development of collective goals.^[213]

9.12 Geography

9.12.1 Prevalence and incidence

A Canadian study found that risk factors were more prevalent, and less likely to be controlled in rural than in urban residents without prior stroke. In those with prior stroke, risk factor prevalence, and treatment were similar.^[107]

9.12.2 Access to healthcare

It is important that patients experiencing a stroke are treated quickly, and ideally in a specialist stroke unit (see 2.3.1). Modelling has demonstrated that for patients eligible for mechanical thrombectomy in remote English hospitals using a helicopter may be cost-effective when travel time is reduced by at least 60 minutes compared with ground emergency medical services.^[144]

A Canadian study found that patients from rural areas were less likely than those from urban areas to receive stroke unit care, brain imaging within 24 hours, carotid imaging, and consultations from neurologists, physiotherapists, occupational therapists, and speech and language therapists. They were also less likely to be transferred to inpatient rehabilitation facilities following a stroke.^[145]

9.12.3 Outcomes of care

A couple of studies in the USA have shown that there is a higher stroke mortality in rural areas compared to urban areas which may be due to the higher burden of stroke risk factors in these areas.^[195],^[196] Interventions, such as specifically delineated stroke ready plans, mobile stroke units, and access to telestroke services, have improved triage, and health outcomes of acute stroke patients in rural areas.^[197]

The levels of physical activity in people post stroke living in rural/semi-rural communities in England is insufficient to meet current guidelines. The barriers to increasing activity include fear of falling, pain, fatigue, poor knowledge about safely increasing physical activity, and unhelpful beliefs about exercise.^[198]

9.12.4 Experience of care

The literature searches did not find any information.

9.13 Homeless

9.13.1 Prevalence and incidence

CVD including stroke in the homeless population has high prevalence, incidence, and 1-year mortality risk post-diagnosis. There was shown to be a high burden of risk factors in the UK and USA. ^[108] , ^[109] Homeless young stroke patients have significant comorbidities, increased hospitalisation rates, and adverse clinical outcomes. ^[110]

Risk factors for stroke can lead to elevated CVD or stroke risk in homeless people including:

- cocaine use in high-risk populations such as homeless women. ^[111]
- mental health conditions, particularly among males, and those diagnosed with substance dependence. ^[112]
- predictors of developing recurrent stroke, and subsequent death within the homeless veteran population in the US include hypertension, diabetes, and renal disease. ^[113]

9.13.2 Access to healthcare

An American study surveying a homeless population in Chicago found a high prevalence of poor stroke awareness during the covid-19 pandemic. In addition, dietary habits worsened, and physical activity levels decreased during this time. ^[146]

9.13.3 Outcomes of care

All the literature identified related to homelessness in the United States. A study that looked specifically at homeless cancer survivors found that they tended to be younger in 2017 than in 2007, with higher prevalence of cardiovascular risk factors and hospitalisations related to major adverse cardiac and cerebrovascular events. However, they also tend to have improved in-hospital outcomes. ^[199] Homeless patients have a longer length of stay which is likely related to challenges in safely discharging this population. ^[200]

The impact of some interventions on outcomes are noted:

- receipt of any level of primary care outpatient visits was associated with a reduction in the odds of recurrent stroke within the homeless veteran population. ^[113]
- homeless ischaemic stroke patients who receive intravenous thrombolysis are not at an increased risk of developing post-thrombolytic intracranial haemorrhage, or in-hospital death. ^[201]

9.13.4 Experience of care

The literature searches did not find any information.

9.14 Criminal Justice System

9.14.1 Prevalence and incidence

Literature reviewed included limited information about strokes in the UK criminal justice system. People who experience incarceration in the USA have a heightened risk for cardiovascular disease (CVD) including stroke, ^[114] and CVD is a leading cause of mortality in prisons in England and Wales. ^[115] The burden of CVD in the American prison population is greater in Black, and Latina women, and Black men compared to White women and men, respectively. ^[116]

9.14.2 Access to healthcare

The literature searches did not find any information.

9.14.3 Outcomes of care

The literature searches did not find any information.

9.14.4 Experience of care

The literature searches did not find any information.

9.15 Carers

9.15.1 Prevalence and incidence

The literature searches did not find any information.

9.15.2 Access to healthcare

The literature searches did not find any information.

9.15.3 Outcomes of care

A small study has shown that healthcare professionals identified the need for additional training and resources to equip them to better support carers. ^[202]

9.15.4 Experience of care

Care for people who have had a stroke is often provided by women both inside the home, and when patients are within institutions. Women who serve as caregivers to stroke patients may be at higher risk of experiencing burden, and its negative effects, including emotional strain, anxiety, and/or depression. ^[214]

A systematic review of the experiences of carers of stroke survivors undergoing inpatient rehabilitation ^[215] identified seven themes:

- feeling overwhelmed with emotions.
- being recognised as a stakeholder in recovery.
- desire to be heard and informed.
- persisting for action, and outcomes.
- being legitimate clients.
- navigating an alien culture, and environment.
- managing the transition home.

A study showed that parents of children who have had a stroke are concerned about the effects of the event on the child's psychological, cognitive, and social well-being. There are also significant impacts on parents' own well-being, and on the family.^[216] Post-stroke emotionalism, a common neurological symptom of stroke characterised by frequent crying episodes not under usual social control, may significantly increase strain on carers.^[217]

For carers, about 85% do not get the information, and support they need to help them in their caring role, whilst 87% feel at least one negative emotion, (e.g. stress or exhaustion) when their loved one has a stroke. Over time carers experience a reduction in their health and wellbeing.^[218]

Unmet needs in stroke care-givers range from information needs, including information about cognitive impairment,^[219] education, and training,^[220] to support in caring for the stroke survivors, and caring for themselves.^[221],^[222],^[223] This can cause uncertainty in the abilities of carers to navigate caregiving responsibilities, managing finances,^[224] and how to plan for the future.^[225]

Accessing services demands effort, and persistence on carers' part. If carers believe services are unsatisfactory or that they, rather than formal services, should be providing support for stroke survivors, they are unlikely to persist in their efforts. Cultural, and language differences add to the challenges Black, and Asian group carers face.^[226]

A survivor's quality of life after a stroke is associated with their caregiver's burden, anxiety, and depression.^[227] Psychological interventions can be helpful in reducing the caregivers' burden, depressive and anxious symptoms.^[228]

9.16 Religion and health beliefs

Severity of physical limitations alone does not influence perceptions of self-rated health among stroke survivors. Self-rated health in stroke survivors is a multidimensional construct shaped by changes in health status occurring after the stroke, individual characteristics, and social context.^[229]

A small quantitative study in a predominantly Catholic country looking at depression, and quality of life in stroke survivors and their care partners found that the role of spirituality was important. The survivor's spirituality significantly moderated the association between care partner depressive symptoms, and survivor physical, and psychological quality of life. The care partner's own level of spirituality was significantly positively associated with their physical quality of life.^[230] An American study also found that that church environments may play an important role in supporting healthy eating, and physical activity.^[231] Another small study examining the role of spirituality, and post-stroke aphasia recovery found that the participants who considered themselves spiritual reported improvements in communication during post-stroke recovery.^[232]

This section includes some information about adherence to statin treatment, on the assumption that this is driven by health beliefs. However, all the information comes from a Swedish study using administrative data^[233] so it is now known why adherence was lower in some groups.

Sex / Gender

All the literature was based on small scale studies. A small study of American Black women reported that the use of religion, and faith helped them to cope with life after stroke.^[234] Similarly, a small scale qualitative study^[235] found that women were more likely than men to use spiritual, and religious activities as a coping strategy, and perceive their emotional state as the cause of pain following a stroke. Other studies found spiritual belief that a higher power will assist in

coping with illness or disability is associated with better mental health, (but not physical health) ^[236] and reduces emotional distress following stroke. ^[237]

A Swedish study found adherence to statin treatment, assessed by looking at whether a prescription was filled, is less common among women post stroke. ^[233]

Literacy/health literacy/education/English not as first language

There was limited evidence in the literature reviewed. A Swedish study found adherence to statin treatment after stroke is less common among people with a university education ^[233]

Ethnicity

According to Singh et al ^[212] Black people of West African origin come from a culture where the norm is only to visit the hospital when someone is very sick. These individuals are from a culture that rarely seek preventative healthcare or services for mild symptoms because it is “like looking for illness to escape family responsibilities,” and “associated with lazy men”. Instead of seeking immediate medical attention after the onset of acute stroke symptoms, people in this group sometimes hide their symptoms, or attempt to “sleep them off,” or rely on prayers, social networks or religious networks, or use folk/home remedies to facilitate their recovery.

Cultural beliefs can also impact long-term self-management of stroke symptoms ^[212] (e.g. illnesses such as a stroke) are perceived as disharmony resulting from demons, evil spirits, and supernatural phenomena. These beliefs can have implications on medication adherence, and management.

Limited information was found about other ethnic groups or cultures:

- a qualitative study found that positive perception of peer support is an effective strategy for Black men to change their health behaviour to reduce risks for heart disease, and stroke. ^[238]
- a scoping review found several cultural factors impact on the experiences of Asian patients, and their carers post stroke, including cultural beliefs about illness, and caregiving. ^[239]
- a qualitative study found cultural, and religious backgrounds influence stroke caregivers’ experience, coping strategies, and self-sacrifice behaviour in people of Chinese origin. ^[240]

Religion

No literature identified explored the roles of specific religions in stroke. However, one small study found a significant shift of the circadian pattern of stroke onset time from the period between 6:00 a.m. and noon to that between noon and 6:00 pm during the month of Ramadan. ^[241]

Carers

There was limited high quality evidence in the literature reviewed. Older carers of stroke survivors from Black, Asian, and White British groups share many experiences of homecare, however language, and cultural difference may exacerbate common pressures, and stresses. ^[242], ^[226] A small study into the experiences of Black African-Caribbean informal stroke carers revealed stereotypical assumptions about this group based on ethnicity which were unwarranted as there is diversity within ethnic groups. Individual contexts of ethnicity, culture, and religious beliefs shape expectations, and perceptions. ^[243]

Spirituality, and resilience following stroke may be essential factors in caregiver adjustment following stroke, but more evidence is needed. ^[244] According to a systematic review, spirituality plays an important role in improving the quality of life, and decreasing anxiety and depression of both stroke survivors, and their caregivers. ^[245]

A qualitative study found British Asian female carers of people who have had a stroke experience higher level of anxiety, and depression than their White counterparts. This stems from the carers' pre-existing physical ailments, their cultural and religious beliefs, and household arrangements. Carers' strain in extended households is exacerbated by the additional responsibility of caring for other dependent relatives. ^[246]

Appendix C: Bibliography

- [1] 'Definition | Background information | Stroke and TIA | CKS | NICE'. Accessed: Oct. 16, 2025. [Online]. Available: <https://cks.nice.org.uk/topics/stroke-tia/background-information/definition/>
- [2] 'Causes of a stroke', nhs.uk. Accessed: Oct. 16, 2025. [Online]. Available: <https://www.nhs.uk/conditions/stroke/causes/>
- [3] 'Types and causes of stroke | Stroke Association'. Accessed: Oct. 16, 2025. [Online]. Available: <https://www.stroke.org.uk/stroke/types>
- [4] A. Bhalla, L. Clark, R. Fisher, and M. James, 'The new national clinical guideline for stroke: an opportunity to transform stroke care', *Clinical Medicine*, vol. 24, no. 2, p. 100025, Mar. 2024, doi: 10.1016/j.clinme.2024.100025.
- [5] A. Patel, V. Berdunov, Z. Quayyum, D. King, M. Knapp, and R. Wittenberg, 'Estimated societal costs of stroke in the UK based on a discrete event simulation', *Age Ageing*, vol. 49, no. 2, pp. 270–276, Feb. 2020, doi: 10.1093/ageing/afz162.
- [6] 'Hospital admissions for stroke by age and gender', NHS England Digital. Accessed: Oct. 17, 2025. [Online]. Available: <https://digital.nhs.uk/supplementary-information/2024/hospital-admissions-for-stroke-by-age-and-gender>
- [7] D. King, R. Wittenberg, A. Patel, Z. Quayyum, V. Berdunov, and M. Knapp, 'The future incidence, prevalence and costs of stroke in the UK', *Age Ageing*, vol. 49, no. 2, pp. 277–282, Feb. 2020, doi: 10.1093/ageing/afz163.
- [8] '10-Year-Health-Plan.pdf'. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.stroke.org.uk/10-Year-Health-Plan>
- [9] NHS England, 'NHS England » Hospital admissions for strokes rise by 28% since 2004 – as NHS urges the public to “Act FAST”'. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.england.nhs.uk/2024/11/hospital-admissions-for-strokes-rise-by-28-since-2004-as-nhs-urges-the-public-to-act-fast/>
- [10] 'Prevalence | Background information | Stroke and TIA | CKS | NICE'. Accessed: Oct. 17, 2025. [Online]. Available: <https://cks.nice.org.uk/topics/stroke-tia/background-information/prevalence/>
- [11] R. J. Fisher *et al.*, 'Nominal group technique to establish the core components of home-based rehabilitation for survivors of stroke with severe disability', *BMJ Open*, vol. 11, no. 12, p. e052593, Dec. 2021, doi: 10.1136/bmjopen-2021-052593.
- [12] K. Hanna, D. Mercer, and F. Rowe, 'A qualitative exploration of the sociology of poststroke visual impairments and the associated health inequalities', *Brain and Behavior*, vol. 10, no. 8, p. e01738, 2020, doi: 10.1002/brb3.1738.
- [13] 'Social exclusion of people with marked communication impairment following stroke'. Accessed: Oct. 16, 2025. [Online]. Available: <https://web.archive.org/web/20081025012629/http://www.jrf.org.uk/knowledge/findings/socialcare/814.asp>
- [14] S. T. Pendlebury and P. M. Rothwell, 'Incidence and prevalence of dementia associated with transient ischaemic attack and stroke: analysis of the population-based Oxford Vascular

- Study', *Lancet Neurol*, vol. 18, no. 3, pp. 248–258, Mar. 2019, doi: 10.1016/S1474-4422(18)30442-3.
- [15] P. Y. Aw *et al.*, 'Co-prevalence and incidence of myocardial infarction and/or stroke in patients with depression and/or anxiety: A systematic review and meta-analysis', *J Psychosom Res*, vol. 165, p. 111141, Feb. 2023, doi: 10.1016/j.jpsychores.2022.111141.
- [16] 'Getting It Right First Time - GIRFT', Getting It Right First Time - GIRFT. Accessed: Oct. 17, 2025. [Online]. Available: <https://gettingitrightfirsttime.co.uk/>
- [17] A. Alonso, A. E. Barnes, J. L. Guest, A. Shah, I. Y. Shao, and V. Marconi, 'HIV Infection and Incidence of Cardiovascular Diseases: An Analysis of a Large Healthcare Database', *J Am Heart Assoc*, vol. 8, no. 14, p. e012241, Jul. 2019, doi: 10.1161/JAHA.119.012241.
- [18] L. A. Benjamin *et al.*, 'The Role of Human Immunodeficiency Virus–Associated Vasculopathy in the Etiology of Stroke', *J Infect Dis*, vol. 216, no. 5, pp. 545–553, Sep. 2017, doi: 10.1093/infdis/jix340.
- [19] 'Diagnosing a stroke', nhs.uk. Accessed: Oct. 16, 2025. [Online]. Available: <https://www.nhs.uk/conditions/stroke/diagnosis/>
- [20] 'Healthtalk'. Accessed: Oct. 16, 2025. [Online]. Available: <https://healthtalk.org/experiences/stroke/the-event-stroke-or-transient-ischaemic-attack-tia/>
- [21] NHS England, 'NHS England » What are healthcare inequalities?' Accessed: Oct. 16, 2025. [Online]. Available: <https://www.england.nhs.uk/about/equality/equality-hub/national-healthcare-inequalities-improvement-programme/what-are-healthcare-inequalities/>
- [22] 'How ethnicity recording differs across health data sources and the impact on analysis | National Statistical'. Accessed: Jan. 23, 2025. [Online]. Available: <https://blog.ons.gov.uk/2023/01/16/how-ethnicity-recording-differs-across-health-data-sources-and-the-impact-on-analysis/>
- [23] J. Shuford, 'Contribution of Artificial Intelligence in Improving Accessibility for Individuals with Disabilities', *Journal of Knowledge Learning and Science Technology ISSN: 2959-6386 (online)*, vol. 2, no. 2, pp. 421–433, 2023.
- [24] K. Menon *et al.*, 'Reporting of Social Determinants of Health in Pediatric Sepsis Studies', *Pediatr.Crit.Care.Med.*, vol. 24, no. 4, pp. 301–310, 2023, doi: 10.1097/PCC.0000000000003184.
- [25] S. Powis, 'RightCare Stroke Toolkit', [Online]. Available: <https://gettingitrightfirsttime.co.uk/wp-content/uploads/2024/07/B0850-rightcare-stroke-toolkit-v1.04.pdf>
- [26] S. Morris *et al.*, 'Impact and sustainability of centralising acute stroke services in English metropolitan areas: retrospective analysis of hospital episode statistics and stroke national audit data', *BMJ*, vol. 364, p. l1, Jan. 2019, doi: 10.1136/bmj.l1.
- [27] P. Langhorne, S. Ramachandra, and Stroke Unit Trialists' Collaboration, 'Organised inpatient (stroke unit) care for stroke: network meta-analysis', *Cochrane Database Syst Rev*, vol. 4, no. 4, p. CD000197, Apr. 2020, doi: 10.1002/14651858.CD000197.pub4.
- [28] R. Holmes, S. Ackerley, R. J. Fisher, and L. A. Connell, 'Exploring variation in the six-month review for stroke survivors: a national survey of current practice in England', *BMC Health Services Research*, vol. 25, no. 1, p. 159, Jan. 2025, doi: 10.1186/s12913-025-12323-6.
- [29] 'Mechanical Thrombectomy - Stroke Medicine', North Tees and Hartlepool NHS Foundation Trust. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.nth.nhs.uk/resources/mechanical-thrombectomy-stroke-medicine/>
- [30] P. McMeekin, M. James, C. I. Price, G. A. Ford, and P. White, 'The impact of large core and late treatment trials: An update on the modelled annual thrombectomy eligibility of UK stroke patients', *European Stroke Journal*, vol. 9, no. 3, pp. 566–574, Sep. 2024, doi: 10.1177/23969873241232820.

- [31] R. J. Jabbour, H. Routledge, and N. Curzen, 'How do we ensure that more patients receive stroke thrombectomy in the UK?', *Br J Hosp Med (Lond)*, vol. 84, no. 5, pp. 1–4, May 2023, doi: 10.12968/hmed.2023.0111.
- [32] H. Ashraf *et al.*, 'Sex disparities and trends in stroke incidence, prevalence, and mortality in the US and worldwide: Findings from the global burden of disease, 1990-2021', *J Clin Neurosci*, vol. 133, p. 111029, Mar. 2025, doi: 10.1016/j.jocn.2025.111029.
- [33] R. K. Akyea *et al.*, 'Sex, Age, and Socioeconomic Differences in Nonfatal Stroke Incidence and Subsequent Major Adverse Outcomes', *Stroke*, vol. 52, no. 2, pp. 396–405, Jan. 2021, doi: 10.1161/STROKEAHA.120.031659.
- [34] K. M. Mohan, S. L. Crichton, A. P. Grieve, A. G. Rudd, C. D. A. Wolfe, and P. U. Heuschmann, 'Frequency and predictors for the risk of stroke recurrence up to 10 years after stroke: the South London Stroke Register', *J Neurol Neurosurg Psychiatry*, vol. 80, no. 9, pp. 1012–1018, Sep. 2009, doi: 10.1136/jnnp.2008.170456.
- [35] L. Li, C. A. Scott, and P. M. Rothwell, 'Association of Younger vs Older Ages With Changes in Incidence of Stroke and Other Vascular Events, 2002-2018', *JAMA*, vol. 328, no. 6, pp. 563–574, Aug. 2022, doi: 10.1001/jama.2022.12759.
- [36] C. A. Scott, L. Li, and P. M. Rothwell, 'Diverging Temporal Trends in Stroke Incidence in Younger vs Older People: A Systematic Review and Meta-analysis', *JAMA Neurol*, vol. 79, no. 10, pp. 1036–1048, Oct. 2022, doi: 10.1001/jamaneurol.2022.1520.
- [37] N. Yesilot, J. Putaala, S. Z. Bahar, and T. Tatlisumak, 'Ethnic and Geographical Differences in Ischaemic Stroke Among Young Adults', *Curr Vasc Pharmacol*, vol. 15, no. 5, pp. 416–429, 2017, doi: 10.2174/1570161115666170202161719.
- [38] S. A. E. Peters, C. Carcel, E. R. C. Millett, and M. Woodward, 'Sex differences in the association between major risk factors and the risk of stroke in the UK Biobank cohort study', *Neurology*, vol. 95, no. 20, pp. e2715–e2726, Nov. 2020, doi: 10.1212/WNL.00000000000010982.
- [39] C. W. Yoon and C. D. Bushnell, 'Stroke in Women: A Review Focused on Epidemiology, Risk Factors, and Outcomes', *J Stroke*, vol. 25, no. 1, pp. 2–15, Jan. 2023, doi: 10.5853/jos.2022.03468.
- [40] K. Bilodeau, 'Early menopause linked to higher risk of stroke', Harvard Health. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.health.harvard.edu/womens-health/early-menopause-linked-to-higher-risk-of-stroke>
- [41] S. L. Demel, S. Kittner, S. H. Ley, M. McDermott, and K. M. Rexrode, 'Stroke Risk Factors Unique to Women', *Stroke*, vol. 49, no. 3, pp. 518–523, Mar. 2018, doi: 10.1161/STROKEAHA.117.018415.
- [42] J. Ospel, N. Singh, A. Ganesh, and M. Goyal, 'Sex and Gender Differences in Stroke and Their Practical Implications in Acute Care', *J Stroke*, vol. 25, no. 1, pp. 16–25, Jan. 2023, doi: 10.5853/jos.2022.04077.
- [43] M. Graber *et al.*, 'A review of psychosocial factors and stroke: A new public health problem', *Rev Neurol (Paris)*, vol. 175, no. 10, pp. 686–692, Dec. 2019, doi: 10.1016/j.neurol.2019.02.001.
- [44] M. H. F. Poorthuis, A. M. Algra, A. Algra, L. J. Kappelle, and C. J. M. Klijn, 'Female- and Male-Specific Risk Factors for Stroke: A Systematic Review and Meta-analysis', *JAMA Neurol*, vol. 74, no. 1, pp. 75–81, Jan. 2017, doi: 10.1001/jamaneurol.2016.3482.
- [45] E. Twardzik *et al.*, 'Abstract P398: Relative versus Absolute Neighborhood Economic Conditions and Risk of Stroke in a United States National Cohort', *Circulation*, vol. 141, no. Suppl_1, pp. AP398–AP398, Mar. 2020, doi: 10.1161/circ.141.suppl_1.P398.
- [46] R. Zhang, L. Han, S. Xu, G. Jiang, L. Pu, and H. Liu, 'Relationship between socioeconomic status and stroke: An observational and network Mendelian randomization study', *J Stroke Cerebrovasc Dis*, vol. 33, no. 12, p. 108097, Dec. 2024, doi: 10.1016/j.jstrokecerebrovasdis.2024.108097.

- [47] Z. Jiang, S. Zhang, P. Zeng, and T. Wang, 'Influence of social deprivation on morbidity and all-cause mortality of cardiometabolic multi-morbidity: a cohort analysis of the UK Biobank cohort', *BMC Public Health*, vol. 23, no. 1, p. 2177, Nov. 2023, doi: 10.1186/s12889-023-17008-5.
- [48] B. D. Bray *et al.*, 'Socioeconomic disparities in first stroke incidence, quality of care, and survival: a nationwide registry-based cohort study of 44 million adults in England', *Lancet Public Health*, vol. 3, no. 4, pp. e185–e193, Apr. 2018, doi: 10.1016/S2468-2667(18)30030-6.
- [49] E. Tod *et al.*, 'What causes the burden of stroke in Scotland? A comparative risk assessment approach linking the Scottish Health Survey to administrative health data', *PLoS One*, vol. 14, no. 7, p. e0216350, 2019, doi: 10.1371/journal.pone.0216350.
- [50] A. Avan *et al.*, 'Socioeconomic status and stroke incidence, prevalence, mortality, and worldwide burden: an ecological analysis from the Global Burden of Disease Study 2017', *BMC Medicine*, vol. 17, no. 1, p. 191, Oct. 2019, doi: 10.1186/s12916-019-1397-3.
- [51] H. Selvik, H. Naess, and C. Kvistad, 'Abstract WP168: Socioeconomic Status and Stroke Severity', *Stroke*, vol. 49, Jan. 2018, doi: 10.1161/str.49.suppl_1.WP168.
- [52] C. A. Jackson, M. Jones, and G. D. Mishra, 'Educational and homeownership inequalities in stroke incidence: a population-based longitudinal study of mid-aged women', *Eur J Public Health*, vol. 24, no. 2, pp. 231–236, Apr. 2014, doi: 10.1093/eurpub/ckt073.
- [53] C. A. McHutchison, E. V. Backhouse, V. Cvorovic, S. D. Shenkin, and J. M. Wardlaw, 'Education, Socioeconomic Status, and Intelligence in Childhood and Stroke Risk in Later Life: A Meta-analysis', *Epidemiology*, vol. 28, no. 4, p. 608, Jul. 2017, doi: 10.1097/EDE.0000000000000675.
- [54] K. H. D. Ignacio, J. D. B. Diestro, A. I. Espiritu, and M. C. Pineda-Franks, 'Stroke in Male-to-Female Transgenders: A Systematic Review and Meta-Analysis', *Can J Neurol Sci*, vol. 49, no. 1, pp. 76–83, Jan. 2022, doi: 10.1017/cjn.2021.54.
- [55] 'Do transgender people have a higher risk of heart problems?', British Heart Foundation. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.bhf.org.uk/informationsupport/heart-matters-magazine/medical/transgender-heart-risk>
- [56] L. D'hoore and G. T'Sjoen, 'Gender-affirming hormone therapy: An updated literature review with an eye on the future', *J Intern Med*, vol. 291, no. 5, pp. 574–592, May 2022, doi: 10.1111/joim.13441.
- [57] 'CARDIOMETABOLIC PROFILES OF TRANSGENDER INDIVIDUALS TAKING GENDER-AFFIRMING HORMONE THERAPY IN THE TRANSGENDER HEALTH AGING STUDY AND REGISTRY | JACC'. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.jacc.org/doi/10.1016/S0735-1097%2821%2902956-9>
- [58] E. S. Mullins *et al.*, 'Thrombosis Risk in Transgender Adolescents Receiving Gender-Affirming Hormone Therapy', *Pediatrics*, vol. 147, no. 4, p. e2020023549, Apr. 2021, doi: 10.1542/peds.2020-023549.
- [59] 'Androgens and cardiovascular risk in female-to-male gender dysphoric subjects - Maturitas'. Accessed: Oct. 17, 2025. [Online]. Available: [https://www.maturitas.org/article/S0378-5122\(17\)30165-2/abstract](https://www.maturitas.org/article/S0378-5122(17)30165-2/abstract)
- [60] K. J. Denby, L. Cho, K. Toljan, M. Patil, and C. A. Ferrando, 'Assessment of Cardiovascular Risk in Transgender Patients Presenting for Gender-Affirming Care', *Am J Med*, vol. 134, no. 8, pp. 1002–1008, Aug. 2021, doi: 10.1016/j.amjmed.2021.02.031.
- [61] LGBTQ Institute, 'Older Lesbians At Higher Risk For Stroke, Arthritis, Back Pain, Than Straight Seniors', LGBTQ Institute. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.lgbtqinstitute.org/research-from-field/2017/9/8/older-lesbians-at-higher-risk-for-stroke-arthritis-back-pain-than-straight-seniors>
- [62] B. A. Caceres, N. Makarem, K. T. Hickey, and T. L. Hughes, 'Cardiovascular Disease Disparities in Sexual Minority Adults: An Examination of the Behavioral Risk Factor

- Surveillance System (2014-2016)', *Am J Health Promot*, vol. 33, no. 4, pp. 576–585, May 2019, doi: 10.1177/0890117118810246.
- [63] Y. Sharma, J. Y. Taylor, T. Hughes, and B. Caceres, 'Abstract 9744: Cardiovascular Stroke Nursing Best Abstract Award: Investigating Sexual Identity Disparities in Hypertension and Hypertension Treatment Among Adults', *Circulation*, vol. 144, no. Suppl_1, pp. A9744–A9744, Nov. 2021, doi: 10.1161/circ.144.suppl_1.9744.
- [64] 'More attention should be paid to heart health of lesbian, gay and bisexual adults, study suggests | American Heart Association'. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.heart.org/en/news/2018/10/18/more-attention-should-be-paid-to-heart-health-of-lesbian-gay-and-bisexual-adults-study-suggests>
- [65] A. Garg, H. Roeder, and E. C. Leira, 'In-hospital outcomes and recurrence of stroke during pregnancy and puerperium', *Int J Stroke*, vol. 18, no. 4, pp. 445–452, Apr. 2023, doi: 10.1177/17474930221116209.
- [66] P. Ijäs, 'Trends in the Incidence and Risk Factors of Pregnancy-Associated Stroke', *Front. Neurol.*, vol. 13, Apr. 2022, doi: 10.3389/fneur.2022.833215.
- [67] C. Katsafanas and C. Bushnell, 'Pregnancy and stroke risk in women', *Neurobiol Dis*, vol. 169, p. 105735, Jul. 2022, doi: 10.1016/j.nbd.2022.105735.
- [68] R. H. Swartz *et al.*, 'The incidence of pregnancy-related stroke: A systematic review and meta-analysis', *Int J Stroke*, vol. 12, no. 7, pp. 687–697, Oct. 2017, doi: 10.1177/1747493017723271.
- [69] E. C. Miller, 'Maternal Stroke Associated With Pregnancy', *Continuum (Minneapolis)*, vol. 28, no. 1, pp. 93–121, Feb. 2022, doi: 10.1212/CON.0000000000001078.
- [70] L. Ban, N. Sprigg, A. Abdul Sultan, C. Nelson-Piercy, P. M. Bath, and L. J. Tata, 'Abstract 140: Incidence of Stroke in and Around Pregnancy: A UK Population-based Cohort Study', *Stroke*, vol. 47, no. suppl_1, pp. A140–A140, Feb. 2016, doi: 10.1161/str.47.suppl_1.140.
- [71] L. Ban *et al.*, 'Incidence of First Stroke in Pregnant and Nonpregnant Women of Childbearing Age: A Population-Based Cohort Study From England', *J Am Heart Assoc*, vol. 6, no. 4, p. e004601, Apr. 2017, doi: 10.1161/JAHA.116.004601.
- [72] B. S. Liew, A. A. Ghani, and X. You, 'Stroke in pregnancy', *Med J Malaysia*, vol. 74, no. 3, pp. 246–249, Jun. 2019.
- [73] 'Infertility, recurrent pregnancy loss, and risk of stroke: pooled analysis of individual patient data of 618 851 women | The BMJ'. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.bmj.com/content/377/bmj-2022-070603>
- [74] Fink, 'Women Who Experienced Miscarriage or Stillbirth Early in Life Have an...', Clinician.com. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.clinician.com/articles/149274-women-who-experienced-miscarriage-or-stillbirth-early-in-life-have-an-increased-risk-of-stroke-in-later-life>
- [75] A. de Havenon *et al.*, 'Association of Preeclampsia With Incident Stroke in Later Life Among Women in the Framingham Heart Study', *JAMA Netw Open*, vol. 4, no. 4, p. e215077, Apr. 2021, doi: 10.1001/jamanetworkopen.2021.5077.
- [76] D. Canoy *et al.*, 'Hypertension in pregnancy and risk of coronary heart disease and stroke: A prospective study in a large UK cohort', *Int J Cardiol*, vol. 222, pp. 1012–1018, Nov. 2016, doi: 10.1016/j.ijcard.2016.07.170.
- [77] K. K. Andersen and T. S. Olsen, 'Married, unmarried, divorced, and widowed and the risk of stroke', *Acta Neurol Scand*, vol. 138, no. 1, pp. 41–46, Jul. 2018, doi: 10.1111/ane.12914.
- [78] 'News', British Heart Foundation. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.bhf.org.uk/informationsupport/heart-matters-magazine/news>
- [79] V. Jaiswal *et al.*, 'The Racial Disparity Among the Clinical Outcomes Post Stroke and its Intervention Outcomes: A Systematic Review and Meta-analysis', *Current Problems in Cardiology*, vol. 48, no. 9, p. 101753, Sep. 2023, doi: 10.1016/j.cpcardiol.2023.101753.

- [80] 'Ethnic disparities in the major causes of mortality and their risk factors – a rapid review', GOV.UK. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.gov.uk/government/publications/the-report-of-the-commission-on-race-and-ethnic-disparities-supporting-research/ethnic-disparities-in-the-major-causes-of-mortality-and-their-risk-factors-by-dr-raghib-ali-et-al>
- [81] B. Bonnechère, J. Liu, A. Thompson, N. Amin, and C. van Duijn, 'Does ethnicity influence dementia, stroke and mortality risk? Evidence from the UK Biobank', *Front Public Health*, vol. 11, p. 1111321, 2023, doi: 10.3389/fpubh.2023.1111321.
- [82] I. J. Marshall *et al.*, 'Cohort profile: The South London Stroke Register - a population-based register measuring the incidence and outcomes of stroke', *J Stroke Cerebrovasc Dis*, vol. 32, no. 8, p. 107210, Aug. 2023, doi: 10.1016/j.jstrokecerebrovasdis.2023.107210.
- [83] H. Ramadan *et al.*, 'Incidence of first stroke and ethnic differences in stroke pattern in Bradford, UK: Bradford Stroke Study', *Int J Stroke*, vol. 13, no. 4, pp. 374–378, Jun. 2018, doi: 10.1177/1747493017743052.
- [84] 'Friends, families and travellers, How to tackle health inequalities in Gypsy, Roma and traveller communities. A guide for health and care services'. Accessed: Oct. 17, 2025. [Online]. Available: https://www.gypsy-traveller.org/wp-content/uploads/2025/03/SS00-Health-inequalities_FINAL-2.pdf
- [85] M. Traylor *et al.*, 'Genetics of stroke in a UK African ancestry case-control study: South London Ethnicity and Stroke Study', *Neurol Genet*, vol. 3, no. 2, p. e142, Apr. 2017, doi: 10.1212/NXG.0000000000000142.
- [86] D. Kamin Mukaz, N. A. Zakai, S. Cruz-Flores, L. D. McCullough, and M. Cushman, 'Identifying Genetic and Biological Determinants of Race-Ethnic Disparities in Stroke in the United States', *Stroke*, vol. 51, no. 11, pp. 3417–3424, Nov. 2020, doi: 10.1161/STROKEAHA.120.030425.
- [87] S. Fatumo *et al.*, 'Metabolic Traits and Stroke Risk in Individuals of African Ancestry: Mendelian Randomization Analysis', *Stroke*, vol. 52, no. 8, pp. 2680–2684, Aug. 2021, doi: 10.1161/STROKEAHA.121.034747.
- [88] 'What is Lupus? | Lupus UK'. Accessed: Oct. 17, 2025. [Online]. Available: <https://lupusuk.org.uk/what-is-lupus/>
- [89] M. Barbhuiya *et al.*, 'Racial/Ethnic Variation in Stroke Rates and Risks among Patients with Systemic Lupus Erythematosus', *Semin Arthritis Rheum*, vol. 48, no. 5, pp. 840–846, Apr. 2019, doi: 10.1016/j.semarthrit.2018.07.012.
- [90] 'Sickle Cell Disease in Childhood: Standards and Recommendations for Clinical Care » Sickle Cell Society', Sickle Cell Society. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.sicklecellsociety.org/resource/paediatricstandardsresource/>
- [91] S. Kuikel *et al.*, 'Prevalence of Stroke in Asian Patients with Sickle Cell Anemia: A Systematic Review and Meta-Analysis', *Neurol Res Int*, vol. 2021, p. 9961610, 2021, doi: 10.1155/2021/9961610.
- [92] A. I. Qureshi, A. A. Malik, M. M. Adil, and M. F. K. Suri, 'Oral contraceptive use and incident stroke in women with sickle cell disease', *Thrombosis Research*, vol. 136, no. 2, pp. 315–318, Aug. 2015, doi: 10.1016/j.thromres.2015.04.013.
- [93] T. Aurelius *et al.*, 'Ischaemic stroke in South Asians: The BRAINS study', *Eur J Neurol*, vol. 30, no. 2, pp. 353–361, Feb. 2023, doi: 10.1111/ene.15605.
- [94] C.-F. Tsai, N. Anderson, B. Thomas, and C. L. M. Sudlow, 'Risk factors for ischemic stroke and its subtypes in Chinese vs. Caucasians: Systematic review and meta-analysis', *Int J Stroke*, vol. 10, no. 4, pp. 485–493, Jun. 2015, doi: 10.1111/ijss.12508.
- [95] T. Al-Rousan *et al.*, 'Epidemiology of cardiovascular disease and its risk factors among refugees and asylum seekers: Systematic review and meta-analysis', *Int J Cardiol Cardiovasc Risk Prev*, vol. 12, p. 200126, Mar. 2022, doi: 10.1016/j.ijcrp.2022.200126.

- [96] R. Hamad *et al.*, 'Association of Neighborhood Disadvantage With Cardiovascular Risk Factors and Events Among Refugees in Denmark', *JAMA Netw Open*, vol. 3, no. 8, p. e2014196, Aug. 2020, doi: 10.1001/jamanetworkopen.2020.14196.
- [97] M. B. Downer *et al.*, 'Association of multimorbidity with mortality after stroke stratified by age, severity, etiology, and prior disability', *Int J Stroke*, vol. 19, no. 3, pp. 348–358, Mar. 2024, doi: 10.1177/17474930231210397.
- [98] P. Inchai, W.-C. Tsai, L.-T. Chiu, and P.-T. Kung, 'Incidence, risk, and associated risk factors of stroke among people with different disability types and severities: A national population-based cohort study in Taiwan', *Disabil Health J*, vol. 14, no. 4, p. 101165, Oct. 2021, doi: 10.1016/j.dhjo.2021.101165.
- [99] K. Fleetwood *et al.*, 'Association of severe mental illness with stroke outcomes and process-of-care quality indicators: nationwide cohort study', *Br J Psychiatry*, vol. 221, no. 1, pp. 394–401, Jul. 2022, doi: 10.1192/bjp.2021.120.
- [100] C. A. Jackson, J. Kerssens, K. Fleetwood, D. J. Smith, S. W. Mercer, and S. H. Wild, 'Incidence of ischaemic heart disease and stroke among people with psychiatric disorders: retrospective cohort study', *Br J Psychiatry*, vol. 217, no. 2, pp. 442–449, Aug. 2020, doi: 10.1192/bjp.2019.250.
- [101] R. Prigge, S. H. Wild, and C. A. Jackson, 'The individual and combined associations of depression and socioeconomic status with risk of major cardiovascular events: A prospective cohort study', *J Psychosom Res*, vol. 160, p. 110978, Sep. 2022, doi: 10.1016/j.jpsychores.2022.110978.
- [102] K. Hemphill, S. Tierney, D. Tirschwell, and A. P. Davis, 'A review of methamphetamine use and stroke in the young', *Front Neurol*, vol. 15, p. 1397677, Apr. 2024, doi: 10.3389/fneur.2024.1397677.
- [103] A. Tsatsakis *et al.*, 'A Mechanistic and Pathophysiological Approach for Stroke Associated with Drugs of Abuse', *J Clin Med*, vol. 8, no. 9, p. 1295, Aug. 2019, doi: 10.3390/jcm8091295.
- [104] B. I. Indave *et al.*, 'Risk of stroke in prescription and other amphetamine-type stimulants use: A systematic review', *Drug Alcohol Rev*, vol. 37, no. 1, pp. 56–69, Jan. 2018, doi: 10.1111/dar.12559.
- [105] C. Hakulinen, L. Pulkki-Råback, M. Virtanen, M. Jokela, M. Kivimäki, and M. Elovainio, 'Social isolation and loneliness as risk factors for myocardial infarction, stroke and mortality: UK Biobank cohort study of 479 054 men and women', *Heart*, vol. 104, no. 18, pp. 1536–1542, Sep. 2018, doi: 10.1136/heartjnl-2017-312663.
- [106] R. W. Smith, I. Barnes, J. Green, G. K. Reeves, V. Beral, and S. Floud, 'Social isolation and risk of heart disease and stroke: analysis of two large UK prospective studies', *Lancet Public Health*, vol. 6, no. 4, pp. e232–e239, Apr. 2021, doi: 10.1016/S2468-2667(20)30291-7.
- [107] M. K. Kapral *et al.*, 'Rural-Urban Differences in Stroke Risk Factors, Incidence, and Mortality in People With and Without Prior Stroke', *Circ Cardiovasc Qual Outcomes*, vol. 12, no. 2, p. e004973, Feb. 2019, doi: 10.1161/CIRCOUTCOMES.118.004973.
- [108] A. Nanjo, H. Evans, K. Direk, A. C. Hayward, A. Story, and A. Banerjee, 'Prevalence, incidence, and outcomes across cardiovascular diseases in homeless individuals using national linked electronic health records', *Eur Heart J*, vol. 41, no. 41, pp. 4011–4020, Nov. 2020, doi: 10.1093/eurheartj/ehaa795.
- [109] N. Jafar, E. Shalen, H. Patel, G. Nah, and N. Parikh, 'Cardiovascular outcomes and mortality in people experiencing homelessness in california', *JACC*, vol. 77, no. 18_Supplement_1, pp. 1466–1466, May 2021, doi: 10.1016/S0735-1097(21)02824-2.
- [110] S. U. Khan *et al.*, 'Clinical and Economic Profile of Homeless Young Adults with Stroke in the United States, 2002–2017', *Curr Probl Cardiol*, vol. 48, no. 8, p. 101190, Aug. 2023, doi: 10.1016/j.cpcardiol.2022.101190.

- [111] E. D. Riley *et al.*, 'Cocaine Use and White Matter Hyperintensities in Homeless and Unstably Housed Women', *J Stroke Cerebrovasc Dis*, vol. 30, no. 5, p. 105675, May 2021, doi: 10.1016/j.jstrokecerebrovasdis.2021.105675.
- [112] A. Gozdzik, R. Salehi, P. O'Campo, V. Stergiopoulos, and S. W. Hwang, 'Cardiovascular risk factors and 30-year cardiovascular risk in homeless adults with mental illness', *BMC Public Health*, vol. 15, no. 1, p. 165, Feb. 2015, doi: 10.1186/s12889-015-1472-4.
- [113] A. E. Montgomery, A. J. DeRussy, J. S. Richman, and C. Lin, 'Predictors of recurrent stroke and subsequent mortality among patients experiencing housing instability', *J Stroke Cerebrovasc Dis*, vol. 33, no. 9, p. 107896, Sep. 2024, doi: 10.1016/j.jstrokecerebrovasdis.2024.107896.
- [114] M. Victory Brodman, J. C. Iturrizaga, and P. Cram, 'Rates of Cardiovascular Events in the Justice System: An Unknown Problem', *J Correct Health Care*, vol. 31, no. 1, pp. 3–5, Feb. 2025, doi: 10.1089/jchc.24.07.0057.
- [115] S. Stürup-Toft, E. J. O'Moore, and E. H. Plugge, 'Looking behind the bars: emerging health issues for people in prison', *Br.Med.Bull.*, vol. 125, no. 1, pp. 15–23, 2018, doi: 10.1093/bmb/ldx052.
- [116] M. C. Jimenez, L. Lopez, and K. M. Rexrode, 'Abstract P134: Greater Burden of Cardiovascular Disease Among Incarcerated Women of Color Compared to Whites', *Circulation*, vol. 139, no. Suppl_1, pp. AP134–AP134, Mar. 2019, doi: 10.1161/circ.139.suppl_1.P134.
- [117] A. Bhat, V. Mahajan, and N. Wolfe, 'Implicit bias in stroke care: A recurring old problem in the rising incidence of young stroke', *J Clin Neurosci*, vol. 85, pp. 27–35, Mar. 2021, doi: 10.1016/j.jocn.2020.12.017.
- [118] C. Lawrence and J. Webb, 'Sickle Cell Disease and Stroke: Diagnosis and Management', *Curr Neurol Neurosci Rep*, vol. 16, no. 3, p. 27, Mar. 2016, doi: 10.1007/s11910-016-0622-0.
- [119] J. Addo, A. Bhalla, S. Crichton, A. G. Rudd, C. McKevitt, and C. D. A. Wolfe, 'Provision of acute stroke care and associated factors in a multiethnic population: prospective study with the South London Stroke Register', *BMJ*, vol. 342, p. d744, Feb. 2011, doi: 10.1136/bmj.d744.
- [120] S. Walter *et al.*, 'Detection to Hospital Door: Gender Differences of Patients With Acute Stroke Symptoms', *Front Neurol*, vol. 13, p. 833933, Apr. 2022, doi: 10.3389/fneur.2022.833933.
- [121] J. Mainz, G. Andersen, J. B. Valentin, M. F. Gude, and S. P. Johnsen, 'Disentangling Sex Differences in Use of Reperfusion Therapy in Patients With Acute Ischemic Stroke', *Stroke*, vol. 51, no. 8, pp. 2332–2338, Aug. 2020, doi: 10.1161/STROKEAHA.119.028589.
- [122] S. S. Bruce *et al.*, 'Differences in Diagnostic Evaluation in Women and Men After Acute Ischemic Stroke', *J Am Heart Assoc*, vol. 9, no. 5, p. e015625, Mar. 2020, doi: 10.1161/JAHA.119.015625.
- [123] C. Bushnell *et al.*, 'Sex differences in the evaluation and treatment of acute ischaemic stroke', *Lancet Neurol*, vol. 17, no. 7, pp. 641–650, Jul. 2018, doi: 10.1016/S1474-4422(18)30201-1.
- [124] L. L. Dalli *et al.*, 'Disparities in Antihypertensive Prescribing After Stroke', *Stroke*, vol. 50, no. 12, pp. 3592–3599, Dec. 2019, doi: 10.1161/STROKEAHA.119.026823.
- [125] K.-A. Sterling, M. J. MacLeod, M. Barber, and M. Turner, 'Acute Care, Secondary Prevention, and Outcomes after Ischaemic and Haemorrhagic Stroke in Men and Women: A Data-Linkage Study', *Cerebrovasc Dis*, vol. 54, no. 3, pp. 371–378, 2025, doi: 10.1159/000540371.
- [126] A. Lekoubou, K. G. Bishu, and B. Ovbiagele, 'Stroke Thrombectomy Utilization Rates by Sex: What were Things Like before 2015?', *J Stroke Cerebrovasc Dis*, vol. 29, no. 3, p. 104587, Mar. 2020, doi: 10.1016/j.jstrokecerebrovasdis.2019.104587.
- [127] A. M. Ajabnoor *et al.*, 'Incidence of nonvalvular atrial fibrillation and oral anticoagulant prescribing in England, 2009 to 2019: A cohort study', *PLoS Med*, vol. 19, no. 6, p. e1004003, Jun. 2022, doi: 10.1371/journal.pmed.1004003.
- [128] R. Forman *et al.*, 'Association of Neighborhood-Level Socioeconomic Factors With Delay to Hospital Arrival in Patients With Acute Stroke', *Neurology*, vol. 102, no. 1, p. e207764, Jan. 2024, doi: 10.1212/WNL.0000000000207764.

- [129] A. Stecksén, E.-L. Glader, K. Asplund, B. Norrving, and M. Eriksson, 'Education level and inequalities in stroke reperfusion therapy: observations in the Swedish stroke register', *Stroke*, vol. 45, no. 9, pp. 2762–2768, Sep. 2014, doi: 10.1161/STROKEAHA.114.005323.
- [130] A. Stecksén, K. Asplund, E.-L. Glader, B. Norrving, and M. Eriksson, 'Socioeconomic inequalities in access to stroke thrombolysis : observations in the Swedish stroke register (Riks-Stroke)', *Cerebrovascular Diseases*, vol. 35, no. Suppl. 3, pp. 671–671, 2013.
- [131] M. A. Diaz and N. Rosendale, 'Exploring Stroke Risk Factors and Outcomes in Sexual and Gender Minority People', *Neurol Clin Pract*, vol. 13, no. 1, p. e200106, Feb. 2023, doi: 10.1212/CPJ.0000000000200106.
- [132] S. Sengupta, S. Srivastava, and N. McNeese, 'Public Perceptions, Critical Awareness and Community Discourse on AI Ethics: Evidence from an Online Discussion Forum', no. Journal Article, 2024.
- [133] E. S. Emmett *et al.*, 'Trends in Ethnic Disparities in Stroke Care and Long-Term Outcomes', *JAMA Netw Open*, vol. 8, no. 1, p. e2453252, Jan. 2025, doi: 10.1001/jamanetworkopen.2024.53252.
- [134] F. O. Otite and N. Morris, 'Race, Ethnicity, and Gender Disparities in the Management and Outcomes of Critically Ill Adults with Acute Stroke', *Crit Care Clin*, vol. 40, no. 4, pp. 709–740, Oct. 2024, doi: 10.1016/j.ccc.2024.05.006.
- [135] K. P. Simmonds, F. D. Atem, B. G. Welch, and N. L. Ifejika, 'Racial and Ethnic Disparities in the Medical Management of Poststroke Complications Among Patients With Acute Stroke', *J Am Heart Assoc*, vol. 13, no. 5, p. e030537, Mar. 2024, doi: 10.1161/JAHA.123.030537.
- [136] G. F. Mkoma *et al.*, 'Processes of Care and Associated Factors in Patients With Stroke by Immigration Status', *Med Care*, vol. 61, no. 3, pp. 120–129, Mar. 2023, doi: 10.1097/MLR.0000000000001787.
- [137] T. L. Green, P. Singh, and K. King-Shier, 'The impact of ethnic/racial status on access to care and outcomes after stroke: A narrative systematic review', *J Vasc Nurs*, vol. 37, no. 3, pp. 199–212, Sep. 2019, doi: 10.1016/j.jvn.2019.07.002.
- [138] C. Cruise, N. Mfofo M'Carthy, A. Ganesh, and B. Lashewicz, 'Imperfect Patients: Disparities in Treatment of Stroke Patients with Premorbid Disability', *Can J Neurol Sci*, vol. 50, no. 6, pp. 826–837, Nov. 2023, doi: 10.1017/cjn.2022.341.
- [139] V. Longley, S. Peters, C. Swarbrick, S. Rhodes, and A. Bowen, 'Does pre-existing cognitive impairment impact on amount of stroke rehabilitation received? An observational cohort study', *Clin Rehabil*, vol. 33, no. 9, pp. 1492–1502, Sep. 2019, doi: 10.1177/0269215519843984.
- [140] M. J. Young, R. W. Regenhardt, T. M. Leslie-Mazwi, and M. A. Stein, 'Disabling stroke in persons already with a disability: Ethical dimensions and directives', *Neurology*, vol. 94, no. 7, pp. 306–310, Feb. 2020, doi: 10.1212/WNL.00000000000008964.
- [141] A. Ganesh, J. Fladt, N. Singh, and M. Goyal, 'Efficacy and safety of mechanical thrombectomy in acute stroke patients with pre-morbid disability', *Expert Review of Medical Devices*, vol. 19, no. 8, pp. 641–648, Aug. 2022, doi: 10.1080/17434440.2022.2124109.
- [142] R. W. Regenhardt *et al.*, 'Toward a more inclusive paradigm: thrombectomy for stroke patients with pre-existing disabilities', *Journal of NeuroInterventional Surgery*, vol. 13, no. 10, pp. 865–868, Oct. 2021, doi: 10.1136/neurintsurg-2020-016783.
- [143] V. Longley, S. Peters, C. Swarbrick, and A. Bowen, 'What influences decisions about ongoing stroke rehabilitation for patients with pre-existing dementia or cognitive impairment: a qualitative study?', *Clin Rehabil*, vol. 32, no. 8, pp. 1133–1144, Aug. 2018, doi: 10.1177/0269215518766406.
- [144] D. Coughlan *et al.*, 'Secondary transfer of emergency stroke patients eligible for mechanical thrombectomy by air in rural England: economic evaluation and considerations', *Emerg Med J*, vol. 38, no. 1, pp. 33–39, Jan. 2021, doi: 10.1136/emered-2019-209039.

- [145] J. Koifman *et al.*, 'The association between rural residence and stroke care and outcomes', *J Neurol Sci*, vol. 363, pp. 16–20, Apr. 2016, doi: 10.1016/j.jns.2016.02.019.
- [146] J. Dodson, A. Santos, A. Volgman, and N. Aggarwal, 'Impact of COVID-19 on Physical Activity, Diet, and Stroke Awareness in Homeless Individuals of Chicago (P1-1.Virtual)', *Neurology*, vol. 98, no. 18_supplement, p. 299, May 2022, doi: 10.1212/WNL.98.18_supplement.299.
- [147] 'lived_experience_of_stroke_chapter_1.pdf'. Accessed: Oct. 16, 2025. [Online]. Available: https://www.stroke.org.uk/sites/default/files/conferences/nisc/documents/lived_experience_of_stroke_chapter_1.pdf
- [148] 'report_chapter_2_final.pdf'. Accessed: Oct. 16, 2025. [Online]. Available: https://www.stroke.org.uk/sites/default/files/report_chapter_2_final.pdf
- [149] M. Villain, I. Sibon, P. Renou, M. Poli, and J. Swendsen, 'Very early social support following mild stroke is associated with emotional and behavioral outcomes three months later', *Clin Rehabil*, vol. 31, no. 1, pp. 135–141, Jan. 2017, doi: 10.1177/0269215515623600.
- [150] E. Patchwood *et al.*, 'Wellbeing After Stroke (WATERs): Feasibility Testing of a Co-developed Acceptance and Commitment Therapy Intervention to Support Psychological Adjustment After Stroke', *Clin Rehabil*, vol. 38, no. 7, pp. 979–989, Jul. 2024, doi: 10.1177/02692155241239879.
- [151] 'Stroke GIRFT Programme National Specialty Report (Oct 21)'. Accessed: Oct. 17, 2025. [Online]. Available: <https://gettingitrightfirsttime.co.uk/wp-content/uploads/2025/01/Stroke-01-10L-FINAL.pdf>
- [152] M. Goyal *et al.*, 'Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials', *Lancet*, vol. 387, no. 10029, pp. 1723–1731, Apr. 2016, doi: 10.1016/S0140-6736(16)00163-X.
- [153] S. Vidale and E. Agostoni, 'Endovascular Treatment of Ischemic Stroke: An Updated Meta-Analysis of Efficacy and Safety', *Vasc Endovascular Surg*, vol. 51, no. 4, pp. 215–219, May 2017, doi: 10.1177/1538574417698905.
- [154] L. D'Anna *et al.*, 'Outcomes of mechanical thrombectomy in orally anticoagulated patients with anterior circulation large vessel occlusion: a propensity-matched analysis of the Imperial College Thrombectomy Registry', *J Neurol*, vol. 270, no. 12, pp. 5827–5834, Dec. 2023, doi: 10.1007/s00415-023-11926-5.
- [155] A. Comer, S. Northcott, N. Behn, A. Roper, N. Devane, and K. Hilari, 'Experiences and perspectives of UK speech and language therapists on telehealth assessment with people living with post-stroke aphasia', *Int J Lang Commun Disord*, vol. 60, no. 2, p. e70018, 2025, doi: 10.1111/1460-6984.70018.
- [156] A. Mehta *et al.*, 'National Trends in Utilization and Outcome of Endovascular Thrombectomy for Acute Ischemic Stroke in Elderly', *J Stroke Cerebrovasc Dis*, vol. 30, no. 2, p. 105505, Feb. 2021, doi: 10.1016/j.jstrokecerebrovasdis.2020.105505.
- [157] S. L. Harrison *et al.*, 'Stroke in Older Adults Living in Care Homes: Results From a National Data Linkage Study in Wales', *J Am Med Dir Assoc*, vol. 23, no. 9, pp. 1548–1554.e11, Sep. 2022, doi: 10.1016/j.jamda.2022.05.003.
- [158] N. M. Broomfield, A. Scoular, P. Welsh, M. Walters, and J. J. Evans, 'Poststroke anxiety is prevalent at the population level, especially among socially deprived and younger age community stroke survivors', *Int J Stroke*, vol. 10, no. 6, pp. 897–902, Aug. 2015, doi: 10.1111/ijs.12109.
- [159] H. L. Jarvis *et al.*, 'Return to Employment After Stroke in Young Adults: How Important Is the Speed and Energy Cost of Walking?', *Stroke*, vol. 50, no. 11, pp. 3198–3204, Nov. 2019, doi: 10.1161/STROKEAHA.119.025614.
- [160] A. Clery, A. Bhalla, A. G. Rudd, C. D. A. Wolfe, and Y. Wang, 'Trends in prevalence of acute stroke impairments: A population-based cohort study using the South London Stroke Register', *PLoS Med*, vol. 17, no. 10, p. e1003366, Oct. 2020, doi: 10.1371/journal.pmed.1003366.

- [161] S. Zhang, S. Cheng, Z. Zhang, C. Wang, A. Wang, and W. Zhu, 'Related risk factors associated with post-stroke fatigue: a systematic review and meta-analysis', *Neurol Sci*, vol. 42, no. 4, pp. 1463–1471, Apr. 2021, doi: 10.1007/s10072-020-04633-w.
- [162] H. Yilmaz, H. Gumus, S. D. Yilmaz, H. E. Akkurt, and F. O. Odabas, 'The evaluation of sexual function in women with stroke', *Neurol India*, vol. 65, no. 2, pp. 271–276, 2017, doi: 10.4103/neuroindia.NI_1102_15.
- [163] R. Chen, S. Crichton, C. McKevitt, A. G. Rudd, A. Sheldenkar, and C. D. A. Wolfe, 'Association between socioeconomic deprivation and functional impairment after stroke: the South London Stroke Register', *Stroke*, vol. 46, no. 3, pp. 800–805, Mar. 2015, doi: 10.1161/STROKEAHA.114.007569.
- [164] K. Thorne, J. G. Williams, A. Akbari, and S. E. Roberts, 'The impact of social deprivation on mortality following acute myocardial infarction, stroke or subarachnoid haemorrhage: a record linkage study', *BMC Cardiovasc Disord*, vol. 15, p. 71, Jul. 2015, doi: 10.1186/s12872-015-0045-x.
- [165] E. Twardzik, P. Clarke, M. R. Elliott, W. E. Haley, S. Judd, and N. Colabianchi, 'Neighborhood Socioeconomic Status and Trajectories of Physical Health-Related Quality of Life Among Stroke Survivors', *Stroke*, vol. 50, no. 11, pp. 3191–3197, Nov. 2019, doi: 10.1161/STROKEAHA.119.025874.
- [166] K. K. Andersen, S. O. Dalton, M. Steding-Jessen, and T. S. Olsen, 'Socioeconomic position and survival after stroke in Denmark 2003 to 2012: nationwide hospital-based study', *Stroke*, vol. 45, no. 12, pp. 3556–3560, Dec. 2014, doi: 10.1161/STROKEAHA.114.007046.
- [167] S. Wang, H. Zhai, L. Wei, B. Shen, and J. Wang, 'Socioeconomic status predicts the risk of stroke death: A systematic review and meta-analysis', *Prev Med Rep*, vol. 19, p. 101124, May 2020, doi: 10.1016/j.pmedr.2020.101124.
- [168] T. Elfassy *et al.*, 'Sociodemographic Disparities in Long-Term Mortality Among Stroke Survivors in the United States', *Stroke*, vol. 50, no. 4, pp. 805–812, Apr. 2019, doi: 10.1161/STROKEAHA.118.023782.
- [169] J. McCormick and R. Chen, 'Impact of socioeconomic deprivation on mortality in people with haemorrhagic stroke: a population-based cohort study', *Postgrad Med J*, vol. 92, no. 1091, pp. 501–505, Sep. 2016, doi: 10.1136/postgradmedj-2015-133663.
- [170] J. K. Brey and T. J. Wolf, 'Socioeconomic disparities in work performance following mild stroke', *Disabil Rehabil*, vol. 37, no. 2, pp. 106–112, 2015, doi: 10.3109/09638288.2014.909535.
- [171] K. E. Coté, M. E. Pudlo, E. Jost-Price, and L. Y. Leung, 'Neighborhood income inequality associated with functional independence after ischemic stroke: a cohort study', *J Stroke Cerebrovasc Dis*, vol. 34, no. 1, p. 108035, Jan. 2025, doi: 10.1016/j.jstrokecerebrovasdis.2024.108035.
- [172] F. C. T. van der Heide *et al.*, 'Role of cardiovascular health factors in mediating social inequalities in the incidence of dementia in the UK: two prospective, population-based cohort studies', *EClinicalMedicine*, vol. 70, p. 102539, Apr. 2024, doi: 10.1016/j.eclinm.2024.102539.
- [173] D. Naouri *et al.*, 'Social inequalities and gender differences in healthcare management of acute ischaemic stroke in France', *Eur J Neurol*, vol. 29, no. 11, pp. 3255–3263, Nov. 2022, doi: 10.1111/ene.15490.
- [174] A. Pawlak and E. Y. H. Tang, 'Socioeconomic deprivation and post-stroke care in the community', *Br J Gen Pract*, vol. 73, no. 727, pp. 56–57, Jan. 2023, doi: 10.3399/bjgp23X731781.
- [175] V. Belleudi *et al.*, 'Socioeconomic differences in one-year survival after ischemic stroke: the effect of acute and post-acute care-pathways in a cohort study', *BMC Public Health*, vol. 16, p. 408, May 2016, doi: 10.1186/s12889-016-3019-8.

- [176] K. Austin, S. Seeho, I. Ibiebele, J. Ford, J. Morris, and S. Torvaldsen, 'Pregnancy outcomes for women with a history of stroke: A population-based record linkage study', *Aust N Z J Obstet Gynaecol*, vol. 61, no. 2, pp. 239–243, Apr. 2021, doi: 10.1111/ajo.13267.
- [177] K. K. Andersen and T. S. Olsen, 'Stroke case-fatality and marital status', *Acta Neurol Scand*, vol. 138, no. 4, pp. 377–383, Oct. 2018, doi: 10.1111/ane.12975.
- [178] Q. Liu *et al.*, 'Association between marriage and outcomes in patients with acute ischemic stroke', *J Neurol*, vol. 265, no. 4, pp. 942–948, 2018, doi: 10.1007/s00415-018-8793-z.
- [179] L. X. Blonder, S. L. Langer, L. C. Pettigrew, and T. F. Garrity, 'The effects of stroke disability on spousal caregivers', *NeuroRehabilitation*, vol. 22, no. 2, pp. 85–92, 2007.
- [180] S. Anderson and N. Keating, 'Marriage after the transition to stroke: a systematic review', *Ageing & Society*, vol. 38, no. 11, pp. 2241–2279, Nov. 2018, doi: 10.1017/S0144686X17000526.
- [181] T. Srinivas *et al.*, 'Racial disparities in functional outcomes following mechanical thrombectomy in a cohort of patients with ischemic stroke', *J Neurointerv Surg*, vol. 16, no. 9, pp. 857–863, Aug. 2024, doi: 10.1136/jnis-2023-020634.
- [182] M. Jacobs and C. Ellis, 'Silent and suffering: Untreated depression among minority stroke survivors', *Psychol Serv*, vol. 20, no. Suppl 1, pp. 126–133, 2023, doi: 10.1037/ser0000586.
- [183] M. D. Patel, C. McKeivitt, E. Lawrence, A. G. Rudd, and C. D. A. Wolfe, 'Clinical determinants of long-term quality of life after stroke', *Age Ageing*, vol. 36, no. 3, pp. 316–322, May 2007, doi: 10.1093/ageing/afm014.
- [184] X. Wang *et al.*, 'Associations of psychological distress with positive psychological variables and activities of daily living among stroke patients: a cross-sectional study', *BMC Psychiatry*, vol. 19, no. 1, p. 381, Dec. 2019, doi: 10.1186/s12888-019-2368-0.
- [185] P. Olowoyo, M. O. Owolabi, B. Fawale, and A. Ogunniyi, 'Short term stroke outcome is worse among individuals with sickle cell trait', *eNeurologicalSci*, vol. 3, pp. 64–68, Mar. 2016, doi: 10.1016/j.ensci.2016.02.009.
- [186] O. T. Babatunde, P. M. Briley, B. M. White, X. Fang, and C. Ellis, 'Dietary Practices Among Stroke-survivors-Racial/Ethnic Differences', *J Stroke Cerebrovasc Dis*, vol. 27, no. 11, pp. 2926–2931, Nov. 2018, doi: 10.1016/j.jstrokecerebrovasdis.2018.06.026.
- [187] R. Chen, C. McKeivitt, S. L. Crichton, A. G. Rudd, and C. D. A. Wolfe, 'Socioeconomic deprivation and provision of acute and long-term care after stroke: the South London Stroke Register cohort study', *J Neurol Neurosurg Psychiatry*, vol. 85, no. 12, pp. 1294–1300, Dec. 2014, doi: 10.1136/jnnp-2013-306413.
- [188] R. Chen, C. McKeivitt, A. Rudd, and C. Wolfe, 'Impact of Socioeconomic Deprivation on Survival After Stroke: Is There any Ethnic Differences?', *Cerebrovascular Diseases*, vol. 36, pp. 8–8, Jan. 2013.
- [189] S. Byberg, C. Agyemang, A. D. Zwisler, A. Krasnik, and M. Norredam, 'Cardiovascular disease incidence and survival: Are migrants always worse off?', *Eur J Epidemiol*, vol. 31, no. 7, pp. 667–677, Jul. 2016, doi: 10.1007/s10654-015-0024-7.
- [190] T. S. Han *et al.*, 'Prestroke Disability Predicts Adverse Poststroke Outcome', *Stroke*, vol. 51, no. 2, pp. 594–600, Feb. 2020, doi: 10.1161/STROKEAHA.119.027740.
- [191] K. Hreha, J. Wong, I. Molton, I. K. Nelson, and D. Lee, 'The impact of stroke on psychological and physical function outcomes in people with long-term physical disability', *Disabil Health J*, vol. 13, no. 4, p. 100919, Oct. 2020, doi: 10.1016/j.dhjo.2020.100919.
- [192] A. Gil-Salcedo *et al.*, 'Pre-stroke Disability and Long-Term Functional Limitations in Stroke Survivors: Findings From More of 12 Years of Follow-Up Across Three International Surveys of Aging', *Front Neurol*, vol. 13, p. 888119, 2022, doi: 10.3389/fneur.2022.888119.
- [193] A. Ganesh, R. Luengo-Fernandez, S. T. Pendlebury, and P. M. Rothwell, 'Long-Term Consequences of Worsened Poststroke Status in Patients With Premorbid Disability', *Stroke*, vol. 49, no. 10, pp. 2430–2436, Oct. 2018, doi: 10.1161/STROKEAHA.118.022416.

- [194] A. Z. Sharrief *et al.*, 'The Impact of Pre-Stroke Depressive Symptoms, Fatalism, and Social Support on Disability after Stroke', *J Stroke Cerebrovasc Dis*, vol. 26, no. 11, pp. 2686–2691, Nov. 2017, doi: 10.1016/j.jstrokecerebrovasdis.2017.06.039.
- [195] D. Kamin Mukaz *et al.*, 'Rural/urban differences in the prevalence of stroke risk factors: A cross-sectional analysis from the REGARDS study', *J Rural Health*, vol. 38, no. 3, pp. 668–673, Jun. 2022, doi: 10.1111/jrh.12608.
- [196] G. Howard, 'Rural-urban differences in stroke risk', *Prev Med*, vol. 152, no. Pt 2, p. 106661, Nov. 2021, doi: 10.1016/j.ypmed.2021.106661.
- [197] G. Lazarus, A. P. Permana, S. W. Nugroho, J. Audrey, D. N. Wijaya, and I. S. Widyahening, 'Telestroke strategies to enhance acute stroke management in rural settings: A systematic review and meta-analysis', *Brain Behav*, vol. 10, no. 10, p. e01787, Oct. 2020, doi: 10.1002/brb3.1787.
- [198] S. Jackson, C. Mercer, and B. J. Singer, 'An exploration of factors influencing physical activity levels amongst a cohort of people living in the community after stroke in the south of England', *Disabil Rehabil*, vol. 40, no. 4, pp. 414–424, Feb. 2018, doi: 10.1080/09638288.2016.1258437.
- [199] A. Jain *et al.*, 'Abstract 61: Major Adverse Cardiovascular And Cerebrovascular Events Among Homeless Cancer Survivors: A Decade-apart Nationwide Hospitalizations Analysis', *Circulation: Cardiovascular Quality and Outcomes*, vol. 15, May 2022, doi: 10.1161/circoutcomes.15.suppl_1.61.
- [200] L. Corless, L. Lucas, and E. Baraban, 'Abstract P260: Patients Experiencing Homelessness Have Longer Hospital Lengths of Stay After Admission for Ischemic Stroke or TIA', *Circulation*, vol. 135, no. suppl_1, pp. AP260–AP260, Mar. 2017, doi: 10.1161/circ.135.suppl_1.p260.
- [201] G. Asaithambi, E. H. Marino, B. M. Ho, and M. E. Tipps, 'Outcomes of Homeless Ischemic Stroke Patients Receiving Intravenous Thrombolysis in the United States', *J Stroke Cerebrovasc Dis*, vol. 30, no. 8, p. 105862, Aug. 2021, doi: 10.1016/j.jstrokecerebrovasdis.2021.105862.
- [202] M. Jammal, G. S. Kolt, K. P. Y. Liu, N. Dennaoui, and E. S. George, 'Healthcare professionals' perceptions on providing support to informal carers within stroke care', *PLoS One*, vol. 19, no. 10, p. e0311915, 2024, doi: 10.1371/journal.pone.0311915.
- [203] C. Perry *et al.*, 'Patient experience of centralized acute stroke care pathways', *Health Expect*, vol. 21, no. 5, pp. 909–918, Oct. 2018, doi: 10.1111/hex.12685.
- [204] P. Dm *et al.*, 'Stroke survivors' and informal caregivers' experiences of primary care and community healthcare services - A systematic review and meta-ethnography', *PloS one*, vol. 13, no. 2, Feb. 2018, doi: 10.1371/journal.pone.0192533.
- [205] E. K. Kjörk, C. Gunnel, Å. Lundgren-Nilsson, and K. S. Sunnerhagen, 'Experiences, needs, and preferences for follow-up after stroke perceived by people with stroke and healthcare professionals: A focus group study', *PLoS One*, vol. 14, no. 10, p. e0223338, 2019, doi: 10.1371/journal.pone.0223338.
- [206] V. Abrahamson and P. M. Wilson, 'How unmet are unmet needs post-stroke? A policy analysis of the six-month review', *BMC Health Services Research*, vol. 19, no. 1, p. 480, Jul. 2019, doi: 10.1186/s12913-019-4210-2.
- [207] 'leos_report_chapter_4.pdf'. Accessed: Oct. 16, 2025. [Online]. Available: https://www.stroke.org.uk/sites/default/files/leos_report_chapter_4.pdf
- [208] K. L. Hanna and F. J. Rowe, 'Health Inequalities Associated with Post-Stroke Visual Impairment in the United Kingdom and Ireland: A Systematic Review', *Neuroophthalmology*, vol. 41, no. 3, pp. 117–136, Jun. 2017, doi: 10.1080/01658107.2017.1279640.
- [209] 'Healthtalk'. Accessed: Oct. 16, 2025. [Online]. Available: <http://dipex.demon.fatbeehive.com>
- [210] S. Shajahan *et al.*, 'Sex differences in the symptom presentation of stroke: A systematic review and meta-analysis', *Int J Stroke*, vol. 18, no. 2, pp. 144–153, Feb. 2023, doi: 10.1177/17474930221090133.

- [211] C. Moorley, S. Cahill, A. Tunariu, and O. Scott, 'Impact of stroke: a functional, psychological report of an inner-city multiracial population', *Primary Health Care*, vol. 24, no. 4, pp. 26–34, Apr. 2014, doi: 10.7748/phc2014.04.24.4.26.e871.
- [212] H. Singh *et al.*, 'Stroke Experiences and Unmet Needs of Individuals of African Descent Living in High-Income Economy Countries: a Qualitative Meta-Synthesis', *J Racial Ethn Health Disparities*, vol. 11, no. 5, pp. 2608–2626, Oct. 2024, doi: 10.1007/s40615-023-01725-z.
- [213] L. Hollands, R. Calitri, C. Haslam, R. A. Lamont, L. Mounce, and M. Tarrant, 'A UK national cross-sectional survey of stroke support groups: exploring the role of social identification and group processes in reducing loneliness', *BMC Public Health*, vol. 24, no. 1, p. 2992, Oct. 2024, doi: 10.1186/s12889-024-20432-w.
- [214] A. Comer, H. Roeder, A. Jones, A. Jawed, and N. Kramer, 'The impact of sex and gender on burden for caregivers of stroke patients: A narrative review', *J Stroke Cerebrovasc Dis*, vol. 33, no. 11, p. 107854, Nov. 2024, doi: 10.1016/j.jstrokecerebrovasdis.2024.107854.
- [215] J. Luker, C. Murray, E. Lynch, S. Bernhardsson, M. Shannon, and J. Bernhardt, 'Carers' Experiences, Needs, and Preferences During Inpatient Stroke Rehabilitation: A Systematic Review of Qualitative Studies', *Arch Phys Med Rehabil*, vol. 98, no. 9, pp. 1852–1862.e13, Sep. 2017, doi: 10.1016/j.apmr.2017.02.024.
- [216] C. McKeivitt *et al.*, 'Seeking normality: Parents' experiences of childhood stroke', *Child Care Health Dev*, vol. 45, no. 1, pp. 89–95, Jan. 2019, doi: 10.1111/cch.12622.
- [217] N. Broomfield, M. Walters, and R. M. West, 'Carer strain in post-stroke emotionalism: a cross-sectional analysis', *BMJ Open*, vol. 14, no. 12, p. e084079, Dec. 2024, doi: 10.1136/bmjopen-2024-084079.
- [218] 'lived_experience_of_stroke_report_-_chapter_3.pdf'. Accessed: Oct. 16, 2025. [Online]. Available: https://www.stroke.org.uk/sites/default/files/lived_experience_of_stroke_report_-_chapter_3.pdf
- [219] G. Hobden, F. Tabone, and N. Demeyere, 'Research investigating patient and carer psychoeducation needs regarding post-stroke cognition: a scoping review', *BMJ Open*, vol. 15, no. 1, p. e084681, Jan. 2025, doi: 10.1136/bmjopen-2024-084681.
- [220] A. M. J. Denham *et al.*, 'The long-term unmet needs of informal carers of stroke survivors at home: a systematic review of qualitative and quantitative studies', *Disabil Rehabil*, vol. 44, no. 1, pp. 1–12, Jan. 2022, doi: 10.1080/09638288.2020.1756470.
- [221] N. S. M. Zawawi, N. A. Aziz, R. Fisher, K. Ahmad, and M. F. Walker, 'The Unmet Needs of Stroke Survivors and Stroke Caregivers: A Systematic Narrative Review', *J Stroke Cerebrovasc Dis*, vol. 29, no. 8, p. 104875, Aug. 2020, doi: 10.1016/j.jstrokecerebrovasdis.2020.104875.
- [222] L. Gemitto *et al.*, 'Programmes Addressed to Informal Caregivers' Needs: A Systematic Literature Review', *Geriatrics (Basel)*, vol. 9, no. 3, p. 71, May 2024, doi: 10.3390/geriatrics9030071.
- [223] D. Bartoli, A. Brugnera, A. Grego, R. Alvaro, E. Vellone, and G. Pucciarelli, 'Stroke disease-specific quality of life trajectories and their associations with caregivers' anxiety, depression, and burden in stroke population: a longitudinal, multicentre study', *Eur J Cardiovasc Nurs*, vol. 23, no. 2, pp. 160–168, Mar. 2024, doi: 10.1093/eurjcn/zvad054.
- [224] E. Malewezi, M. R. O'Brien, K. Knighting, J. Thomas, and B. Jack, 'A different way of life: a qualitative study on the experiences of family caregivers of stroke survivors living at home', *Br J Community Nurs*, vol. 27, no. 11, pp. 558–566, Nov. 2022, doi: 10.12968/bjcn.2022.27.11.558.
- [225] G. T. Ponzini, B. Kirk, S. E. Segear, E. A. Claydon, E. B. Engler-Chiurazzi, and S. A. Steinman, 'Addressing Uncertainty in Informal Familial Caregivers of Stroke Survivors: A Systematic Meta-Ethnography', *Int J Environ Res Public Health*, vol. 19, no. 17, p. 11116, Sep. 2022, doi: 10.3390/ijerph191711116.
- [226] N. Greenwood, J. Holley, T. Ellmers, G. Mein, and G. Cloud, 'Qualitative focus group study investigating experiences of accessing and engaging with social care services: perspectives

- of carers from diverse ethnic groups caring for stroke survivors', *BMJ Open*, vol. 6, no. 1, p. e009498, Jan. 2016, doi: 10.1136/bmjopen-2015-009498.
- [227] G. Pucciarelli, C. S. Lee, K. S. Lyons, S. Simeone, R. Alvaro, and E. Vellone, 'Quality of Life Trajectories Among Stroke Survivors and the Related Changes in Caregiver Outcomes: A Growth Mixture Study', *Arch Phys Med Rehabil*, vol. 100, no. 3, pp. 433-440.e1, Mar. 2019, doi: 10.1016/j.apmr.2018.07.428.
- [228] A. Panzeri, S. Rossi Ferrario, and G. Vidotto, 'Interventions for Psychological Health of Stroke Caregivers: A Systematic Review', *Front Psychol*, vol. 10, p. 2045, Sep. 2019, doi: 10.3389/fpsyg.2019.02045.
- [229] N. Mavaddat *et al.*, 'Perceptions of self-rated health among stroke survivors: a qualitative study in the United Kingdom', *BMC Geriatr*, vol. 18, no. 1, p. 81, Apr. 2018, doi: 10.1186/s12877-018-0765-8.
- [230] G. Pucciarelli *et al.*, 'Role of Spirituality on the Association Between Depression and Quality of Life in Stroke Survivor-Care Partner Dyads', *Circ Cardiovasc Qual Outcomes*, vol. 13, no. 6, p. e006129, Jun. 2020, doi: 10.1161/CIRCOUTCOMES.119.006129.
- [231] K. R. Jacob Arriola *et al.*, 'Promoting Policy and Environmental Change in Faith-Based Organizations: Outcome Evaluation of a Mini-Grants Program', *Health Promot Pract*, vol. 17, no. 1, pp. 146-155, Jan. 2016, doi: 10.1177/1524839915613027.
- [232] J. S. Laures-Gore, P. L. Lambert, A. C. Kruger, J. Love, and D. E. Davis, 'Spirituality and Post-Stroke Aphasia Recovery', *J Relig Health*, vol. 57, no. 5, pp. 1876-1888, Oct. 2018, doi: 10.1007/s10943-018-0592-4.
- [233] M. Sjölander, M. Eriksson, and E.-L. Glader, 'Inequalities in medication adherence to statin treatment after stroke: A nationwide observational study', *Eur Stroke J*, vol. 1, no. 2, pp. 101-107, Jun. 2016, doi: 10.1177/2396987316646026.
- [234] C. R. Moorley, S. Cahill, and N. T. Corcoran, 'Life after Stroke: Coping mechanisms among African Caribbean Women', *Health Soc Care Community*, vol. 24, no. 6, pp. 769-778, Nov. 2016, doi: 10.1111/hsc.12256.
- [235] M. Nogueira and M. J. Teixeira, 'Central pain due to stroke: cognitive representation and coping according to gender', *Arq Neuropsiquiatr*, vol. 70, no. 2, pp. 125-128, Feb. 2012, doi: 10.1590/s0004-282x2012000200010.
- [236] B. Johnstone, K. L. Franklin, D. P. Yoon, J. Burris, and C. Shigaki, 'Relationships among religiousness, spirituality, and health for individuals with stroke', *J Clin Psychol Med Settings*, vol. 15, no. 4, pp. 308-313, Dec. 2008, doi: 10.1007/s10880-008-9128-5.
- [237] S. Giaquinto, C. Spiridigliozzi, and B. Caracciolo, 'Can faith protect from emotional distress after stroke?', *Stroke*, vol. 38, no. 3, pp. 993-997, Mar. 2007, doi: 10.1161/01.STR.0000257996.26950.59.
- [238] S. Lee, E. Schorr, N. N. Hadidi, R. Kelley, D. Treat-Jacobson, and R. Lindquist, 'Power of Peer Support to Change Health Behavior to Reduce Risks for Heart Disease and Stroke for African American Men in a Faith-Based Community', *J Racial Ethn Health Disparities*, vol. 5, no. 5, pp. 1107-1116, Oct. 2018, doi: 10.1007/s40615-018-0460-7.
- [239] K. M. Kokorelias *et al.*, 'Exploring the Poststroke Experiences and Needs of South Asian Communities Living in High-Income Countries: Findings from a Scoping Review', *J Racial Ethn Health Disparities*, vol. 11, no. 3, pp. 1345-1373, Jun. 2024, doi: 10.1007/s40615-023-01613-6.
- [240] X. Qiu, J. W. H. Sit, and F. K. Koo, 'The influence of Chinese culture on family caregivers of stroke survivors: A qualitative study', *J Clin Nurs*, vol. 27, no. 1-2, pp. e309-e319, Jan. 2018, doi: 10.1111/jocn.13947.
- [241] A. El-Mitwalli, A. A. Zaher, and E. El Menshawi, 'Circadian rhythm of stroke onset during the month of Ramadan', *Acta Neurol Scand*, vol. 122, no. 2, pp. 97-101, Aug. 2010, doi: 10.1111/j.1600-0404.2009.01265.x.

- [242] 'The human dimensions of post-stroke homecare: experiences of older carers from diverse ethnic groups: Disability and Rehabilitation: Vol 38, No 20'. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.tandfonline.com/doi/abs/10.3109/09638288.2015.1107783>
- [243] A. Strudwick and R. Morris, 'A qualitative study exploring the experiences of African-Caribbean informal stroke carers in the UK', *Clin Rehabil*, vol. 24, no. 2, pp. 159–167, Feb. 2010, doi: 10.1177/0269215509343847.
- [244] L. A. L. Gibbs, M. I. Anderson, G. K. Simpson, and K. F. Jones, 'Spirituality and resilience among family caregivers of survivors of stroke: A scoping review', *NeuroRehabilitation*, vol. 46, no. 1, pp. 41–52, 2020, doi: 10.3233/NRE-192946.
- [245] R. Ambrosca, T. Bolgeo, V. Zeffiro, R. Alvaro, E. Vellone, and G. Pucciarelli, 'The Role of Spirituality in Stroke Survivors and Their Caregivers: A Systematic Review', *J Relig Health*, vol. 63, no. 5, pp. 3501–3531, Oct. 2024, doi: 10.1007/s10943-024-02029-0.
- [246] S. Katbamna, L. Manning, A. Mistri, M. Johnson, and T. Robinson, 'Balancing satisfaction and stress: carer burden among White and British Asian Indian carers of stroke survivors', *Ethnicity & Health*, vol. 22, no. 4, pp. 425–441, Jul. 2017, doi: 10.1080/13557858.2016.1244740.
- [247] H. Zhang, C. Davies, D. Stokes, and D. O'Donnell, 'Shared Decision-Making for Patients with Stroke in Neurocritical Care: A Qualitative Meta-Synthesis', *Neurocrit Care*, vol. 42, no. 2, pp. 644–667, Apr. 2025, doi: 10.1007/s12028-024-02106-y.
- [248] H. Al-Janabi, N. Efstathiou, C. McLoughlin, M. Calvert, and J. Oyeboode, 'The scope of carer effects and their inclusion in decision-making: a UK-based Delphi study', *BMC Health Services Research*, vol. 21, no. 1, p. 752, Jul. 2021, doi: 10.1186/s12913-021-06742-4.
- [249] J. C. M. Prick *et al.*, 'Experiences with information provision and preferences for decision making of patients with acute stroke', *Patient Educ Couns*, vol. 105, no. 5, pp. 1123–1129, May 2022, doi: 10.1016/j.pec.2021.08.015.
- [250] 'Stroke Patient Reported Experience Measures (PREMs) Survey 2022/23'. Accessed: Oct. 17, 2025. [Online]. Available: https://www.stroke.org.uk/sites/default/files/professionals/stroke_premis_22_23_national_report.pdf
- [251] H. R. Voogdt-Pruis *et al.*, 'Improvement of shared decision making in integrated stroke care: a before and after evaluation using a questionnaire survey', *BMC Health Services Research*, vol. 19, no. 1, p. 936, Dec. 2019, doi: 10.1186/s12913-019-4761-2.
- [252] L. Bajenaru, A. Sorici, I. G. Mocanu, A. M. Florea, F. A. Antochi, and A. C. Ribigan, 'Shared Decision-Making to Improve Health-Related Outcomes for Adults with Stroke Disease', *Healthcare (Basel)*, vol. 11, no. 12, p. 1803, Jun. 2023, doi: 10.3390/healthcare11121803.
- [253] '(PDF) Clinician and patient experiences with shared decision-making to promote daily arm use for individuals with chronic stroke: an exploratory qualitative study', *ResearchGate*, Aug. 2025, doi: 10.3389/fresc.2024.1414878.
- [254] S. M. Keij, M. E. Branda, V. M. Montori, J. P. Brito, M. Kunneman, and A. H. Pieterse, 'Patient Characteristics and the Extent to Which Clinicians Involve Patients in Decision Making: Secondary Analyses of Pooled Data', *Med Decis Making*, vol. 44, no. 3, pp. 346–356, Apr. 2024, doi: 10.1177/0272989X241231721.
- [255] J. Hinckley and M. Jayes, 'Person-centered care for people with aphasia: tools for shared decision-making', *Front Rehabil Sci*, vol. 4, p. 1236534, 2023, doi: 10.3389/fresc.2023.1236534.
- [256] 'Shared Decision-Making and Cardiovascular Health: A Scientific Statement From the American Heart Association | Circulation'. Accessed: Oct. 17, 2025. [Online]. Available: <https://www.ahajournals.org/doi/10.1161/CIR.0000000000001162>
- [257] V. D. Torres Roldan *et al.*, 'Shared Decision Making Tools for People Facing Stroke Prevention Strategies in Atrial Fibrillation: A Systematic Review and Environmental Scan', *Med Decis Making*, vol. 41, no. 5, pp. 540–549, Jul. 2021, doi: 10.1177/0272989X211005655.

^[258] T. Porat *et al.*, 'Collaborative design of a decision aid for stroke survivors with multimorbidity: a qualitative study in the UK engaging key stakeholders', *BMJ Open*, vol. 9, no. 8, p. e030385, Aug. 2019, doi: 10.1136/bmjopen-2019-030385.