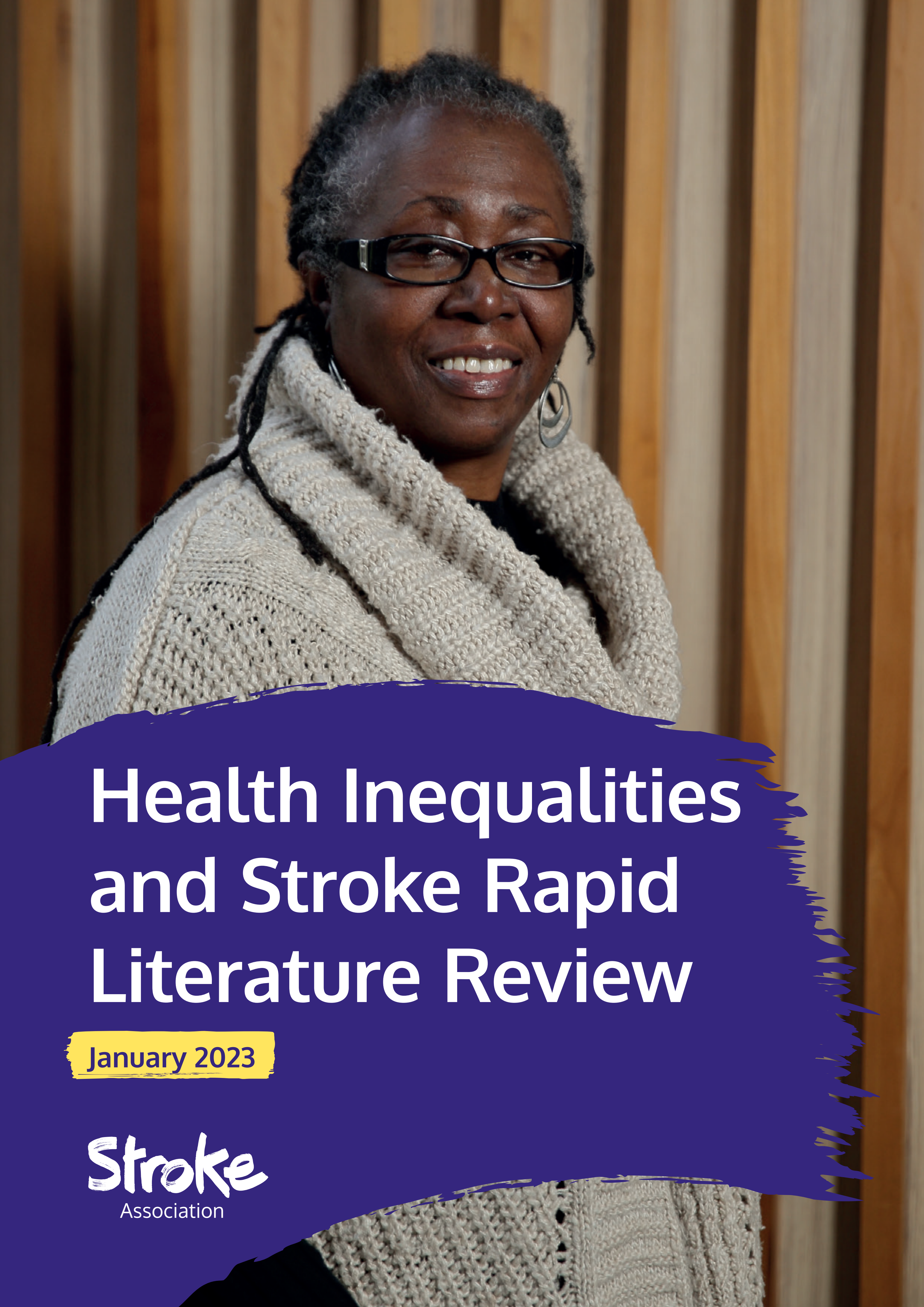


Health Inequalities and Stroke Rapid Literature Review

January 2023

Stroke Association

Contents

Every five minutes stroke destroys lives. We help to rebuild them.

Authors:

Dr Verity Longley, Manchester Metropolitan University

Bria Bullard, University of Loughborough (on placement at University of Manchester)

Josh Cheyne, University of Edinburgh

Ramona Naicker, Northern Care Alliance NHS Foundation Trust

Jess Zadik, Northern Care Alliance NHS Foundation Trust

Ann Bamford (ABa), Public contributor with honorary post at University of Manchester

Sarah Rickard, Greater Manchester Neurorehabilitation & Integrated Stroke Delivery Network

Charles Kwaku-Odoi, Caribbean and African Health Network

Maqsood Ahmad, British Muslim Heritage Centre

Professor Dawn Edge, University of Manchester

Sandra Regan, Stroke Association

Professor Audrey Bowen (ABo), University of Manchester

27 January 2023

Funded by the Stroke Association

1. Key findings

It is encouraging to see the amount of stroke research examining health inequalities. Our commissioned rapid review (a systematic search and mapping exercise) identified and categorised 70 studies (48 from the UK) and explored the findings with people with lived experience of stroke.

This review highlights the type of research evidence that exists, as well as obvious gaps, that could inform research commissioning; concluding that most studies explored socio-economic status or ethnicity rather than other lenses of inequalities, resulting in sparse evidence for vulnerable groups (3/70) and urban/rural geographical differences (5/70).

Most studies used a quantitative methodology although it was encouraging to also find 12 qualitative studies. Most designs were epidemiological (19).

It is commendable that research on inequalities and stroke exists across a broad range of topics, although notably there are fewer than ten studies on each of: thrombectomy and thrombolysis, secondary prevention, access to services, care processes, functional outcomes, quality of life, atrial fibrillation and carers.

Consultation with people with lived experience elicited their concern about the absence of studies exploring their priorities e.g. prevention, awareness raising, psychological support, return to work, carers; consistent with the James Lind Alliance.

There is clear interest in health inequalities from the stroke research community which could be harnessed to improve access to services and outcomes, beginning with sharing and critical appraisal of the findings from studies identified in this review.

2. Executive Summary

Health inequalities are unfair differences in health between different groups in society. We conducted a commissioned rapid review of the research literature of health inequalities and stroke as a first step to finding out what research exists on health inequalities across the stroke pathway, and we collated these studies.

We systematically searched five electronic databases for peer reviewed journal articles in September 2022, restricted to studies from 2009 onwards. We included any studies that were about stroke survivors, their carers, or stroke clinicians that reported data on any aspect of health inequalities. We screened studies based on the country the research was from and agreed with Stroke Association to prioritise studies from the UK, expanding to Anglosphere countries, Western Europe and Japan (as a G7 country) where UK data were sparse on the topic area. USA studies were excluded due to major differences to UK healthcare. We categorised studies by four non-mutually exclusive focal lenses of health inequalities:

We conducted parallel Patient Carer and Public Involvement and Engagement (PCPIE) work including visiting six stroke groups across Greater Manchester (November and December 2022) to introduce the topic of health inequalities, discuss stroke survivor and carer priorities and build relationships. A panel of nine stroke survivors and carers met with us at the University/online (January 2023) to consider the findings from our review and contribute to the key messages and recommendations for the next steps for research.

1. **socioeconomic status (SES)/deprivation,**
2. **protected characteristics,**
3. **vulnerable groups (inclusion health groups such as migrants, asylum seekers, Gypsy, Roma and traveller communities, rough sleepers and unhoused people, sex workers, people in prison) and**
4. **geography (urban/rural/coastal communities), and by study topic e.g. thrombectomy, access to services, carers and by stages of the UK stroke care pathway.**

We identified 6179 studies from the database searches, and included 70 following screening by title, abstract, and full text. Forty-eight studies were from the UK. Most of the 70 studies, addressed inequalities from the lens of SES/deprivation or ethnicity (see Table 1). Despite a comprehensive search we did not identify any studies of stroke and under-served communities: migrants, asylum seekers, Gypsy, Roma and traveller communities, LGBTQ+ communities, neurodiverse communities, people with learning disabilities, sex workers, people in prison or other socially excluded groups. We identified five studies about urban/rural differences in geography but none relevant to coastal communities. We identified three studies about inequalities outside of the pre-specified lenses.

Table 1: Number of studies included by lens of inequality

Lenses of inequality	Number of studies included (n = 70)
SES/deprivation	27
Education level	10
Protected characteristics	
Ethnicity	25
Age	16
Sex	15
Language	4
Mental health	3
Dementia	4
Vulnerable groups	
Unhoused people	1
Immigrants	2
Geography	5
Other e.g. presence of informal carer	3

Most studies (58) took a quantitative approach and almost one third (19/70) were epidemiological, about stroke incidence, prevalence or risk (see Table 2). We did not identify studies about inequalities in emotional or psychological support after stroke or return to work, which were priority areas for the stroke survivors we consulted with, and only found two studies reporting their own Patient Carer and Public Involvement and Engagement (PCPIE).

Table 2: Number of included studies by topic.

Topic of study	Number of studies included (n = 70)
Epidemiology	19
Thrombectomy/thrombolysis*	10
Secondary prevention*	9
Access to services*	8
Care processes	6
Functional outcomes	5
Quality of life	4
Atrial fibrillation*	4
Carers	3
Others	2

*** Denotes Stroke Association priority areas.**

Now that these 70 studies have been found and catalogued, critical appraisal of the quality of these studies is essential to know whether their findings can be implemented into practice or used to inform future research. Gaps in the data on inequalities and stroke could be reduced by partnership working with populations who are often not included in research. We strongly recommend all future studies are equipped to enable effective Patient, Carer and Public Involvement, which is rarely included in the research to date. Time, trust and collaboration are needed for researchers and healthcare providers to build meaningful relationships with community organisations that can facilitate engagement with under-served groups and tackle health inequalities. Community organisations will need resources, including long-term funding, and need to believe there is a genuine wish to change the model of co-working from a short-term, professional-led, approach to one that builds trust, ensures respect for values and leads to positive change for their communities.

2.1. Key messages

A considerable amount of, mostly quantitative, research exists on health inequalities and stroke, with a high proportion of studies about socio-economic status (n=27) and ethnicity (n=25) compared with other inequalities.

There are considerable gaps in focal lenses of inequalities, particularly around vulnerable groups, comorbidities, and urban/rural/coastal geographical differences.

We identified studies on ten different topics, almost one third of which were epidemiological about differences in stroke risk, incidence and prevalence due to health inequalities.

Stroke survivors reported a desire for more research on inequalities and: primary prevention and awareness raising, quality of life after stroke, inequalities that affect informal or family carers, emotional and psychological support, and return to work.

Researchers should use existing organisations such as religious groups or local charities to reach and listen to under-researched communities.

Meaningful engagement between researchers and community organisations must factor in the time, effort and funding that this requires for both parties.

Next steps include agreeing topics for critical appraisal of the identified studies, possible wider searches on key topics and, sharing this report and the references for the studies found with the stroke research community, research funders and other key organisations.

3. Introduction

Health inequalities are defined as "unfair and avoidable differences in health across the population and between different groups in society" (NHS England, 2022). Since 2010, health inequalities in England have widened and people living in more deprived areas in England have worse health than those living in less deprived areas (Marmot et al., 2020a). A similar trend is seen in Scotland (Finch et al., 2023), Wales (Health and Wellbeing Alliance, 2022) and Northern Ireland (Carson et al., 2022). There are clear regional differences in health, for example people living in the North of England or in coastal communities have higher rates of disease, including stroke (Chief Medical Officer for England, 2021; Marmot et al., 2020a). Those living in more deprived areas in England also spend longer living with ill health and are more likely to have multiple health conditions, with women spending longer living with illness than men (Watt, 2022).

These health inequalities impact on the whole stroke pathway, from prevention, acute care, to rehabilitation and the community. Globally, people of low socioeconomic status (SES) are more likely to have a stroke and have higher mortality rates and risk factors (Avan et al., 2019). People living in low-income countries have poorer access to stroke services and treatment, with poorer outcomes (Langhorne et al., 2018).
In England, cardiovascular diseases (including stroke and TIA) occur more frequently in people living in more deprived areas and are twice as prevalent in the most deprived areas in England than the least (Watt, 2022). People from Pakistani and Bangladeshi ethnic backgrounds in England have the highest rates of cardiovascular disease once age is accounted for (Watt, 2022), and evidence suggests people from minority ethnic backgrounds experience unique barriers to accessing UK health services (Kapadia et al., 2022).

Health inequalities are a priority for devolved UK nations, with NHS England focusing on prevention and multiagency action. It is important therefore, to understand what is currently known about health inequalities and stroke in the UK to identify gaps in research-informed care, and to direct developments in Stroke Association service provision. We conducted a commissioned rapid mapping review of the research literature to:

Identify the knowns and unknowns from research into health inequalities across the stroke pathway

Identify gaps for future research that fit with Stroke Association strategic priorities

4. Methods

The protocol search strategy was designed by JC for the MEDLINE Ovid database in December 2021 and January 2022 and adapted for other databases. The Cochrane Central Register of Controlled Trials (CENTRAL) in the Cochrane Library, MEDLINE Ovid and Embase Ovid search strategies were written by JC (see Cheyne et al. (2022) for a copy of the MEDLINE search strategy). The CINAHL EBSCO (Cumulative Index to Nursing and Allied Health Literature), and PsycINFO Ovid search strategies were written by RN (see supplementary material). There are many cases where antiquated, non-standard, exclusionary, and potentially offensive terms for people have been used in past and present literature about health inequalities. In light of this, the authors have included such terms in search strategies in order to conduct a sensitive, comprehensive search for relevant studies (Townsend, 2022). The authors of this review recognize and acknowledge the inappropriate and harmful nature of these terms.

We searched five databases (CENTRAL in the Cochrane Library, MEDLINE Ovid, Embase Ovid, CINAHL EBSCO and PsycINFO Ovid) in September 2022. Search results were restricted from 2009 to provide a reasonably current body of literature, as well restricting to English-language, peer reviewed journal articles. We hand-searched reference lists of systematic reviews that were identified by our database searches for relevant studies, and included additional studies co-authored by the report authors.

4.1. Study selection

We included studies of stroke survivors, their carers or stroke clinicians at any point in the stroke pathway, that reported data on any aspects of health inequalities using NHS England's Core20PLUS approach: socioeconomic status (SES) and deprivation, ethnicity, multi-morbidity, protected characteristics, vulnerable and socially excluded groups (sometimes called inclusion health groups, such as unhoused people, drug and alcohol dependence, vulnerable migrants, Gypsy, Roma and Traveller communities, sex workers, people in contact with the justice system, victims of modern slavery),CPI and geography (urban/rural/coastal). We included studies using any measure of socioeconomic status or deprivation, including Indices of Multiple Deprivation (IMD), Carstairs Deprivation Index, or occupational class. For practical reasons this initial rapid review restricted inclusion to peer-reviewed studies only, and excluded protocols, conference abstracts, dissertations, and grey literature.

Two authors (VL and BB) screened references by title and abstract against inclusion/exclusion criteria using Rayyan systematic review software (Ouzzani et al., 2016). Disagreements were discussed together by VL, BB, and ABo.

4.2. Data extraction

We (VL and BB) extracted data initially on country of origin, study methods, lenses of inequalities and Stroke Association priorities addressed, and the topic of each study using an Excel spreadsheet. The initial priorities were: Atrial Fibrillation, secondary prevention, thrombectomy and thrombolysis, emotional and psychological support, access to rehabilitation, new stroke survivors, patient experience, equal access to interventions, equality of outcomes and experience.

Through discussion with the Stroke Association, we decided to prioritise studies from the UK but expand to Anglosphere countries (excluding USA due to differences in healthcare systems), Western Europe and Japan (as a G7 country) where UK data was sparse on the topic area (fewer than three studies). We also prioritised studies about epidemiology, access to care, thrombectomy and outcomes.

We (VL, BB, AT, CA, NH, RR) then extracted data on study population, data source, setting, inclusion criteria, participant characteristics, and inequalities addressed using an Excel spreadsheet (see study characteristics table, appendix B). Stage of the stroke pathway was often difficult to identify due the large proportion of longitudinal studies, so we classified studies based on their setting or source of data when unclear. We classified studies as acute where they collected data within 30 days of stroke. We assumed that studies starting in the acute setting with follow-up over years continued into both in-patient rehabilitation and community settings. We (VL) narratively synthesised results by each lens of health inequality.

We extracted additional data on study findings as reported by the original authors, but as studies have not been critically appraised in this initial rapid review these findings are not reported but the data are available for future analysis (shared with the Stroke Association and available from https://e-space.mmu.ac.uk/631465/

4.3. Patient Carer and Public Involvement and Engagement (PCPIE)

Given the short four-month duration of this review (09/22-01/23) our approach to PCPIE was mainly at the consultation and engagement level. We conducted a series of discussion group meetings and one-to-one conversations to gather views of those with lived experience of the stroke pathway relevant to the four lenses of inequalities. Groups and individuals were identified targeting as broad and diverse a range of stroke survivors and informal carers as possible, drawing on established networks across Greater Manchester and attempting to begin collaborations with new individuals and organisations.

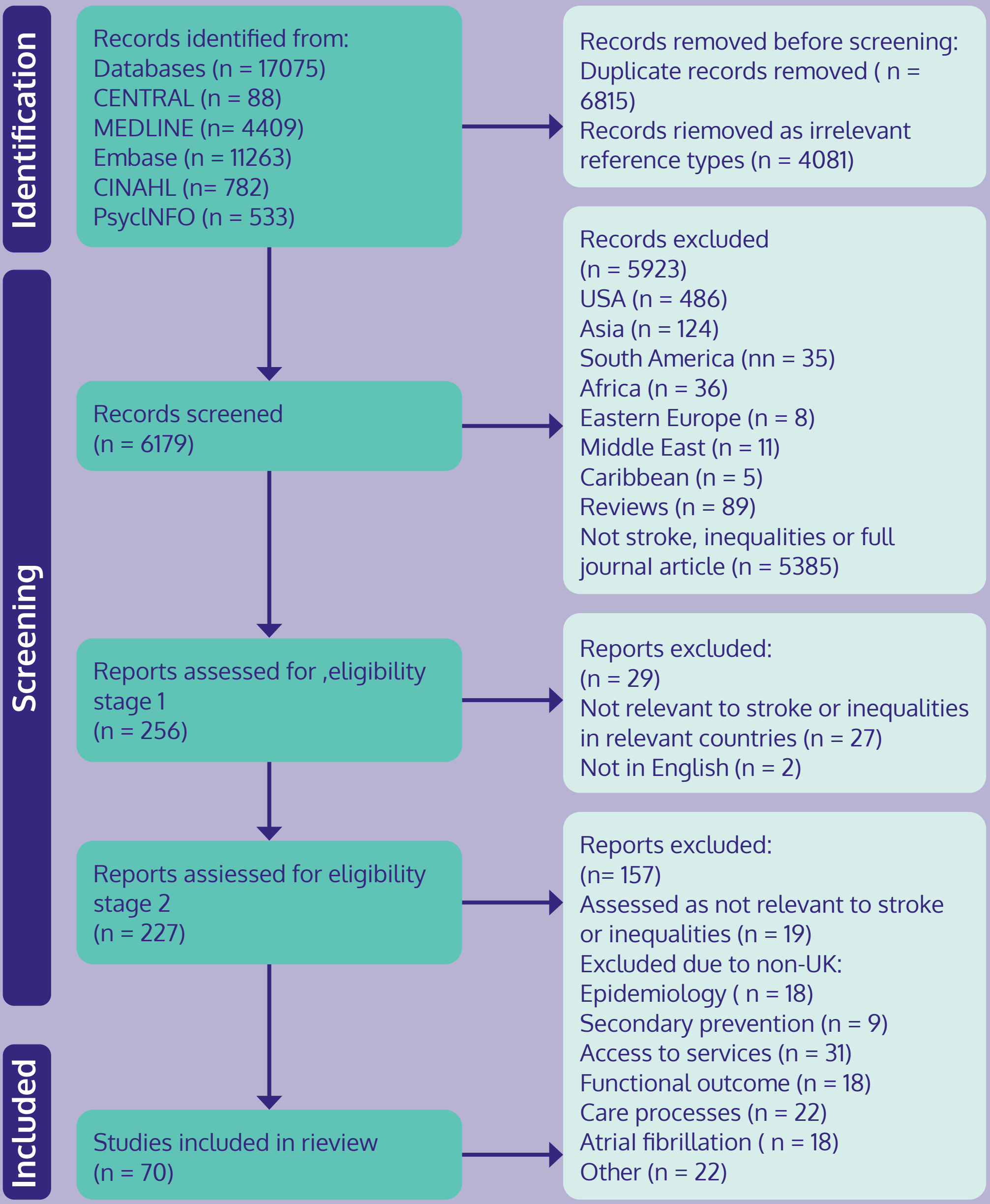
Initially we (ABa, JZ, BB) visited six established stroke support groups across Greater Manchester (November and December 2022). Groups were identified based on a number of factors including geographical location, indices of deprivation and target group e.g. younger stroke survivors (see appendix A). Contact was made via group co-ordinators to ensure group buy-in and identify any communication and support needs in advance of the group discussions. In consideration of the drop-in nature of the existing support groups, combined with the open format of the discussion group model, sessions were structured to create a safe environment and based around an agreed set of broad questions. Groups followed an informal structure, with individuals offering (where possible) their own views on the stroke pathway - verbally or written. The research team documented and synthesised key suggestions into this report at a summary level. We did not collect demographic details from group attendees.

Alongside group visits, a flyer was designed to attract individuals to take part in the review process, which was shared at local stroke network events and displayed in general community settings. Two separate meetings (one online, one face-to-face) with eight individuals (seven stroke survivors, one carer) took place in January 2023 to identify whether the review findings reflected their own lived experience of the stroke pathway, together with any areas of omission. An additional carer who could not attend shared their thoughts individually. Meetings were facilitated by ABa, JZ, BB, VL and ABo and enabled an in-depth discussion about health inequalities in relation to their own experience. The members of these meetings had an age range of 26-62; six identified as female, two as male, one undisclosed. Five identified their ethnicity as White British, two as Black British Caribbean, one as Other, and one undisclosed.

Whilst there were benefits from our speed-PCPIE activities we also acknowledge limitations. Whilst specific stroke support groups and more generic community and health-based organisations were approached, the limitations of the four-month timescale, available resource and time needed to develop meaningful mutually beneficial relationships impacted wider involvement. This was particularly in relation to non-stroke, community-based organisations (e.g. Caribbean and African Health Network, British Muslim Heritage Centre) who were clear that a longer term process needed to be in place for them to fully engage. Our review therefore has limitations in generalisability as we primarily consulted with people already engaged in stroke support groups meaning we did not hear the views of those who do not access such groups. However, the strengths include that we visited groups that were new to us and had diverse members in terms of age, gender, ethnicity, and deprivation. In addition, the eight individuals who attended our University/online PCPIE panel meetings were new to working with us and came from a more diverse range of backgrounds than on our other studies, and we also had input from the leaders of key community organisations such as CK-O from CAHN and MA from the BMHC.

5. Results

Our database searches identified 6179 potentially relevant papers. Following screening by title and abstract, we initially included 256 studies categorised by country of origin. Figure 1 outlines the study selection process. Following consultation with the Stroke Association's Insight and Evidence Advisory Group members at a meeting in October 2022, we included a total of 70 studies following the second stage of data extraction, 48 studies from the UK, and 22 studies from other countries
(see appendix B for study characteristics table).



Records identified from:
Databases (n = 17075)
CENTRAL (n = 88)
MEDLINE (n= 4409)
Embase (n = 11263)
CINAHL (n= 782)
PsycINFO (n = 533)

Records removed before screening:
Duplicate records removed (n = 6815)
Records riemoved as irrelevant reference types (n = 4081)

Records screened
(n = 6179)

Records excluded
(n = 5923)
USA (n = 486)
Asia (n = 124)
South America (nn = 35)
Africa (n = 36)
Eastern Europe (n = 8)
Middle East (n = 11)
Caribbean (n = 5)
Reviews (n = 89)
Not stroke, inequalities or full journal article (n = 5385)

Reports assessed for ,eligibility stage 1
(n = 256)

Reports excluded:
(n = 29)
Not relevant to stroke or inequalities in relevant countries (n = 27)
Not in English (n = 2)

Reports assiessed for eligibility stage 2
(n = 227)

Reports excluded:
(n= 157)
Assessed as not relevant to stroke or inequalities (n = 19)
Excluded due to non-UK:
Epidemiology (n = 18)
Secondary prevention (n = 9)
Access to services (n = 31)
Functional outcome (n = 18)
Care processes (n = 22)
Atrial fibrillation (n = 18)
Other (n = 22)

Studies included in rieview
(n = 70)

**Figure 1:
Flow diagram of study selection process.**

Our results are presented in terms of the four focal lenses of health inequalities: SES/deprivation, protected characteristics, vulnerable groups and geography. These lenses are not mutually exclusive, many studies reported data addressing multiple lenses. We categorised the 70 studies in terms of what they were about: epidemiology (studies of stroke prevalence, incidence and risk), care processes, functional outcomes, access to services, thrombectomy and thrombolysis, quality of life, secondary prevention, atrial fibrillation, and carers. Although atrial fibrillation plays an important role in primary and secondary prevention, it was categorised separately because it is a Stroke Association priority area.

70 studies about

- epidemiology
- care processes
- functional outcomes
- access to services
- thrombectomy and thrombolysis
- quality of life
- secondary prevention
- atrial fibrillation
- carers

5.1. Overview of study characteristics

We identified 58 quantitative studies and 12 qualitative. Out of the 70 studies in total, 27 addressed SES/deprivation and ten of the 70 studies specifically addressed education level, which is often included in measures of deprivation. Protected characteristics were addressed in multiple ways which were not mutually exclusive; 25 studies reported data on inequalities and ethnicity, 19 reported age, 16 reported sex or gender (referred to throughout this report as sex as we have inferred this was what authors meant), eight reported mental health or dementia comorbidities, and four reported language inequalities. Vulnerable groups were addressed in three studies, five studies addressed geography and three studies reported data on inequalities outside of the pre-specified lenses (see Table 1). See appendix B for table of study characteristics.

We identified 19 epidemiological studies about stroke incidence, prevalence and risk; six about care processes; ten about thrombectomy and thrombolysis; eight about access to services; five about functional outcome; nine about secondary prevention; four about quality of life; four about atrial fibrillation; three about carers and two others (see Table 2). Table 6 (appendix C) outlines lenses addressed compared with topic area.

We included studies from a range of countries: the UK, England, Scotland, Wales, Denmark, Portugal, Italy, Sweden, Australia, the Netherlands, France, Germany, Japan and Canada. Studies used data from a range of sources including the South London Stroke Register (n=13), Sentinel Stroke National Audit Programme (SSNAP) (n=2) or equivalent national stroke registries (n=10), electronic health records or census data (n=25), existing cohort studies (n=3), biobank (n=2), questionnaires (n=3), and bespoke qualitative methods (n=12). Two studies reported using PCPIE in their design (Fleetwood et al., 2022; Tang et al., 2019). Data sources were from 1991 at the earliest (Fleetwood et al., 2022) to 2019 at the latest (Ajabnoor et al., 2022). Note these are the latest results available from searches in September 2022, probably due to timelags in publication and the impact of the pandemic on research activity.

Thirteen studies of stroke survivors included participants with ischaemic stroke only, 23 include patients with both ischaemic and haemorrhagic stroke, 10 included patients with stroke and TIA, 2 included haemorrhagic stroke only and 17 were unspecified.

Most studies collected data from the acute stage of the stroke pathway (n=44) (see Table 3). One study used population-level data to determine life expectancy related to range of diseases which we classified as not applicable to a pathway stage (Bennett et al., 2018). Table 7 (appendix C) demonstrates the lenses addressed compared with study setting.

Table 3: Setting and number of studies (settings are not mutually exclusive per study).

Setting or stage of stroke pathway	Number of studies
Acute	44
Community and primary care	36
Rehabilitation	13
Secondary prevention	9
Prevention (both primary and secondary)	5
Outpatient post-stroke	4
Pre-hospital/ambulance	3
n/a	1

5.2. SES/deprivation

We identified 27 out of 70 studies investigating stroke and health inequalities due to SES/deprivation. Of these, nine studies were population-based epidemiological studies reporting data about stroke incidence, mortality, risk and SES/deprivation in the UK (Akyea et al., 2021; Bennett et al., 2018; Bray et al., 2018; Chen et al., 2014a; McCormick and Chen, 2016; Peters et al., 2020; Prigge et al., 2022; Thorne et al., 2015; Tod et al., 2019). Two of these epidemiological studies reported data on cardiovascular disease incidence, including stroke, in biobank participants (Peters et al., 2020; Prigge et al., 2022). One study used data about all-cause mortality with stroke reported separately (Bennett et al., 2018).

Three studies looked at care processes in England (Addo et al., 2011; Chen et al., 2014b; Bhalla et al., 2010) and one in Scotland (Kerr et al., 2011). These studies reported data on SES/deprivation and receipt of care indicators, such as admission to a stroke unit, brain imaging, physiotherapy within 72 hours, occupational therapy or speech and language therapy within seven days in the acute setting (Addo et al., 2011; Kerr et al., 2011), in the acute setting with long term follow up (Chen et al., 2014b). One looked at differences in care process for people admitted with stroke versus stroke in hospital in England (Bhalla et al., 2010). Two studies were also identified relevant to functional outcome and SES/deprivation in England (Chen et al., 2015; Hanna et al., 2020).

Four studies looked at SES/deprivation and thrombectomy/thrombolysis however none were from the UK. Sobral et al. (2019) reported data on SES/deprivation and thrombolysis in Portugal, and three studies addressed both thrombectomy and thrombolysis in Denmark, (Buus et al., 2022), France (Perrin et al., 2021) and Sweden (Stecksén et al., 2014).

Three studies were identified about preventative treatment for atrial fibrillation and SES/deprivation using GP practice or outpatient records in England (Ajabnoor et al., 2022; Mathur et al., 2013; Zulkifly et al., 2020). Three other studies were identified relevant to secondary prevention from outside the UK; from Australia (Paige et al., 2022), Canada (Salma et al., 2018) and Sweden (Ullberg et al., 2017). One study was identified focused on risk of hospital readmission following a stroke in Scotland and reported data on SES/deprivation (Lewsey et al., 2015).

We did not identify any studies about SES/deprivation and quality of life from the UK. One small questionnaire study of 102 Portuguese stroke survivors reported data on SES and health-related quality of life two years after stroke (Lourenco et al., 2021). No studies were identified about access to services or carers and SES/deprivation specifically.

Our PCPIE group noted no studies were identified exploring inequalities in employment status or return to work. There was also a belief expressed that SES/deprivation affected whether someone was offered psychological support, with suggestions that knowing what to ask for, and having advocates (personal/professional) to argue on your behalf, had come about because of being from a more advantaged background.

5.2.1. Education

Ten studies reported data specifically on education level and stroke, separately to SES/deprivation, three of which were from the UK. Prigge et al. (2022) reported data on education level as a risk factor for cardiovascular disease incidence in the UK, as did Tod et al. (2019) in Scotland. Chandratheva et al. (2010) looked at education level and help-seeking behaviour after stroke in England.

Outside the UK, two studies collected questionnaire data on education and health-related quality of life after stroke, in Denmark (Larsen et al., 2020) and Portugal (Lourenco et al., 2021). Two studies reported data on education level and both thrombectomy and thrombolysis using national stroke registry data in Sweden (Stecksén et al., 2014) and in Denmark (Buus et al., 2022); a third reported data on thrombolysis in a region of Portugal (Sobral et al., 2019). Two studies addressed education and secondary prevention, in Australia (Paige et al., 2022) and Sweden (Sjolander et al., 2016).

We did not identify any studies about education and care processes, functional outcomes, access to services, atrial fibrillation, or carers.

5.3. Protected characteristics

5.3.1. Ethnicity

We found 25 out of 70 studies investigating stroke and health inequalities due to ethnicity. Eight of these were large, quantitative, population-based studies about stroke incidence, mortality and ethnicity in the UK (Bhopal et al., 2012; Chen et al., 2014a; George et al., 2017; Gulli et al., 2016; Hajat et al., 2011; Smeeton et al., 2009; Wang et al., 2013; Mackay et al., 2018). Mackay et al. (2018) addressed cardiovascular disease incidence in people with non-English language preference, with stroke reported separately.

Three studies reported data on ethnicity and receipt of care indicators in England; one in the acute setting (Addo et al., 2011), one of differences in care process for people admitted with stroke versus stroke in hospital (Bhalla et al., 2010) and one in the acute setting with long term follow up (Chen et al., 2014b). We identified one study about thrombolysis rate and ethnicity, in the Netherlands (Coutinho et al., 2011). No studies were identified about thrombectomy and ethnicity.

Two studies addressed functional outcome and ethnicity in England; Clery et al. (2020) looked at trends in prevalence of functional impairments over time and Moorley et al. (2014) collected data from a small sample of outpatients on functional ability.

We identified one qualitative interview study about access to services and ethnicity, specifically about barriers to self-management post-stroke in minority ethnic stroke survivors in England, from the clinician's perspective (Norris et al., 2014).

Three studies were identified about atrial fibrillation and ethnicity in England (Ajabnoor et al., 2022; Mathur et al., 2013; Zulkifly et al., 2020). We also identified three studies about secondary prevention; a qualitative interview study about beliefs of causes and risks of stroke in African-Caribbean women in England (Moorley et al., 2016); a qualitative interview study about stroke prevention with Arab Muslim Immigrant Women in Canada (Salma et al., 2018); and a quantitative study of adherence to secondary preventative treatment in Sweden (Ullberg et al., 2017).

One study reported data on ethnicity and physical and mental health-related quality of life at one-year post-stroke and trends over time between 1995-2011 (Sheldenkar et al., 2014). We identified three qualitative studies about carers and ethnicity, specifically about carers from ethnic minority groups in England exploring experiences of caring (Strudwick and Morris, 2010), accessing services (Greenwood et al., 2016) and satisfactions with services (Greenwood et al., 2017).

Ethnicity was categorised differently across studies which may affect interpretations and comparisons. Eleven studies used the generic terms of White or Black (grouping together Afro-Caribbean/ African-Caribbean, African or Caribbean) (Addo et al., 2011; Ajabnoor et al., 2022; Bhopal et al., 2012; Chen et al., 2014b; Chen et al., 2014a; Clery et al., 2020; Coutinho et al., 2011; Mathur et al., 2013; Moorley et al., 2016; Sheldenkar et al., 2014; Strudwick and Morris, 2010) rather than stating the race and the specific ethnicity for White demographic and Black demographic. Six studies were more specific when describing the Black ethnicity, as in these studies they used terms such as 'Black Caribbean' or 'Black African' (but not ‘Black British’) to describe members of their demographic (Bhalla et al., 2010; Gulli et al., 2016; Hajat et al., 2011; Mackay et al., 2018; Wang et al., 2013). Smeeton et al. (2009) was the only study to solely include those of the Black Caribbean ethnicity.

In three studies the generic term South Asian ethnicity was used (George et al., 2017; Mathur et al., 2013; Zulkifly et al., 2020); in four other studies, the more specific terms for South Asian ethnicities such as 'Asian Indian, Asian Pakistani' (Greenwood et al., 2017; Greenwood et al., 2016) and 'Asian British (British Bangladeshi, British Indian, British Pakistani') (Mackay et al., 2018) and 'Indian, Pakistani, other South Asian' (Bhopal et al., 2012) were used. Only Bhopal et al., (2012) and Mackay et al., (2018) included ‘Chinese’ ethnicity. Out of all 25 studies of ethnicity, only Coutinho et al. (2011) described ethnicities such as Turkish and Moroccan and only Salma et al. (2018) included an Arab demographic.

Only Mackay et al., (2018) and Bhopal et al., (2012) used specific terms for White, such as ‘White British’ or ‘White Irish’. Bhopal et al. (2012) was the only study to specifically describe the 'White Scottish' demographic. Only four studies included mixed ethnicity (Bhalla et al., 2010; Bhopal et al., 2012; Mackay et al., 2018; Moorley et al., 2014).Seven studies (Ajabnoor et al., 2022; Bhalla et al., 2010; Clery et al., 2020; Hajat et al., 2011; Mathur et al., 2013; Moorley et al., 2014; Sheldenkar et al., 2014) included the terms 'other' or ‘unknown' to describe ethnicity.

This review was conducted by a team of people from ethnically diverse backgrounds (the researchers and our public contributors). However, our PCPIE panel membership did not include anyone from an Asian background, and this would be valuable to explore in future work.

5.3.2. Age

We found 19 out of 70 studies investigating stroke and health inequalities due to age. Two of these were epidemiological studies reporting data about stroke incidence, mortality and age in the UK (Akyea et al., 2021; Mohan et al., 2009), one of which included data about age differences in terms of predictors of stroke reoccurrence (Mohan et al., 2009).

Two studies in England reported data on age and receipt of care indicators in the acute setting (Addo et al., 2011), in the acute setting with long term follow up (Crichton et al., 2012). Two studies reported data on age and functional outcomes in England; Clery et al. (2020) looked at trends in prevalence of functional impairments over time whereas Chen et al. (2015) reported age differences at 3 months and 3 years post-stroke.

Three studies were identified about thrombectomy/thrombolysis and age. Using SSNAP data, Bray et al. (2013) report differences in age and thrombolysis rates in England. In two studies from Germany Stolz et al. (2011) reported age differences in thrombolysis rates and Weber et al. (2019) reported differences in both thrombolysis and thrombectomy. It is worth noting the age of these studies given the advances in thrombectomy and thrombolysis services in the past decade.

Two studies were identified that related to treatment for atrial fibrillation and age in England (Ajabnoor et al., 2022; Mathur et al., 2013). We also identified five studies about treatment for secondary prevention and age across countries: Bartsch et al. (2013) in Canada, Dalli et al. (2019) in Australia, Raine et al. (2009) in England, and Sjolander et al. (2016); Ullberg et al. (2017) in Sweden.

Three studies reported data on age and health-related quality of life; at one year post-stroke in England (Sheldenkar et al., 2014); at least 3 months post-stroke in Denmark (Larsen et al., 2020) and two years post-stroke in Portugal (Lourenco et al., 2021). No studies were identified that reported data on age and access to services or carers.

Our PCPIE group noted that no studies were identified about age as an inequality in return to work following stroke, or access to rehabilitation and felt these should be explored. Some of our PCPIE contributors felt they had experienced inequalities due to age e.g. young adults felt their stroke, or earlier TIA, had not being recognised as such due to their age. Others felt age played a part in services offered, or with older people likely to miss out on return to work.

5.3.3. Sex and gender

We identified 16 studies investigating stroke and health inequalities due to sex or gender. Whilst the terms ‘sex’ and ‘gender’ were used interchangeably between studies, we did not identify any studies that addressed differences in stroke for people of gender identities other than ‘male’ or ‘female’. We have therefore used the term ‘sex’ throughout as it is most likely the reporting studies assumed gender identity from biological sex.

Two of the included studies were epidemiological studies about stroke incidence, mortality, and sex differences in the UK (Akyea et al., 2021; Peters et al., 2020). Peters et al. (2020) reported cardiovascular disease risk factors and incidence in general in biobank participants aged between 40-69, with results reported separately for stroke.

One study reported differences in care process for people admitted with stroke versus stroke in hospital (Bhalla et al., 2010). Three studies addressed differences in functional outcome after stroke and sex differences in England (Chen et al., 2015; Clery et al., 2020; Moorley et al., 2014). We identified one study that reported sex differences and thrombectomy and thrombolysis treatment, from Germany (Weber et al., 2019).

Three studies reported data on sex differences and health-related quality of life using questionnaires. Franzen-Dahlin and Laska (2012) collected data at eight weeks post-stroke/six weeks post-TIA from patients visiting an outpatient clinic in England; Sheldenkar et al. (2014) collected data from one-year post-stroke as part of the South London Stroke Register; and Larsen et al. (2020) collected data up to two years post-stroke in Denmark.

We identified two studies about treatment for atrial fibrillation in England that reported data about sex (Ajabnoor et al., 2022; Mathur et al., 2013). We also identified four studies about treatment for secondary prevention and sex across countries, all of which also reported data on age: Bartsch et al. (2013), Dalli et al. (2019), and Sjolander et al. (2016); Ullberg et al. (2017).

No studies were identified that reported data about sex differences in access to services or carers.

5.3.1. Comorbidities

5.3.4.1. Mental health

We identified three studies investigating stroke or stroke prevention and health inequalities due to mental health comorbidities. One study reported data on prevalence of depression and cardiovascular disease (including stroke), amongst UK biobank participants aged 40-69 (Prigge et al., 2022). One study from Scotland reported data on receipt of stroke care indicators for people with pre-existing schizophrenia, bipolar disorder and major depression (Fleetwood et al., 2022). Fenger-Grøn et al. (2021) used the Danish stroke register to report data on treatment for atrial fibrillation in patients with bipolar disorder or schizophrenia.

We did not identify any studies exploring inequalities in access to or receipt of emotional or psychological support after stroke; the three studies related to mental health were about pre-existing comorbidities.

Many of our PCPIE contributors mentioned inequalities in access to psychological support as a priority and felt that a holistic approach was important given many people will have existing physical and mental health co-morbidities.

5.3.4.2. Dementia

We identified five studies about inequalities in stroke for people with dementia, two of which were not identified from our searches but were co-authored by VL and ABo. Three of these five studies focused on access to services (Longley et al., 2018; Longley et al., 2019; Tang et al., 2019). Two studies addressed the impact of dementia on access to stroke rehabilitation services in England, one using quantitative data from rehabilitation settings (Longley et al., 2019) and one using qualitative interviews with clinicians (Longley et al., 2018). Another qualitative interview study with stroke survivors and carers up to 12 months post-stroke in England reported data about access to primary care with people with post-stroke cognitive impairment and dementia (Tang et al., 2019).

Two studies addressed prevention, one about treatment for atrial fibrillation that reported data on differences for people with dementia in England (Ajabnoor et al., 2022), and another which reported use of antihypertensives after stroke and dementia in Australia (Dalli et al., 2019).

We did not identify any studies about mental health or dementia comorbidities and functional outcome, thrombectomy and thrombolysis, quality of life, or carers.

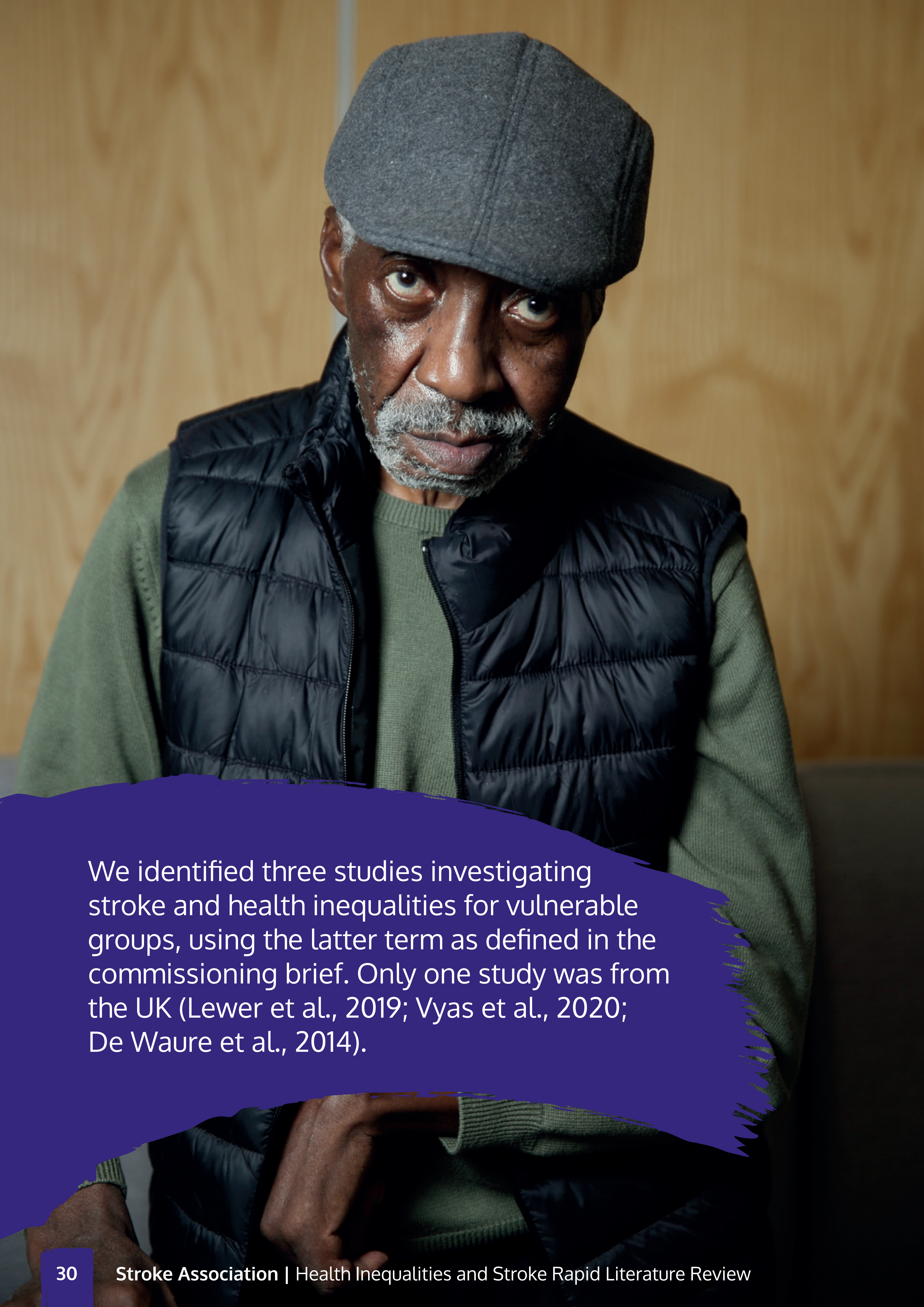
Our PCPIE group noted that we did not identify any studies about inequalities due to other types of comorbidities (for example pre-existing physical disability) or neurodiversity. This links to the largely under-researched issue of intersectionality, whereby sources of inequality may combine to create an effect that need to be considered simultaneously.

5.3.5. Language

We identified three studies investigating stroke and health inequalities due to spoken or native language. One study, conducted in England, was about non-English language preference and prevalence of cardiovascular disease prevalence and risk factors, including stroke (Mackay et al., 2018). Greenwood et al. (2016) reported data from focus groups with ethnic minority carers of stroke survivors in England about barriers to accessing stroke services, including language barriers. Salma et al. (2018) conducted qualitative interviews in Arabic with Arab Muslim immigrant women in Canada about secondary stroke prevention, including language barriers. One study mentioned inequalities in secondary prevention and lifestyle behaviour due to aphasia (Lawrence et al., 2010).

We did not identify any studies about language and the impact on care processes, functional outcome, thrombectomy and thrombolysis, quality of life, atrial fibrillation, or carers.

As mentioned, including PCPIE contributors from communities likely to speak non-English languages would be helpful in exploring this further.



We identified three studies investigating stroke and health inequalities for vulnerable groups, using the latter term as defined in the commissioning brief. Only one study was from the UK (Lewer et al., 2019; Vyas et al., 2020; De Waure et al., 2014).

5.4. Vulnerable groups

We identified an age-matched cross-sectional survey study of prevalence of six health conditions (including stroke) in the unhoused versus housed population in England (Lewer et al., 2019). Type of stroke was unspecified and sample size was small; the total study population of 1,336 unhoused people included only 24 unhoused stroke survivors. This study involved clients of a mobile tuberculosis screening unit working alongside services for unhoused people to select the diseases included in the study, and in testing and refining the questionnaire.

Two non-UK studies reported data about stroke in immigrants versus native residents (De Waure et al., 2014; Vyas et al., 2020). Vyas et al. (2020) reported data using the Ontario Stroke Registry about prevalence, acute care processes and outcomes in native-born Canadians versus immigrants, including data on immigration status such as refugees.

De Waure et al. (2014) used nationwide hospital admission records to report incidence of a range of conditions, including stroke, in Italian citizens versus immigrants, however immigration status was not reported so it unclear whether this is truly relevant to vulnerable groups such as refugees rather than long-settled immigrants.

We did not identify any studies about vulnerable groups and access to services, thrombectomy and thrombolysis, quality of life, secondary prevention, atrial fibrillation, or carers. We did not identify any studies about stroke and migrants, asylum seekers, Gypsy, Roma and traveller communities, LGBTQ+ communities, people with learning disabilities, sex workers, people in prison or other socially excluded groups.

Our PCPIE panel contributors raised concerns about the value of the term 'vulnerable groups' and its ambiguity.

5.5. Geography

We identified five studies investigating stroke and health inequalities due to urban/rural differences in geography. Three studies addressed urban/rural differences in access to thrombolysis/ thrombectomy; two about thrombolysis in Australia (Leyden et al., 2011) and Portugal (Sobral et al., 2019), another about thrombolysis and thrombectomy in Japan (Maeda et al., 2021). Bartsch et al. (2013) reported data on urban/rural differences in secondary preventative treatment for hypertension in Canada however they did not report sample size. Todd and Anderson (2009) reported a small study about access to CT scanning in rural Scotland between 2004-2006.

We did not identify any studies about geography and epidemiology, care process, functional outcome, quality of life, atrial fibrillation, carers, or differences in coastal communities.

5.6. Other inequalities

We identified three studies that did not fit into the lenses of inequalities but nevertheless we feel are still relevant to health inequalities due to focussing on barriers to accessing services. These included a qualitative interview study about patient and carer experience of accessing acute stroke care in England (Harrison et al., 2013) addressing inequalities in care due to hospital arrival time; a qualitative interview study about barriers and facilitators to treatment for aneurysmal subarachnoid haemorrhage with inequalities due to awareness by clinicians and accessibility of services (Nguyen et al., 2022), and a quantitative questionnaire study addressing inequalities in access to services due to presence of an informal caregiver in Italy (Torbica et al., 2015).

Our PCPIE activities took place largely around the Greater Manchester area and did not include coastal communities.

6. Discussion

This rapid review, informed by public involvement, provided a starting point for understanding stroke and health inequalities by identifying and mapping the existing research. The number of studies and breadth of topics covered, shows that the stroke research community recognises the importance of health inequalities, and the value of research in reducing those. But ultimately there are far more unknowns than knowns, and an imbalance between the inequalities studied to date. What is unknown is only worth knowing if it is a priority for key stakeholders. Although limited in time, resource and therefore reach, this review has benefited from the generous contributions from people with lived experience, and this could and should be enhanced in all future work.

We identified 70 studies, covering the four lenses: SES/deprivation, protected characteristics, vulnerable groups and geography (rural/urban/coastal). SES/deprivation was the most frequently addressed lens (27 studies) and ethnicity the most frequently addressed protected characteristic (25 studies). We only identified three studies about some of the communities classed as vulnerable groups, a term our contributors with lived experience of stroke felt was ambiguous. These three studies were not stroke-specific and there were no studies at all to help understand the needs of other under-served communities e.g. migrants, asylum seekers, Gypsy, Roma and traveller communities, LGBTQ+ communities, people with learning disabilities, sex workers, people in prison or other socially excluded or inclusion health groups. There are very few studies about people with comorbid physical or mental health conditions, dementia, and inequalities due to native language or aphasia. We identified studies about urban/rural differences in geography but none relevant to coastal communities. The concept of intersectionality deserves much greater attention. In terms of lenses, the stroke survivors and carers we consulted with felt important gaps in research included pre-existing disability as a protected characteristic, inequalities due to cultural or age appropriateness of existing services, and the influence of social advantage/education level on access to services.

Studies were split across the stroke pathway including prevention, acute, rehabilitation and community settings as well as many studies which were mixed across pathway stages. Our PCPIE contributors had differing views on where to focus priorities as all stages are important, but several argued for primary prevention and acute treatment (particularly inequalities due to age for young stroke survivors), and other key stages were around life after stroke and the challenges facing people adjusting to long term consequences.

We grouped studies by topic: epidemiology (studies of prevalence, incidence and risk), care processes, functional outcomes, access to services, thrombectomy and thrombolysis, quality of life, secondary prevention, atrial fibrillation, and carers. Almost one third (19/70, 27%) of studies were epidemiological. We identified a lack of studies about access to services and carers from the lens of SES/deprivation, age or sex. No studies were identified about thrombectomy alone, all included thrombolysis. In terms of topics studied, our PCPIE contributors felt that what was missing in inequalities research to date included: stroke education and awareness for the general public, employers and healthcare providers; mental health and psychological support after stroke; return to work; carers; quality of life for stroke survivors; and timing, cultural appropriateness and amount of services offered and received.

Despite its many strengths, this rapid review has limitations and was intended as a starting point for subsequent work by us or others. We are aware that a body of literature relevant to health inequalities may not have been captured by our searches, for example around young stroke survivor experience (a priority area for our PCPIE groups), clinical decision-making and access to emergency services. This may be due to studies not using terms or keywords around inequalities. For example, our own qualitative study (Longley et al. (2018) addresses how clinical decision-making affects access to stroke rehabilitation for people with dementia, however it was not picked up by our database searches as the original paper did not use terms relevant to inequalities. We recommend any future literature reviews on specific topics should consider how to expand database searches to capture this literature, and plan adequate time to handle the resulting data. Any future research on health inequalities and stroke could also expand searches into other brain injuries to gain a deeper understand of gaps in specific topic areas for example, access to community rehabilitation. Future reviews could also expand reporting to a wider range of countries or non-English language publications, although key differences in healthcare systems may reduce the validity and utility of data into UK health, care and third sector services.

The COVID-19 pandemic has had an impact on stroke services and care, with changes in admission rates and mortality (Douiri et al., 2021). The pandemic also exacerbated health inequalities in England, whilst bringing them into public focus (Marmot et al., 2020b). Our searches in September 2022 included studies that collected data in 2019 at the latest, and thus it is too soon to explore published data about the impact of the pandemic on stroke, possibly due to academic publishing turnaround.

The purpose of this review was to identify what literature exists, rather than to critically appraise the quality of the evidence. As such, we have not reported the findings from these studies. However, now that we have all the studies catalogued an immediate next step would be for us or others to appraise the studies, or subsections of them, and summarise their findings if the quality warrants that. In addition, broadening the search strategy whilst conducting an in-depth systematic review including critical appraisal could be a useful exercise. This would be most manageable if restricted to key topics/lenses e.g. where most evidence exists, such as SES or ethnicity or for priority topics. Our PCPIE members also wished to know how inequalities in stroke compare with other conditions, such as cancer or heart disease, therefore this could be a valuable area of future research to contextualise findings.

7. Implications

Many of the unknowns we have identified around health inequalities for under-served populations may be due to people being unintentionally or otherwise excluded from recruitment to studies. For example, people with aphasia are often excluded from stroke research (Townend et al., 2007) and recruitment methods may not be accessible to all e.g. methods for reaching people from minority ethnic populations may not be appropriate (Rai et al., 2022). It is important to ensure that future research on stroke, and all research on health inequalities, is truly inclusive to increase its validity with clear justification of exclusion criteria. "We don't have the resources to…" should not be an acceptable reason for widening health inequalities and needs to be challenged by research funders. Genuine PCPIE, that starts from the research design stage, is likely to prevent this occurring. But as we discovered, how to initiate inclusive PCPIE with contributors from under-served communities without whom we have a prior relationship, requires a different way of working, time, and resource.

One method for improving inclusion is through meaningful partnership with organisations that already have trusted relationships with under-served or vulnerable groups, to design studies in collaboration with affected communities (Morris et al., 2022). Time is needed to build trust and to facilitate engagement, therefore research organisations and funders need to accommodate this process. We identified a study of Arab Muslim immigrant women in Canada, in which the authors outline a process of relationship building over a year by a bilingual researcher familiar with the culture of participants, to complete the research (Salma et al., 2018). Resources are also needed, such as interpreters or translated research materials, alongside long-term funding for staff within organisations and support to put research findings into practice. Partnership needs to be genuine to tackle health inequalities on a long-term basis.

Research and public involvement often use existing stroke networks as gatekeepers. It is unknown what exists outside of these for people who do not attend stroke support groups, and whether this is affected by awareness/access issues or if what exists is perceived as not culturally appropriate. Stroke Association estimate that only 30% of stroke survivors access their national services (personal communication). Equally, there is little knowledge about stroke survivors who do not access stroke services due to support provided by family particularly in minority ethnic communities, or support from other networks e.g. LGBTQ+. Similarly some may decline research participation due to fear and mistrust of being experimented on based on historical injustices e.g. towards people from black ethnic groups. Consideration is needed of how best to capture these experiences, to develop the type of support and research that fits the needs and values of stroke survivors and their families/support networks.

We excluded grey literature from our review to enable a rapid search however service evaluation-type literature exists that is relevant to health inequalities and stroke, for example the 2022 Greater Manchester Neurorehabilitation and Integrated Stroke Delivery Network inequalities project (https://gmnisdn.org.uk/news/health-inequalities-in-stroke-services). This is a consideration for conducting research also; services that already have trusted relationships with inclusion health groups may be best placed to lead evaluations, rather than researchers.

8. Acknowledgements

We wish to acknowledge funding from the Stroke Association, and to thank Sandra Regan, their Health Inequalities Specialist, who has been a pleasure to work with and source of expertise. We thank the Stroke Cafes, Different Strokes and STAR Stroke Group and Michelle Registe, Louis Registe, Peter Higson, Tony Godrich, Loretta Hanley, Samantha Owen, Lana Leech-Martin, Audrey Cushion, and Judith Thomas for their invaluable PCPIE contributions. We thank Anna Thomas, Chloe Anderson, Noah Hussain and Ruby Rainbow, undergraduate psychology placement students from University of Manchester, who efficiently assisted with data extraction. And finally, this work would not have been possible without the commitment of one person, Bria Bullard, a psychology undergraduate on a nine-month work placement with us from the University of Loughborough. Bria you have been amazing, thank you.

9. Appendix A

Table 4. Level of deprivation both regionally and nationally based on location of the stroke groups (data from 2019 Index of Multiple Deprivation).

Stroke Group	Location in Greater Manchester	Ranking of Deprivation in Manchester (1 = most deprived out of 32)	National Ranking (1 = most deprived out of 32,844)
Harpurhey Stroke Café	Harpurhey (Manchester)	2	100
Gorton Stroke Café	Gorton (Manchester)	4	429
Moss Side Stroke Café	Moss Side (Manchester)	11	2,216
Northenden Stroke Café	Northenden (Manchester)	12	2,158
Star Stroke Group	Withington (Manchester)	28	19,215
Different Strokes Manchester Group	Altrincham (Trafford)	N/A	28,986

10. Appendix B

Table 5. Table of study characteristics.

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
Addo et al., 2011	England	Cohort	South London Stroke register	3800	Patients experiencing their first ever recorded ischaemic or primary intracerebral haemorrhage. Patients with subarachnoid haemorrhage excluded due to differing needs and protocols
Ajabnoor et al., 2022	England	Cohort	Electronic health records	192,265	Eligible patients were adults aged ≥18 years and registered with a GP in England for at least 1 year before NVAF diagnosis. Patients with heart valve problems before NVAF diagnosis were excluded.
Akyea et al., 2021	UK	Cohort	Electronic health records	9,992,380	All patients in database over 18 at study start date. Data collected on first stroke between Jan 1988-Dec 2018 with data available. Prior stroke excluded.
Bartsch et al., 2013	Canada	cross section	Electronic health records	Not reported	All residents who were hospitalized for a stroke or TIA. Excluded under the age of 18 and those who were hospitalized outside of the province of Saskatchewan and those who died prior to 90-days post-discharge. Lastly those without valid Saskatchewan health insurance were also excluded.
Bennett et al., 2018	England	Cohort	Census	7.65 million	Whole population
Bhalla et al., 2010	England	Cohort	South London Stroke register	2402	First-ever strokes in patients registered in South London Stroke Register. Patients included those admitted with at stroke-onset and those who had the stroke in-hospital. All age groups.

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
71.1 (SD 14.1)	Men (1,921) Women - unspecified	Ischemic and haemorrhagic	Acute	1995-2009.	Ethnicity, SES/deprivation, Age	Acute care processes
Mean age of 75.1 years old	102, 503 (53.3%) males	Ischemic	Prevention (primary and secondary), community	2009-2019	Age, Ethnicity, SES/deprivation, Dementia	AF
74.3 (SD: 13.6)	53.9% women	Ischemic and haemorrhagic	Acute, community	1998-2017	SES/deprivation, Age, Sex	Epidemiology
Unspecified	Unspecified	Stroke and TIA	Secondary prevention, community	April 1 2003 - March 31 2008	Age, Sex, Geography	Secondary prevention
Unspecified	Unspecified	Unspecified	n/a	2001-2016	SES/deprivation	Epidemiology
In-hospital patient mean age = 74.0(SD 13.4), admitted patients mean age 70.1 (SD 15.0)	Male- 1040 admitted. Male – 124 in hospital. Female- Unspecified	Stroke and TIA	Acute, rehabilitation, community	1995-2004	SES/deprivation, Sex, Ethnicity	Acute care processes

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
Bhopal et al., 2012	Scotland	Cohort	Census	4.65 million	Whole population
Bray et al., 2013	England	Cohort	SSNAP	37151	All patients admitted in England with acute ischaemic stroke between 1 April 2010 and 30 November 2011 are included.
Bray et al., 2018	England	Cohort	SSNAP	43.8 million total population, 145 324 admitted with first ever stroke	Over 18, hospitalised for first ever stroke, excluded previous stroke
Buus et al.	Denmark	cohort	Danish stroke registry	37,187	Ischemic stroke, over 18 registered in DSR between Jan 2015 and Dec 2018. Excluded: in hospital strokes and strokes among non permanent residents. If patient had recurrent strokes during study period, only first recorded.
Chandratheva et al., 2010	England	Quantitative interview	Cohort study	1000	1000 consecutive patients with TIA and minor stroke
Chen et al., 2015	England	Cohort	South London Stroke Register	4414, registered for first-stroke 2128 had 3 month follow up	All ages in South London, patients alive at 3 months post-stroke.

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
Unspecified	Unspecified	Unspecified	Acute	2001-2008	Ethnicity	Epidemiology
38% (14,147) were aged >80 years old.	Unspecified	Ischemic	Acute	1 April 2010 to 30 November 2011	Age	Thrombectomy/ thrombolysis
Unspecified	Female – 72,412 (50%) with their first ever stroke. Male- 72,912 (50%) with their first ever stroke	Ischemic and haemorrhagic	Acute	July 2013-March 2016	SES/deprivation	Epidemiology
Median age was 73.2	44.1% female	Ischemic	Acute	2015-2018	SES/deprivation	Thrombectomy/ thrombolysis
73 (SD 12.2)	501 females 499 males	Stroke and TIA	Acute, community	2002-2007	Education	Other
Mean age of 70.1 years old)	50.4% male	Ischemic and haemorrhagic	Acute, rehabilitation, community	January 1995-December 2011	SES/deprivation, Sex, Age	Functional outcome

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
Chen et al., 2014	England	Cohort	South London Stroke register	4212	First-ever strokes of patients of all ages.
Chen et al., 2013	England	Cohort	South London Stroke register	4,398	First ever stroke in population
Clery et al., 2020	England	Cohort	South London Stroke Register	4683, 3381	First-ever stroke
Coutinho et al., 2011	Netherlands	Cohort	Local stroke registry	510	Admitted with ischemic stroke between 2003 and 2008.

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
Deprived (2nd-5th) Median age (72.6 years old) Least deprived (1st Q) median age = 72.3 years old	2,117 males	Ischemic and haemorrhagic	Acute, rehabilitation, community	Jan 1995 - Dec 2010	SES/deprivation, Ethnicity	Acute care processes
32.1% = 0-64 years old 25.1% = 65-74 years old 27.9 % = 75-84 years 14.9% = >85	2230 (50.6) male 2168 (49.4%) female	Ischemic and haemorrhagic	Acute, rehabilitation, community	1995-2011	SES/deprivation, Ethnicity	Epidemiology
Mean age of 68.9	47.83% female, male 52.17%	Ischemic and haemorrhagic	Acute	Jan 2001 - Dec 2018	Sex, Age, Ethnicity	Functional outcome
White patients median age = 69 years old. Non-white median age = 60 years old	Unspecified	Ischemic	Acute	2003-2008	Ethnicity	Thrombectomy/ thrombolysis

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
Dalli et al., 2019	Australia	Cross section	Australian Stroke Clinical Registry.	10315	Included adult patients with ischaemic stroke or ICH who were alive at the time of discharge.
De Waure et al., 2015	Italy	Cross section	Electronic health records	Unclear	Hospitalised for certain conditions including stroke
Fenger-Gran et al., 2021	Denmark	Cohort	Danish Stroke Registry	147,810	Patients with AF aged 18-100, who had 5+ years of uninterrupted residence in Denmark at the date of AF diagnosis & were at an increased risk of thromboembolic events. Exposures of interest were AF patients with Bipolar Disorder & Schizophrenia.
Fleetwood et al., 2021	Scotland	Cohort	Electronic health records	228 699	First admission for stroke.
Franzen-Dahlin et al., 2012	England	Cross section	Questionnaire	502	All stroke/ TIA patients appointed to outpatient clinic between May 2008-August 2009.

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
74.9% >65 years old	45.2% female	Ischemic and haemorrhagic	Acute, secondary prevention	2009-2013	Age, Sex, Dementia	Secondary prevention
Unspecified	Unspecified	Unspecified	Acute	2006-2008	Vulnerable groups	Epidemiology
Mean age of 76.9 years old	78, 577 (53.2%) were women 69,233 (46.8) were men	Unspecified	Prevention (primary and secondary)	Jan 1st, 2005- Dec 31st, 2016	Mental health	AF
Mean age at Stroke with no mental health condition = 72.7 years old With Schizophrenia = 65.4 years old With Bipolar disorder = 70.3 years old With MDD = 71.2 years old	112, 432 females 105, 696 males	Ischemic and haemorrhagic	Acute, rehabilitation, community	1991-2014	Mental health	Functional outcome
Mean for stroke patients = 72 years old Mean of 77 years old for TIA patients.	Split 50% for stroke, TIA patients were 52% men	Stroke and TIA	Outpatient	May 2008 - August 2009	Sex	Quality of life

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
George et al., 2017	England	Cohort	Electronic health records	1,068,318	Over 30, no CVD on study entry. Women who were pregnant in the 6 months of the study entry were excluded, alongside patients with no ethnicity recorded.
Greenwood et al.2017	England	Interviews	Interviews	57 carers	Participants had to self-identify as Asian Indian, Asian Pakistani, black African, black Caribbean or white British, be over 45 years and either currently or recently (last 2 years) caring for stroke survivors living in the community. They or the stroke survivor had to have used social care services in the last 2 years.

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
Mean age at time of study entry based on ethnicity: White = 48.6 years old South Asian = 41.3 years old Black = 42.2 years old Other = 42.2 years old	Mean sex at time of study entry based on ethnicity: Women: White = 55.5% South Asian = 53.2% Black = 55.4% Other = 57.8%	Ischemic and haemorrhagic	Acute, community	1997-2010	Ethnicity	Epidemiology
Age based on ethnicity: White British = (<65 years old) 3 & 12 (>65 years old) Asian Indian = (<65 years old) 13(>65 years old) Asian Pakistani =(<65 years old) 1(>65 years old) Black Caribbean =(<65 years old) 6 (>65 years old) Black African =(<65 years old) 5	Sex based on ethnicity: White British= (8 male, 7 female) Asian Indian = (6 male, 14 female) Asian Pakistani = (1 male, 2 female) Black Caribbean = (5 male, 6 female) Black African = (0 male, 8 female)	n/a	Community	2013-2014	Ethnicity, Language	Carers

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
Greenwood et al.,2016	England	Focus group	Focus groups with carers, or stroke survivors in and around London	41 carers	Participants had to be either currently or to have recently been caring for stroke survivors living in the community, aged over 45
Gulli et al., 2016	England	Cohort	South London Ethnicity study	2,400	Admitted to hospital with stroke.
Hajat et al., 2011	England	Cohort	South London Stroke register	1,169	All patients with a suspected diagnosis of stroke or TIA
Hanna et al., 2020	England	Interviews and focus groups	Interviews and focus groups	13 stroke survivors, 1 spouse	Any stroke survivor, over 18, with a post-stroke visual impairment
Harrison et al., 2013	England	Interviews	Interviews	31 patients, and 28 carers	Treated in hospital for stroke or carer for stroke survivor
Kerr et al., 2011	Scotland	Cohort	Electronic health records	467	Stroke and TIA consecutive admissions.
Larsen et al., 2020	Denmark	Cohort	Danish stroke registry	2414	Only first-time stroke patients, younger than 80 years, alive 90 days after the stroke, and living in their own home prior to the stroke

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
<50 years = 8 50+ years = 33	29 females 12 males	n/a	Community	Unspecified	Ethnicity	Carers
Mean age of White stroke patients = 74.8 years old Black Stroke patients = 65.1 years old	White males = 599 Black males = 468	Ischemic and haemorrhagic	Acute	1999-2010	Ethnicity	Epidemiology
Mean of 71.4 years old	51% female	Stroke and TIA	Acute	1999-2006	Ethnicity	Epidemiology
Mean age of 51 years old	6 females 7 males	Unspecified	Community	October 2016 -January 2017	SES/deprivation	Functional outcome
66 patients, 62 carers	31 patients (18 men, 13 women). 28 carers (9 men, 19 women)	Unspecified	Pre-hospital, acute	2011-2012	Other	Access to services
Mean age of 55.2	6 female respondents 7 male respondents	Stroke and TIA	Acute, outpatients	2007-2008	SES/deprivation	Acute care processes
64.5	61% males, 39% females	Ischemic and haemorrhagic	Community	October 1, 2008 - January 1, 2012	Age	Quality of life

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
Lawrence et al., 2010	Scotland	Interviews	Interviews	29 patients, including 7 with aphasia; 20 family members	people aged ≥18 who had had a stroke and were living at home, and with family members of adults who had had a stroke
Lewer et al., 2019	England	Cross section	Questionnaire	1,336	Rough sleepers, living in hostels or had a history of sleeping rough accessing homeless services. Housed comparison from Health Survey for England

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
Median age for stroke survivors = 62 years old Median age for family members = 64 years old	Stroke survivors' sex = 16 (55.2% male) & 13 (44.8%) female Family members sex = 11 (55% male) & 9 (45% female)	Unspecified	Community, secondary prevention	Unspecified	Language	Secondary prevention
16-24 years old = 140 (10.5%) homeless & 1400 (10.5%) housed 25-34 years old = 364 (27.2%) homeless & 3640 (27.2%) housed 35-44 years old = 374 (28%) homeless & 3740 (28%) housed 45-54 years old = 315 (23.6%) homeless & 3150 (23.6%) housed 55-64 years old = 143 (10.7%) homeless & 1430 (10.7) housed	249 (18.6%) homeless males 1087 (81.4%) homeless females 2490 (18.6%) housed males 10, 870 (81.4%) housed females	Unspecified	Community	1st July 2012- 24th July 2015	Vulnerable groups	Epidemiology

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
Lewsey et al., 2015	Scotland	Cohort	Electronic health records	51,182	Patients discharged alive after stroke hospitalisation between 1997-2005
Leyden et al., 2011	Australia	Cohort	International stroke registry	157	Ischemic stroke where thrombolysis was administered.
Longley et al., 2018	England	Interviews	Interviews	23	Healthcare professionals currently working in stroke care
Longley et al., 2019	England	Cohort	Electronic health records	139	Patients over 18 admitted to hospital with stroke and consenting to study
Lourenco et al., 2021	Portugal	Cross section	Electronic health records	102	>18 years at the time of diagnosis; stroke diagnosed at least 3 months apart. Patients were excluded in the presence of neurological deficits preventing effective communication and incomplete medical history

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
<55 years = 6909 (135.%) 55-64 = 8238 (16.1%) 65-74 = 13,909 (27.2%) 75-84 = 15, 413 (30.1%) 85+ = 6713 (13.1%)	24, 754 (48.4%) Men, 26,428 (51.6%) Women	Unspecified	Acute	1997-2005	SES/deprivation	Acute care processes
median age of patients was 76 years (interquartile range, 71–79 years)	84 patients were male and 73 were female	Ischemic	Acute	1 October 2007 to 30 September 2009	Geography	Thrombectomy/ thrombolysis
Mean age of 36 (minimum 22, max 55)	20 females, 3 males	n/a	Acute, rehabilitation, community	Unspecified	Dementia	Access to services
75	83 females (59.7%)	Unspecified	Acute, rehabilitation	Sampling occurred from August 2017- January 2018	Dementia	Access to services
67.7 (SD: 12.3)	(65/63.7%) were men	Unspecified	Community	February 2018 - September 2018	Age	Quality of life

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
Mackay et al., 2018	England	Cross section	Electronic health records	302,404	18+ years old, registered with GP in England.
Maeda et al., 2021	Japan	Cohort	Electronic health records	69948	Patients with acute ischemic stroke who were hospitalised and treated with IV rt-PA and/or EVT from April 2010 to March 2016
Mathur et al., 2013	England	Cross section	Electronic health records	6292	Patients aged 18 years or over registered with GP. Had diagnostic read code for Atrial Fibrillation (AF) both paroxysmal and persistent forms recorded in electronic medical records. Atrial flutter patients excluded as well as those with AF resolved.

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
Mean age based on language preference: English = 41.4 years Non-English = 48.2 years old Portuguese = 38.9 years old Spanish = 38.8 years old French = 36.5 years old Polish = 35.6 years old Somali = 39.3 years old Other = 40.3 years old	Sex based on language preference: Males: English = 47.9% Non-English = 48.2% Portuguese = 49.3% Spanish = 47.2% French= 48.5% Polish = 45% Somali = 43.7% Other = 49.2%	Unspecified	Community, prevention (primary and secondary)	Risk factors/ Prevalence study	Ethnicity	Epidemiology
74.9 (SD 12.0)	41.4% women	Ischemic	Acute	2010-2015	Geography	Thrombectomy/ thrombolysis
Unspecified	Unspecified	Unspecified	Prevention (primary and secondary), community	2008-2011	Sex, Age, Ethnicity	AF

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
McCormick et al., 2016	England	Cohort	South London Stroke register	782	First ever stroke in population.
Mohan et al., 2009	England	Cohort	South London Stroke register	2,874	First ever stroke in population.
Moorley et al., 2016	England	Interview	Interviews	6	African Caribbean women who had survived a stroke and lived in the East End of London. Participants inclusion criteria included having lived with stroke for a minimum of 6 months.
Moorley et al., 2016	England	Cohort	Electronic health records	185	Patients attending an East London hospital outpatient clinic.
Nguyen et al., 2022	Australia	Interviews	Case studies	90 interviewees from 23 cases	Recruited cases surviving >1 day after the aSAH. When patients couldn't be interviewed- they recruited the next of kin to provide their perspective
Norris et al., 2014	England	Interviews	Interviews	25	Healthcare professionals who had current experience of using a self-management programme with stroke survivors from minority ethnic communities
Paige et al., 2022	Australia	Cohort	Australian 45 and up study	8285	First time stroke diagnosis, participants had to be aged 45 and over and suffered major CVD events.
Perrin et al., 2021	France	Cohort	Electronic health records	1226	All patients aged 18 years or older with a suspicion of acute stroke admitted to hospital
Peters et al., 2020	UK	Cohort	Biobank	471,971	Biobank participants without CVD between 40-69
Prigge et al., 2022	UK	Cohort	Biobank	466,238	Biobank participants without CVD, bipolar or schizophrenia between 40-69

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
Unspecified	Unspecified	Haemorrhagic	Acute, rehabilitation, community	1995-2011	SES/deprivation	Epidemiology
Unspecified	50.3% female	Ischemic and haemorrhagic	Acute, rehabilitation, community	1995-2004	Age	Epidemiology
Mean age = 66 years old	7 females	Unspecified	Community, secondary prevention	January 2004-December 2004	Ethnicity	Secondary Prevention
68 +/- 12.9 men, and 68.2 +/- 11.7 women	108 males, 77 females	Ischemic and haemorrhagic	Outpatient	Jan 2004 - Dec 2004	Ethnicity, Sex	Functional outcome
Unspecified	Unspecified	Haemorrhagic	Acute, pre-hospital	Unclear	Other	Access to services
Unspecified	Unspecified	n/a	Acute, rehabilitation, community	Unspecified	Ethnicity	Access to services
69 (SD 10.5)	60% men	Stroke and TIA	Secondary prevention, community	January 2006-December 2009	SES/deprivation, Education	Secondary prevention
Median age = 79 years old	51.1% female	Ischemic	Acute	November 6, 2015 - December 31,2016	SES/deprivation	Thrombectomy/ thrombolysis
56	44% women, 56% men	Ischemic and haemorrhagic	Acute	2006-2010	Sex, SES/deprivation	Epidemiology
Median 57 (IQR: 50-63)	44.2% men	Unspecified	Acute	2006-2010	Mental health, SES/deprivation, Education	Epidemiology

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
Raine et al., 2009	England	Cohort	Electronic health records	12,830	Participants aged 50+ who survived first 30 days after a stroke.
Salma et al., 2018	Canada	Interviews	Interviews	16	self-identifying as an Arab immigrant woman and having one or more stroke risk factors and/or having experienced a stroke event
Sheldenkar et al., 2014	UK	Cohort	South London Stroke Register	1475	First ever stroke in area of South London
Sjolander et al., 2016	Sweden	Cohort	Swedish Stroke Register	15,192	Patients with ischemic stroke that were discharged alive from hospital.
Smeeton et al., 2009	England	Cohort	South London Stroke register & Barbados stroke register	989 (London) and 336 (Barbados)	Black Caribbean first ever stroke in population in London, and first ever stroke in Barbados
Sobral et al., 2019	Portugal	Case-control	Electronic health records	1247	Patients admitted with ischemic stroke between 2010-2015 within study area
Stecksen et al., 2014	Sweden	Cohort	Swedish Stroke Register	85885	Ischemic stroke, age 18 to 80 years, and year of stroke onset from 2003 to 2009

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
Unspecified	Unspecified	Ischemic and haemorrhagic	Secondary prevention, community	1995-2005	Age	Secondary prevention
Unspecified median age	16 women	Unspecified	Secondary prevention, community	June 2015- May 2016	Ethnicity, SES/deprivation, Language	Secondary prevention
0-64 years old = 562 (38.1%) (33 non-stroke population) 65-74 years old = 425 (28.8%) (33 non-stroke population) 75+ years old = 488 (33.1%)	Males = 790 (53.6%) 32 Non-stroke males Females = 685 (46.4%) 32 Non-stroke females	Ischemic and haemorrhagic	Community	1995-2011	Ethnicity, Age, Sex	Quality of life
37% were over 75 years old	41.1% women	Ischemic	Secondary prevention, community	2009-2010	Age, Education, Sex	Secondary prevention
Barbados Register of Strokes mean age = 70.8 years old South London Stroke Register mean age = 66.4 years old	Barbados Register Stroke males = 439 (43.9%) South London Stroke Register males = 184 (54.8%)	Ischemic and haemorrhagic	Acute	1995-2004	Ethnicity	Epidemiology
73	43.7% women	Ischemic	Pre-hospital, acute	2010-2015	SES/deprivation, Geography, Education	Thrombectomy/ thrombolysis
Unspecified mean age	35, 719 females	Ischemic	Acute	2003-2009	Education, SES/deprivation	Thrombectomy/ thrombolysis

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
Stolz, et al., 2011	Germany	Cohort	Electronic health records	7707	All patients aged between 18 and 80 with ischemic stroke between 2007-2008 with a time from symptom onset to hospital admission of less than 3 hours. Must have a premorbid modified Rankin scale score < 3
Strudwick et al., 2010	England	Interviews	Interviews	9 carers	African-Caribbean informal stroke carers providing support to a relative with stroke for at least six months.
Tang et al., 2019	England	Interviews	Interviews	10 stroke survivors & 5 carers	Inclusion criteria were aged over 60 years old & reporting subjective memory difficulty to the stroke nurse specialist.
Thorne et al., 2015	Wales	Cohort	Electronic health records	37,888 ischaemic and 1753 SAH	All hospital admissions for stroke.
Tod et al., 2019	Scotland	Cohort	Electronic health records	49,451	All hospital admissions.
Todd et al.,2009	Scotland	Cohort	Electronic health records	72	All patients admitted for suspected stroke or TIA
Torbica et al., 2015	Italy	Cohort	Questionnaire	476	Diagnosis of stroke (1st and recurrent)
Ullberg et al., 2017	Sweden	Cohort	Swedish Stroke Register	5,602	Patients with ischemic stroke, aged over 18. First-ever and recurrent strokes. Only included first stroke event in recording data.

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
Unspecified	Unspecified	Ischemic	Acute	2007-2008	Age	Thrombectomy/ thrombolysis
Median age for carers= 62 years old.	8 females, 1 male	n/a	Community	Unspecified	Ethnicity	Carers
Mean age = 74.7 years old	9 females 6 males	Unspecified	Community	interviews were conducted in participants' homes between April 2016 and August 2017	Dementia	Access to services
75.7 years ± 12.7 for stroke and 60.7 years ± 16.0 for SAH	Males 47.3% for stroke and 36.5% for SAH	Ischemic and haemorrhagic	Acute	2004-2011	SES/deprivation	Epidemiology
Median age = 47 years old	56.3% women and 43.7% men	Ischemic and haemorrhagic	Acute	1995-2012	SES/deprivation, Education	Epidemiology
Unspecified	Unspecified	Stroke and TIA	Acute, community	2004-2006	Geography	Access to services
Mean age of 68 years old	Male (59%)	Ischemic and haemorrhagic	Rehabilitation, community	2007-2008	Other	Access to services
Mean age of women = 78.2, mean age of men = 72.7	Unspecified	Ischemic	Secondary prevention, community	Jan 2008 - Dec 2010	Sex, Ethnicity, Age, SES/deprivation	Secondary prevention

Author	Country	Methodology	Data source	Sample size	Participants (inclusion/exclusion criteria)
Vyas et al., 2020	Canada	Cohort	Ontario Stroke Registry (OSR)	34,987	Immigrants & long-term Canadian residents with Stroke & TIA who lived in urban Ontario
Wang et al., 2013	England	Cohort	South London Stroke register	4212	First ever stroke in population.
Weber et al., 2019	Germany	Cohort	Census	1,112,570	Acute ischemic stroke patients over 20 years old with main diagnosis of first or recurrent ischemic stroke.
Zulkifly et al., 2020	England	Cohort	Electronic health records	991	Patients receiving VKA therapy for stroke prevention at one acute Trust in the West Midlands, United Kingdom. Exclusions: valvular atrial fibrillation, unknown ethnicity, unknown medical background

Mean age (years)	Sex	Type of stroke	Setting	Time period studied	Inequalities addressed	Study topic
Median 67 immigrants, median long term residents 76	Female = 1,256 (immigrants), 16,033 (residents)	Stroke and TIA	Acute	2003-2013	Vulnerable groups	Acute care processes
Mean age based on ethnicity: White = 72.8 years old Black Caribbean = 66.6 years old Black African = 56.7 years old	2120 (50.3%) male	Ischemic and haemorrhagic	Acute, rehabilitation, community	1995-2010	Ethnicity	Epidemiology
Mean age = 74 years old	541, 169 women between 2013-2017	Ischemic	Acute	January 1, 2013 - December 31, 2017	Age, Sex	Thrombectomy/ thrombolysis
71.6 (SD 9.4)	55.3% male	Stroke and TIA	Prevention (primary and secondary), outpatient	Feb-Dec 2016	Ethnicity, SES/deprivation	AF

11. Appendix C

Table 6: Lenses addressed verses topic area by number of studies.

	SES/ deprivation	Protected characteristics	Vulnerable groups	Geography	No lens
Epidemiology	9	12	2	0	0
Thrombectomy /thrombolysis*	4	4	0	3	0
Secondary prevention*	4	8	0	0	0
Access to services*	0	4	0	1	3
Care processes	4	4	1	0	0
Functional outcomes	2	4	0	0	0
Quality of life	1	4	0	0	0
Atrial fibrillation*	3	4	0	0	0
Carers	0	3	0	0	0
Others	2	0	0	0	0

* Denotes Stroke Association priority area. Number of studies is not mutually exclusive, studies address multiple lenses.

Table 7: Lenses addressed versus study setting by number of studies (not mutually exclusive, some studies addressed multiple lenses and/or setting).

	SES/ deprivation	Protected characteristics	Vulnerable groups	Geography	No lens
Acute	19	26	2	4	2
Community and primary care	17	20	1	2	2
Rehabilitation	5	11	0	0	1
Secondary prevention	4	7	0	1	1
Prevention (both primary and secondary)	3	5	0	0	0
Outpatient post-stroke	2	3	0	0	0
Pre-hospital/ ambulance	1	0	0	1	2
n/a	1	0	0	0	0

12. References

Addo, J., Bhalla, A., Crichton, S., Rudd, A. G., McKevitt, C. and Wolfe, C. D. (2011) 'Provision of acute stroke care and associated factors in a multiethnic population: prospective study with the South London Stroke Register.' *BMJ*, 342, p. d744.

Ajabnoor, A. M., Zghebi, S. S., Parisi, R., Ashcroft, D. M., Rutter, M. K., Doran, T., Carr, M. J., Mamas, M. A., et al. (2022) 'Incidence of nonvalvular atrial fibrillation and oral anticoagulant prescribing in England, 2009 to 2019: A cohort study.' *PLoS Medicine*, 19(6), pp. e1004003-e1004003.

Akyea, R. K., Vinogradova, Y., Qureshi, N., Patel, R. S., Kontopantelis, E., Ntaios, G., Asselbergs, F. W., Kai, J., et al. (2021) 'Sex, Age, and Socioeconomic Differences in Nonfatal Stroke Incidence and Subsequent Major Adverse Outcomes.' *Stroke*, 52(2), pp. 396-405.

Avan, A., Digaleh, H., Di Napoli, M., Stranges, S., Behrouz, R., Shojaeianbabaei, G., Amiri, A., Tabrizi, R., et al. (2019) 'Socioeconomic status and stroke incidence, prevalence, mortality, and worldwide burden: an ecological analysis from the Global Burden of Disease Study 2017.' *BMC Medicine*, 17(1), p. 191.

Bartsch, J. A., Teare, G. F., Neufeld, A., Hudema, N. and Muhajarine, N. (2013) 'Secondary prevention of stroke in Saskatchewan, Canada: Hypertension control.' *International Journal of Stroke*, 8, pp. 32-38.

Bennett, J. E., Pearson-Stuttard, J., Kontis, V., Capewell, S., Wolfe, I. and Ezzati, M. (2018) 'Contributions of diseases and injuries to widening life expectancy inequalities in England from 2001 to 2016: a population-based analysis of vital registration data.' *The lancet. Public Health*, 3(12), pp. e586-e597.

Bhalla, A., Smeeton, N., Rudd, A. G., Heuschmann, P. and Wolfe, C. D. (2010) 'A comparison of characteristics and resource use between in-hospital and admitted patients with stroke.' *Journal of Stroke & Cerebrovascular Diseases*, 19(5), pp. 357-363.

Bhopal, R. S., Bansal, N., Fischbacher, C. M., Brown, H., Capewell, S., Scottish, H. and Ethnic Linkage, S. (2012) 'Ethnic variations in the incidence and mortality of stroke in the Scottish Health and Ethnicity Linkage Study of 4.65 million people.' *European Journal of Preventive Cardiology*, 19(6), pp. 1503-1508.

Bray, B. D., Campbell, J., Hoffman, A., Tyrrell, P. J., Wolfe, C. D. and Rudd, A. G. (2013) 'Stroke thrombolysis in England: an age stratified analysis of practice and outcome.' *Age Ageing*, 42(2), pp. 240-245.

Bray, B. D., Paley, L., Hoffman, A., James, M., Gompertz, P., Wolfe, C. D. A., Hemingway, H., Rudd, A. G., et al. (2018) '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*, 3(4), pp. e185-e193.

Buus, S. M. O., Schmitz, M. L., Cordsen, P., Johnsen, S. P., Andersen, G. and Simonsen, C. Z. (2022) 'Socioeconomic Inequalities in Reperfusion Therapy for Acute Ischemic Stroke.' *Stroke*, 53(7), pp. 2307-2316.

Carson, M., Dunbar, S. and Laverty, C. (2022) Health Inequalities Annual Report 2022. Belfast: Department of Health.

Chandratheva, A., Lasserson, D. S., Geraghty, O. C., Rothwell, P. M. and Oxford Vascular, S. (2010) 'Population-based study of behavior immediately after transient ischemic attack and minor stroke in 1000 consecutive patients: lessons for public education.' *Stroke*, 41(6), pp. 1108-1114.

Chen, R., McKevitt, C., Rudd, A. G. and Wolfe, C. D. (2014a) 'Socioeconomic deprivation and survival after stroke: findings from the prospective South London Stroke Register of 1995 to 2011.' *Stroke*, 45(1), pp. 217-223.

Chen, R., McKevitt, C., Crichton, S. L., Rudd, A. G. and Wolfe, C. D. (2014b) 'Socioeconomic deprivation and provision of acute and long-term care after stroke: the South London Stroke Register cohort study.' *J Neurol Neurosurg Psychiatry*, 85(12), pp. 1294-1300.

Chen, R., Crichton, S., McKevitt, C., Rudd, A. G., Sheldenkar, A. and Wolfe, C. D. (2015) 'Association between socioeconomic deprivation and functional impairment after stroke: the South London Stroke Register.' *Stroke*, 46(3), pp. 800-805.

Cheyne, J. D., Longley, V. and Naicker, R. (2022) Search strategies for retrieval of references to support a rapid literature review of health inequalities in stroke commissioned by the Stroke Association. Cochrane Stroke Group: University of Edinburgh, College of Medicine and Veterinary Medicine.

Chief Medical Officer for England. (2021) Chief Medical Officer's Annual Report 2021: Health in Coastal Communities. Department of Health and Social Care.

Clery, A., Bhalla, A., Rudd, A. G., Wolfe, C. D. A. and Wang, Y. (2020) 'Trends in prevalence of acute stroke impairments: A population-based cohort study using the South London Stroke Register.' *PLoS Med*, 17(10), p. e1003366.

Coutinho, J. M., Klaver, E. C., Roos, Y. B., Stam, J. and Nederkoorn, P. J. (2011) 'Ethnicity and thrombolysis in ischemic stroke: a hospital based study in Amsterdam.' *BMC Neurology*, 11, p. 81.

Crichton, S. L., Wolfe, C. D. A., Rudd, A. G. and McKevitt, C. (2012) 'Comparison of provision of stroke care in younger and older patients: Findings from the south London stroke register.' *Stroke Research and Treatment*, 2012(0), pp. 1-9.

Dalli, L. L., Kim, J., Thrift, A. G., Andrew, N. E., Lannin, N. A., Anderson, C. S., Grimley, R., Katzenellenbogen, J. M., et al. (2019) 'Disparities in Antihypertensive Prescribing After Stroke: Linked Data From the Australian Stroke Clinical Registry.' *Stroke*, 50(12), pp. 3592-3599.

De Waure, C., Bruno, S., Furia, G., Di Sciullo, L., Carovillano, S., Specchia, M. L., Geraci, S. and Ricciardi, W. (2014) 'Health inequalities: An analysis of hospitalizations with respect to migrant status, gender and geographical area.' *BMC International Health and Human Rights*, 14, Douiri, A., Muruet, W., Bhalla, A., James, M., Paley, L., Stanley, K., Rudd, A. G., Wolfe, C. D. A., et al. (2021) 'Stroke Care in the United Kingdom During the COVID-19 Pandemic.' *Stroke*, 52(6), pp. 2125-2133.

Fenger-Grøn, M., Vestergaard, C. H., Ribe, A. R., Johnsen, S. P., Frost, L., Sandbæk, A. and Davydow, D. S. (2021) 'Association Between Bipolar Disorder or Schizophrenia and Oral Anticoagulation Use in Danish Adults With Incident or Prevalent Atrial Fibrillation.' *JAMA Network Open*, 4(5), pp. e2110096-e2110096.

Finch, D., Wilson, H. and Bibby, J. (2023) Leave no one behind: The state of health and health inequalities in Scotland. London: The Health Foundation.

Fleetwood, K., Wild, S. H., Smith, D. J., Mercer, S. W., Licence, K., Sudlow, C. L. M. and Jackson, C. A. (2022) 'Association of severe mental illness with stroke outcomes and process-of-care quality indicators: nationwide cohort study.' *British Journal of Psychiatry*, 221(1), pp. 394-401.

Franzen-Dahlin, A. and Laska, A. C. (2012) 'Gender differences in quality of life after stroke and TIA: a cross-sectional survey of out-patients.' *J Clin Nurs*, 21(15), pp. 2386-2391.

George, J., Mathur, R., Shah, A. D., Pujades-Rodriguez, M., Denaxas, S., Smeeth, L., Timmis, A. and Hemingway, H. (2017) 'Ethnicity and the first diagnosis of a wide range of cardiovascular diseases: Associations in a linked electronic health record cohort of 1 million patients.' *PLoS ONE [Electronic Resource]*, 12(6), p. e0178945.

Greenwood, N., Holley, J., Ellmers, T., Mein, G. and Cloud, G. (2016) '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*, 6,

Greenwood, N., Holley, J., Ellmers, T., Bowling, A. and Cloud, G. (2017) 'Assessing satisfaction with social care services among black and minority ethnic and white British carers of stroke survivors in England.' *Health & Social Care in the Community*, 25(5), pp. 1571-1580.

Gulli, G., Rutten-Jacobs, L. C. A., Kalra, L., Rudd, A. G., Wolfe, C. D. A. and Markus, H. S. (2016) 'Differences in the distribution of stroke subtypes in a UK black stroke population - final results from the South London Ethnicity and Stroke Study.' *BMC Medicine*, 14,

Hajat, C., Heuschmann, P. U., Coshall, C., Padayachee, S., Chambers, J., Rudd, A. G. and Wolfe, C. D. (2011) 'Incidence of aetiological subtypes of stroke in a multi-ethnic population based study: the South London Stroke Register.' *J Neurol Neurosurg Psychiatry*, 82(5), pp. 527-533.

Hanna, K., Mercer, D. and Rowe, F. (2020) 'A qualitative exploration of the sociology of poststroke visual impairments and the associated health inequalities.' *Brain and Behavior*, 10(8), p. e01738.

Harrison, M., Ryan, T., Gardiner, C. and Jones, A. (2013) 'Patients' and carers' experiences of gaining access to acute stroke care: a qualitative study.' *Emerg Med J*, 30(12), pp. 1033-1037.

Health and Wellbeing Alliance. (2022) Everything affects health. Cardiff: Welsh NHS Confederation

Kapadia, D., Zhang, J.,, Salway, S., Nazroo, J.,, Booth, A., Villarroel-Williams, N., and Bécares, L., Esmail, A. (2022) Ethnic Inequalities in Healthcare: A Rapid Evidence Review. London: NHS Race and Health Observatory.

Kerr, G. D., Higgins, P., Walters, M., Ghosh, S. K., Wright, F., Langhorne, P. and Stott, D. J. (2011) 'Socioeconomic status and transient ischaemic attack/stroke: a prospective observational study.' *Cerebrovascular Diseases*, 31(2), pp. 130-137.

Langhorne, P., O'Donnell, M. J., Chin, S. L., Zhang, H., Xavier, D., Avezum, A., Mathur, N., Turner, M., et al. (2018) 'Practice patterns and outcomes after stroke across countries at different economic levels (INTERSTROKE): an international observational study.' *Lancet*, 391(10134), pp. 2019-2027.

Larsen, L. P., Johnsen, S. P., Andersen, G. and Hjollund, N. H. (2020) 'Determinants of health status after stroke: A cohort study with repeated measurements.' *Clinical Epidemiology*, 12, pp. 1269-1279.

Lawrence, M., Kerr, S., Watson, H., Paton, G. and Ellis, G. (2010) 'An exploration of lifestyle beliefs and lifestyle behaviour following stroke: findings from a focus group study of patients and family members.' *BMC Family Practice*, 11, p. 97.

Lewer, D., Aldridge, R. W., Menezes, D., Sawyer, C., Zaninotto, P., Dedicoat, M., Ahmed, I., Luchenski, S., et al. (2019) 'Health-related quality of life and prevalence of six chronic diseases in homeless and housed people: a cross-sectional study in London and Birmingham, England.' *BMJ Open*, 9(4), p. e025192.

Lewsey, J., Ebueku, O., Jhund, P. S., Gillies, M., Chalmers, J. W. T., Redpath, A., Briggs, A., Walters, M., et al. (2015) 'Temporal trends and risk factors for readmission for infections, gastrointestinal and immobility complications after an incident hospitalisation for stroke in Scotland between 1997 and 2005.' *BMC Neurology*, 15,

Leyden, J. M., Chong, W. K., Kleinig, T., Lee, A., Field, J. B. and Jannes, J. (2011) 'A population-based study of thrombolysis for acute stroke in South Australia.' *Medical Journal of Australia*, 194(3), pp. 111-115.

Longley, V., Peters, S., Swarbrick, C. and Bowen, A. (2018) 'What influences decisions about ongoing stroke rehabilitation for patients with pre-existing dementia or cognitive impairment: a qualitative study?' *Clin Rehabil*, 32(8), pp. 1133-1144.

Longley, V., Peters, S., Swarbrick, C., Rhodes, S. and Bowen, A. (2019) 'Does pre-existing cognitive impairment impact on amount of stroke rehabilitation received? An observational cohort study.' *Clinical Rehabilitation*, 33(9), pp. 1492-1502.

Lourenco, E., Sampaio, M. R. M., Nzwalo, H., Costa, E. I. and Ramos, J. L. S. (2021) 'Determinants of quality of life after stroke in Southern Portugal: A cross sectional community-based study.' *Brain Sciences*, 11,

Mackay, A., Ashworth, M. and White, P. (2018) 'The role of spoken language in cardiovascular health inequalities: A cross- sectional study of people with non-English language preference.' *BJGP Open*, 1(4), pp. 1-8.

Maeda, M., Fukuda, H., Matsuo, R., Ago, T., Kitazono, T. and Kamouchi, M. (2021) 'Regional Disparity of Reperfusion Therapy for Acute Ischemic Stroke in Japan: A Retrospective Analysis of Nationwide Claims Data from 2010 to 2015.' *Journal of the American Heart Association*, 10(20), p. e021853.

Marmot, M., Allen, J., Boyce, T., Goldblatt, P. and Morrison, J. (2020a) Health Equity in England: The Marmot Review 10 Years On. London: Institute of Health Equity.

Marmot, M., Allen, J., Goldblatt, P., Herd and Morrison, J. (2020b) *Build Back Fairer: The COVID-19 Marmot Review. The Pandemic, Socioeconomic and Health Inequalities in England.* London.

Mathur, R., Pollara, E., Hull, S., Schofield, P., Ashworth, M. and Robson, J. (2013) 'Ethnicity and stroke risk in patients with atrial fibrillation.' *Heart*, 99(15), pp. 1087-1092.

McCormick, J. and Chen, R. (2016) 'Impact of socioeconomic deprivation on mortality in people with haemorrhagic stroke: a population-based cohort study.' *Postgrad Med J*, 92(1091), pp. 501-505.

Mohan, K. M., Crichton, S. L., Grieve, A. P., Rudd, A. G., Wolfe, C. D. and Heuschmann, P. U. (2009) 'Frequency and predictors for the risk of stroke recurrence up to 10 years after stroke: the South London Stroke Register.' *Journal of Neurology, Neurosurgery & Psychiatry*, 80(9), pp. 1012-1018.

Moorley, Cahill and Corcoran. (2016) 'Stroke among African-Caribbean women: lay beliefs of risks and causes.' *Journal of Clinical Nursing*, 25(3), pp. 403-411.

Moorley, Cahill, Tunariu and Scott. (2014) 'Impact of stroke: a functional, psychological report of an inner-city multiracial population.' *Primary Health Care*, 24(4), pp. 26-34.

Morris, L., Dumville, J., Treweek, S., Miah, N., Curtis, F. and Bower, P. (2022) 'Evaluating a tool to improve engagement and recruitment of under-served groups in trials.' *Trials*, 23(1), p. 867.

Nguyen, T. P., Stirling, C., Kitsos, G., Nichols, L., Chandra, R. V., Rehman, S., Smith, K., Mosley, I., et al. (2022) 'Barriers and facilitators to more timely treatment of aneurysmal subarachnoid haemorrhage across two tertiary referral centres in Australia: A thematic analysis.' *Australasian Emergency Care*, 25(3), pp. 267-272.

NHS England. (2022) *What are healthcare inequalities?* : NHS England. [Online] [Accessed on November 11th] https://www.england.nhs.uk/about/equality/equality-hub/national-healthcare-inequalities-improvement-programme/what-are-healthcare-inequalities/#:~:text=Health%20inequalities%20are%20unfair%20and,that%20is%20available%20to%20them.

Norris, M., Jones, F., Kilbride, C. and Victor, C. (2014) 'Exploring the experience of facilitating self-management with minority ethnic stroke survivors: A qualitative study of therapists' perceptions.' *Disability and Rehabilitation: An International, Multidisciplinary Journal*, 36(26), pp. 2252-2261.

Ouzzani, M., Hammady, H., Fedorowicz, Z. and Elmagarmid, A. (2016) 'Rayyan — a web and mobile app for systematic review.' *Systematic Reviews*, 5(210), Paige, E., Banks, E., Agostino, J., Brieger, D., Page, K., Joshy, G., Barrett, E. M. and Korda, R. J. (2022) 'The relationship of socioeconomic factors to the use of preventative cardiovascular disease medications: A prospective Australian cohort study.' *Preventive Medicine*, 154, p. 106884.

Perrin, A., Freyssenge, J., Haesebaert, J., Tazarourte, K., Termoz, A., Grimaud, O., Derex, L., Viprey, M., et al. (2021) 'Are there socio-economic inequities in access to reperfusion therapy: The stroke 69 cohort.' *Revue Neurologique*, 177(9), pp. 1168-1175.

Peters, S. A. E., Carcel, C., Millett, E. R. C. and Woodward, M. (2020) 'Sex differences in the association between major risk factors and the risk of stroke in the UK Biobank cohort study.' *Neurology*, 95(20), pp. e2715-e2726.

Prigge, R., Wild, S. H. and Jackson, C. A. (2022) 'The individual and combined associations of depression and socioeconomic status with risk of major cardiovascular events: A prospective cohort study.' *Journal of Psychosomatic Research*, 160, p. 110978.

Rai, T., Hinton, L., McManus, R. J. and Pope, C. (2022) 'What would it take to meaningfully attend to ethnicity and race in health research? Learning from a trial intervention development study.' *Sociology of Health & Illness*, 44(S1), pp. 57-72.

Raine, R., Wong, W., Ambler, G., Hardoon, S., Petersen, I., Morris, R., Bartley, M. and Blane, D. (2009) 'Sociodemographic variations in the contribution of secondary drug prevention to stroke survival at middle and older ages: cohort study.' *BMJ*, 338, p. b1279.

Salma, J., Hunter, K. F., Ogilvie, L. and Keating, N. (2018) 'An Intersectional Exploration: Experiences of Stroke Prevention in Middle-Aged and Older Arab Muslim Immigrant Women in Canada.' *Canadian Journal of Nursing Research*, 50(3), pp. 110-119.

Sheldenkar, A., Crichton, S., Douiri, A., Rudd, A. G., Wolfe, C. D. and Chen, R. (2014) 'Temporal trends in health-related quality of life after stroke: analysis from the South London Stroke Register 1995-2011.' *International Journal of Stroke*, 9(6), pp. 721-727.

Sjolander, M., Eriksson, M. and Glader, E. L. (2016) 'Inequalities in medication adherence to statin treatment after stroke: A nationwide observational study.' *European Stroke Journal*, 1, pp. 101-107.

Smeeton, N. C., Corbin, D. O., Hennis, A. J., Hambleton, I. R., Fraser, H. S., Wolfe, C. D. and Heuschmann, P. U. (2009) 'Differences in risk factors between black Caribbean patients with stroke in Barbados and South london.' *Stroke*, 40(2), pp. 640-643.

Sobral, S., Taveira, I., Seixas, R., Vicente, A. C., Duarte, J., Goes, A. T., Duran, D., Lopes, J., et al. (2019) 'Late Hospital Arrival for Thrombolysis after Stroke in Southern Portugal: Who Is at Risk?' *Journal of Stroke & Cerebrovascular Diseases*, 28(4), pp. 900-905.

Stecksén, A., Glader, E. L., Asplund, K., Norrving, B. and Eriksson, M. (2014) 'Education Level and Inequalities in Stroke Reperfusion Therapy.' *Stroke*, 45(9), pp. 2762-2768.

Stolz, E., Hamann, G. F., Kaps, M. and Misselwitz, B. (2011) 'Regional differences in acute stroke admission and thrombolysis rates in the German federal state of Hesse.' *Deutsches Arzteblatt International*, 108(36), pp. 607-611.

Strudwick, A. and Morris, R. (2010) 'A qualitative study exploring the experiences of African-Caribbean informal stroke carers in the UK.' *Clinical Rehabilitation*, 24(2), pp. 159-167.

Tang, E. Y. H., Price, C., Stephan, B. C. M., Robinson, L. and Exley, C. (2019) 'Post-stroke memory deficits and barriers to seeking help: views of patients and carers.' *Family Practice*, 36(4), pp. 506-510.

Thorne, K., Williams, J. G., Akbari, A. and Roberts, S. E. (2015) 'The impact of social deprivation on mortality following acute myocardial infarction, stroke or subarachnoid haemorrhage: a record linkage study.' *BMC Cardiovascular Disorders*, 15, p. 71.

Tod, E., McCartney, G., Fischbacher, C., Stockton, D., Lewsey, J., Grant, I., Wyper, G. M. A., Mesalles-Naranjo, O., et al. (2019) 'What causes the burden of stroke in Scotland? A comparative risk assessment approach linking the Scottish Health Survey to administrative health data.' *PLoS ONE [Electronic Resource]*, 14(7), p. e0216350.

Todd, A. W. and Anderson, E. M. (2009) 'CT scanning in stroke patients: meeting the challenge in the remote and rural district general hospital.' *Scottish Medical Journal*, 54(2), pp. 17-20.

Torbica, A., Calciolari, S. and Fattore, G. (2015) 'Does informal care impact utilization of healthcare services? Evidence from a longitudinal study of stroke patients.' *Social Science & Medicine*, 124, pp. 29-38.

Townend, E., Brady, M. and McLaughlan, K. (2007) 'Exclusion and Inclusion Criteria for People with Aphasia in Studies of Depression after Stroke: A Systematic Review and Future Recommendations.' *Neuroepidemiology*, 29(1-2), pp. 1-17.

Townsend, W. A., Patricia; Capellari, Emily; Haines, Kate; Hansen, Sam; James, LaTeesa; MacEachern, Mark; Rana, Gurpreet; Saylor, Kate. (2022) Addressing antiquated, non-standard, exclusionary, and potentially offensive terms in evidence syntheses and systematic searches. University of Michigan: University of Michigan Library.

Ullberg, T., Glader, E. L., Zia, E., Petersson, J., Eriksson, M. and Norrving, B. (2017) 'Associations between Ischemic Stroke Follow-Up, Socioeconomic Status, and Adherence to Secondary Preventive Drugs in Southern Sweden: Observations from the Swedish Stroke Register (Riksstroke).' *Neuroepidemiology*, 48(1), pp. 32-38.

Vyas, M. V., Laupacis, A., Austin, P. C., Fang, J., Silver, F. L. and Kapral, M. K. (2020) 'Association Between Immigration Status and Acute Stroke Care: A Retrospective Study.' *Stroke*, 51(5), pp. 1555-1562.

Wang, Y., Rudd, A. G. and Wolfe, C. D. (2013) 'Trends and survival between ethnic groups after stroke: the South London Stroke Register.' *Stroke*, 44(2), pp. 380-387.

Watt, T., Raymond, A., Rachet-Jacquet, L. (2022) *Quantifying health inequalities in England*. The Health Foundation. [Online] [Accessed on November 11th] https://www.health.org.uk/news-and-comment/charts-and-infographics/quantifying-health-inequalities

Weber, R., Krogias, C., Eyding, J., Bartig, D., Meves, S. H., Katsanos, A. H., Caso, V. and Hacke, W. (2019) ‘Age and Sex Differences in Ischemic Stroke Treatment in a Nationwide Analysis of 1.11 Million Hospitalized Cases.’ *Stroke*, 50(12), pp. 3494-3502.

Zulkifly, H., Cheli, P., Lutchman, I., Bai, Y., Lip, G. Y. H. and Lane, D. A. (2020) ‘Anticoagulation control in different ethnic groups receiving vitamin K antagonist therapy for stroke prevention in atrial fibrillation.’ *Thrombosis Research*, 192, pp. 12-20.

When stroke strikes, part of your brain shuts down. And so does a part of you. That's because a stroke happens in the brain, the control centre for who we are and what we can do. It happens every five minutes in the UK and changes lives instantly. Recovery is tough, but with the right specialist support and a ton of courage and determination, the brain can adapt. Our specialist support, research and campaigning are only possible with the courage and determination of the stroke community. With more donations and support from you, we can rebuild even more lives.

Donate or find out more at **stroke.org.uk**

Contact us

We're here for you. Contact us for expert information and support by phone, email and online.
Stroke Helpline: **0303 3033 100**
From a textphone: **18001 0303 3033 100**
Email: **helpline@stroke.org.uk**
Website: **stroke.org.uk**

Rebuilding lives after stroke

Stroke Association

JN 2223-388

The Stroke Association is a company limited by guarantee, registered in England and Wales (No 61274). Registered office: Stroke Association House, 240 City Road, London EC1V 2PR.
Registered as a charity in England and Wales (No 211015) and in Scotland (SC037789). Also registered in the Isle of Man (No. 945) and Jersey (No. 221), and operating as a charity in Northern Ireland.