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Dissertation Title: The Impact of Socioeconomic Inequalities on
Stroke Recovery Outcomes in the UK

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Abstract

Background: Despite universal NHS access, social and economic factors have a significant effect on the recovery from stroke, which is a common cause of long-term disability in the UK. There is evidence that those with lower income, less education, jobs that aren't secure, and living in poorer neighbourhoods have poorer functional recovery, less health-related quality of life, and higher barriers to rehabilitation and secondary prevention. Previous studies are scattered and consider SES as a background covariate instead of as a central explanatory variable, and rarely combine information from several SES dimensions or mixed methods studies. This dissertation will focus on the issues identified above with regard to the contribution of socioeconomic inequalities to post-stroke rehabilitation services, daily functioning and long-term effects in a UK context.

Methods: Using a PEO (population: UK stroke survivors; exposure: socioeconomic inequalities; outcome: recovery) framework, a systematic literature review was carried out on Medline, Embase, Scopus, Cochrane, ProQuest and PubMed between 2016 and 2026, and included only UK-based, peer-reviewed studies. Study selection was based on explicit inclusion and exclusion criteria, followed by a two-stage screening process, data extraction structured, and critical appraisal conducted with CASP based tools for designs of qualitative, quantitative and mixed methods. Braun and Clarke's thematic analysis was used to synthesize findings, which involved bringing together a variety of designs that can be grouped together as themes.

Findings: Themes that emerged are neighbourhood context, educational inequalities and recovery potential, income, material deprivation and post-stroke adjustment, access and quality of care, and employment, work reintegration and unequal recovery pathways. In all themes, lower SES was strongly linked with limited access to rehabilitation, environmental and financial barriers, and decreased social support and multidimensional recovery.

Contribution: Despite universal healthcare, the review highlights a systematic patterning of outcomes by education, income, neighbourhood and employment in stroke recovery in the UK, that is consistent with an interpretivist, socio-structural understanding of stroke recovery. It provides practical, evidence-based recommendations for clinicians, commissioners and policymakers to provide recommendations for developing more equitable rehabilitation pathways and support systems for stroke survivors from socioeconomically disadvantaged communities.

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Chapter 1: Introduction

1.1 Introduction to the Topic

In the United Kingdom, stroke (defined as a sudden interruption of blood flow to the brain causing neurological damage) is a leading cause of morbidity and long-term disability (Bray *et al.* 2018). There are two main types of strokes: ischaemic (when an artery is blocked) and haemorrhagic (when the artery bleeds into the brain). Recovering from a stroke is unpredictable, and the outcome depends on biological, clinical and, more recently, socioeconomic factors. Socioeconomic inequalities, income, education, occupation and resource availability, are important factors that influence health outcomes and access to post-stroke rehabilitation services (Chen *et al.* 2014; Sun *et al.* 2023; McCormick & Chen 2016).

Every year, there are an estimated 1.3–1.4 million stroke survivors in the UK, with around 100,000 people having a stroke each year (Stroke Association, 2024). Despite a significant reduction in mortality rates (by almost 46% between 1990 and 2010) brought about by progress in acute care, stroke is still one of the leading causes of disability in adults (Wafa *et al.*, 2020). More than 50% of the survivors will have permanent disabilities such as reduced mobility, impaired cognition and communication such as aphasia (Poomalai, Prabhakar and Jagadesh, 2023).

This study is specifically interested in the association between socioeconomic differences and stroke recovery outcomes such as functional recovery, access to rehab, and long-term quality of life. It is important to understand these inequalities because they are a large public health problem that adds to the health inequality and further burdens the health system, like the National Health Service (NHS).

1.2 Background and Current Context

Stroke is a major public health problem in the UK, not only for the number of people affected but for the impact it has on individual lives, families and health and social care systems both in the short and long term (Bray *et al.* 2018; Sun *et al.* 2023). Although there has been significant progress in the management of acute stroke, such as speedier diagnosis, use of thrombolysis and specialist stroke units, there are still inequalities in recovery rates (Walters *et al.* 2020). These differences are now increasingly viewed in the context of socioeconomic inequality, or differences in income, education, employment, housing, and the availability of health care services (Marmot 2010; Link & Phelan 1995).

From an epidemiological standpoint, the incidence and outcome of stroke is closely tied to socioeconomic status (SES). People with lower social economic status are more likely to be exposed to risk factors like hypertension, smoking, obesity and less likely to be able to receive preventative health care, which is a risk factor for stroke (Bray *et al.* 2018). Moreover, these individuals may also experience other challenges in the recovery period after stroke (Chen *et al.* 2014). While health care is available to everyone in the UK through the National Health Service, there are inequalities in the level of health care service that people use, the quality of health care that they receive and what happens to them after they receive health care (Chen *et al.* 2015; McCormick & Chen 2016).

The extent of the problem is revealed by current data. The death rate within 30 days is approximately 12.5% of all stroke cases, but substantially better in recent years (Bray *et al.* 2018). This is indicative of progress in emergency treatment but is also a result of the increased number of people surviving the effects of stroke. More than half of people who suffer stroke may have some sort of disability, including physical disabilities like hemiparesis, cognitive and psychological disabilities (Sun *et al.* 2023). About a third of those who survive will suffer from depression, another third from aphasia and up to half feel tired all the time. These outcomes necessitate continuous rehabilitation and support and this is not the same for all socio-economic groups (Hanna *et al.* 2020).

Rehabilitation after stroke is a complicated and multifaceted process, including acute treatment, rehabilitation, and long-term rehabilitation. Rehabilitation, such as physiotherapy, occupational therapy, speech and language therapy, psychological support, is an important consideration for functional outcome (Walters *et al.* 2020). But the access of these services can be very different. Those who have higher social and economic status are more likely to receive private rehabilitation, have better social support network, and have a better health literacy which helps them navigate the health care system more efficiently (Berkman *et al.* 2011). However, people from lower SES groups may experience delayed access to rehabilitation, poor continuity of rehabilitation services and a lack of access to community-based services (Hodyl *et al.* 2024).

Socio-economic inequalities are compounded by geographical disparities. Stroke services and rehabilitation facilities are less available in deprived areas in the UK (Chen *et al.* 2014). Low-income and rural communities can experience staffing, waiting time, and access to follow up care issues. These structural inequalities have significant

negative implications for recovery, for instance, on functional outcomes and quality of life (Sun *et al.* 2023).

Access to healthcare is not the only social determinants of health that impact recovery from stroke. A survivor's housing situation, for instance, may be a determinant of whether or not he or she can achieve independence (Marmot 2010). People who live in poor or cramped housing might have difficulties with moving around or doing exercises. Another important factor is employment status; those who are unemployed or have an insecure position can suffer financial stress, affect recovery and raise mental health risk factors like depression (Bartley 2017). Education level is also a factor; it affects health literacy and understanding and compliance with treatment (Nutbeam 2000).

Social support networks are also crucial during the recovery phase. Family members or caregivers may be needed to provide support in daily functions and emotional support for stroke survivors (Dongen *et al.* 2021). However, those from disadvantaged backgrounds may not be able to access such care as they often lack cohesive family structures or economic resources to provide care. This may result in worse rehabilitation outcomes and greater need for access to formal health care services (Karadzhov 2021).

The risk of stroke recurrence is another facet of the context at present. About a third of the UK's stroke survivors will have a second stroke within the first five years. Medications, lifestyle changes and frequent medical checkups are critical secondary prevention strategies to help minimize this risk (Sterling *et al.* 2025). The ability to adhere to these strategies, however, can be affected by socioeconomic inequalities. For instance, low income people may find it difficult to buy nutritious food, or it may be difficult for them to find safe places to exercise (Link & Phelan 1995). Likewise, for a medication regimen, less health literacy can lead to lack of understanding and increased risk for recurrence (Berkman *et al.* 2011).

To tackle these inequalities, policy documents in the UK have sought to enhance stroke care pathways and increase the availability of rehabilitation services, including the NHS Long Term Plan and the National Stroke Strategy. These efforts have resulted in a range of positive outcomes, such as enhanced acute-care and survival rates; however, issues continue to exist with access to long-term rehabilitation and support services, particularly those that are equitable (Bray *et al.* 2018). The importance of tackling social inequalities in health has been acknowledged in public health research more and more (Marmot 2010).

In recent years, research has also highlighted the importance of a comprehensive recovery plan for stroke victims, combining medical treatment with social and economic assistance (Sun *et al.* 2023). These involve community-based rehabilitation programmes, better linkages between health care and social services and targeting high-risk groups (Hodyl *et al.* 2024). In addition, digital health technologies and tele-rehabilitation are becoming a possible pathway to access gaps; but they can also inadvertently deepen inequalities if implemented in a non-inclusive manner.

Overall, although the UK has seen impressive decreases in stroke mortality, there is still a high proportion of people affected by stroke resulting in disability, and socioeconomic inequalities affect recovery. Healthcare access, social determinants and individual factors all play a role in the complex picture of recovery, which is not necessarily determined by clinical factors. To design appropriate interventions and policies for reducing health inequalities and improving outcomes for all stroke survivors, we need to understand these dynamics.

1.3 Rationale for Research

The aim of this research is to tackle the long-standing and inconsistent recovery from stroke achieved by various socioeconomic groups in the United Kingdom. Progress in treatment of acute stroke has lowered mortality but there is a lack of progress in addressing disparities in long-term outcomes and quality of life. This study aims to critically review the effect of socioeconomic factors (income, education, health care resources) on rehabilitation outcomes, functional recovery and risk for long-term complications for stroke survivors.

This research focuses on UK healthcare, specifically post-stroke and not prevention or acute clinical management. Focuses on adults with stroke survivors and excludes paediatric stroke survivors. Moreover, the study focuses mainly on the social and structural factors and not on biological or genetic determinants. These boundaries will guide the research to produce a deep and detailed analysis of how socioeconomic differences affects recovery pathways in a defined universal healthcare system.

1.4 Research Question

This study is guided by the following central research question: *How do socioeconomic inequalities influence stroke recovery outcomes in the United Kingdom?*

This question seeks to explore the extent to which factors such as income, education, and access to resources shape rehabilitation, functional recovery, and long-term health outcomes among stroke survivors.

1.5 Research Aim

To analyse the effects of socioeconomic inequalities on stroke recovery in the UK and identify barriers alongside potential equitable solutions.

1.6 Research Objectives

- To examine the relationship between socioeconomic status and stroke recovery outcomes in the UK.
- To identify key challenges faced by individuals from disadvantaged backgrounds during stroke recovery.
- To propose evidence-based strategies to improve recovery outcomes and reduce inequalities among low-income and vulnerable populations.

1.7 Chapter Summary

In this chapter, the theme of stroke recovery in the UK was introduced and the strong link between socioeconomic inequalities and recovery was explored. It offered background information on the prevalence, long-term effects, and inequities in access to care and rehabilitation services. Rationale, research question, aim and objectives were clearly formulated to guide the study. The literature review is presented in the next chapter (Chapter 2) which should be a critical examination of the current evidence about socio-economic factors affecting stroke recovery and should identify important research gaps.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of the scientific and scholarly literature that is relevant to the impact of socioeconomic inequalities on stroke recovery, with a focus on literature relevant to the UK context. It begins by outlining some of the social factors and socioeconomic status (SES) that are important for stroke recovery and the relationship between socioeconomic status and health in general. It then examines the research on empirical links between SES and stroke incidence, mortality and recovery, broken down into core areas (education, income, neighbourhood, employment). The chapter also summarises and synthesises key findings throughout, critically examining the strengths and limitations of previous research, and identifying gaps which give a clear justification for the present study.

2.2 Stroke recovery and socioeconomic status

In the world, stroke is a leading cause of death and disability and survivors may experience impairments of physical, cognitive, mood, and social functioning for the long-term (Elendu *et al.*, 2023). Now, recovery is defined as a multi-dimensional process that encompasses physical recovery, gaining independence in daily functioning, reintegration into social life and maintaining health-related quality of life (HRQoL) (Ramsay and Allison, 2025). This general understanding of recovery has motivated researchers to study the impact of social and economic factors on post-stroke courses.

Sun *et al.* (2023) employed a systematic review and meta-analysis to see how SES and HRQoL after stroke are related, and results showed that, in every measure, stroke survivors with lower SES reported significantly poorer HRQoL compared to those with higher SES. All of these factors were linked to reduced physical, mental and social functioning (including reduced income, education, and occupational status). The methodological quality of this work is good and is a synthesis based on data from multiple cohorts and uses meta-analytic techniques, but there is some variation in the SES measures used and an over-representation of non-UK studies (Nguyen *et al.*, 2024). However, it is clear that there is a socioeconomic inequity that exists beyond the acute phase, and is a factor in lived experience in the months and years following stroke.

2.3 Socioeconomic inequalities in stroke incidence and mortality

There has been extensive research focusing on the relationship of SES to risk of first-ever stroke and on death rates after stroke. According to Sterling *et al.* (2025) for the most deprived areas there was a significantly higher incidence for first ever stroke compared to the least deprived areas. They also showed those who lived in deprived neighbourhoods were seven years more likely to have had a stroke and were more likely to be disabled and have pre-stroke diabetes. The advantages of the study include the very large data sample, the very strong linkage of the routine datasets and multivariable models, but it is still an observational study and is not able to differentiate causal pathways fully (Colnet *et al.*, 2024).

The Lindmark, Eriksson and Darehed (2022) stated mortality rates after stroke were increased in those with lower SES, even after accounting for certain clinical risk factors and age and sex. This means there is not just a higher level of risk for socioeconomic differences to increase the likelihood of having a stroke, but also the likelihood of not surviving the stroke. Recently, Pantoja-Ruiz *et al.* (2024) critically synthesised evidence from around the world on SES and stroke, and concluded that the association between lower SES and higher incidence and mortality from stroke was consistently observed in a variety of high-income countries. The review is helpful at summarizing a collection of divergent studies, but is undertaken in multiple countries and health systems, and so, it is not easy to draw inferences to implications for the UK.

Overall, the studies indicate that deprivation raises the likelihood of having a stroke, puts people at risk of having multiple conditions (such as diabetes and hypertension) and reduces survival rates, which impacts on who will make it to the recovery phase, and how (Belau *et al.*, 2023). Their value is less in terms of fine detail of post-stroke rehabilitation and coping mechanisms and more in terms of the nature of what happens as a result of the recovery process, which highlights the need for further research into recovery outcomes.

2.4 Socioeconomic inequalities in stroke recovery outcomes

There has been a focus on incidence and mortality by socio-economic differences, while studies that focus on stroke recovery in relation to socio-economic differences have been less common. Versluis *et al.* (2025) presents the most complete synthesis of SES and HRQoL, concluding that lower SES is always associated with poor HRQoL in all three aspects: physical, psychological and social. The financial constraints and services access restrictions, and the health literacy, are the two factors lying between low SES and poorer recovery. The explicit focus on HRQoL, a patient-centred outcome

that reflects wider recovery, is a strength of this review, albeit there were relatively few studies that used the same HRQoL measures and SES measures were not standardised (Yvan Sonjon *et al.*, 2025).

Other research suggests that functional outcomes, engagement in therapy, and reliance on others with regards to activities of daily living are associated with lower levels of SES (Speckmann *et al.*, 2025). They do highlight, however, that many observational studies are not fully adjusted for the severity of stroke and intensity of rehabilitation and these may result in observed SES gradients. This suggests a methodological weakness that SES has been lumped together as a background variable instead of it being the main concern of the research design, which results in incomplete modelling of pathways between social disadvantage and recovery (Sun *et al.*, 2025).

Despite all these limitations, it is clear from all the literature that there are socioeconomic inequalities that persist across the recovery stage. Poor HRQoL is found in those with low SES, including in universal health care systems, and is linked to disability and more limited participation. This does not mean that inequalities in access to formal treatment are the only factors to consider when examining inequalities in recovery, as other factors such as home environments, informal care, employment conditions, and community resources also play a role (McMaughan, Oloruntoba and Smith, 2020).

2.5 Education, income, neighbourhood and employment

The dimensions identified as being of special relevance for the stroke recovery, in the context of the SES, are: education, income, neighbourhood and employment.

Education influences stroke risk and recovery in several ways such as the way it influences health literacy and the problem solving and communication with health professionals. Pyrrou *et al.* (2025) have consistently associated poor HRQoL after stroke with low levels of education, and have proposed that this may be due to lack of knowledge or understanding of treatment options and secondary prevention. This is supported by other health inequality research that found other links between less education and less capacity to navigate complex health systems and be able to negotiate for appropriate care (McMaughan, Oloruntoba and Smith, 2020). There are a number of studies on stroke that only examine education at a basic level (e.g., basic vs. higher) and that do not examine the relationship between education and ethnicity, language, or disability, and important nuances are not examined.

Recovery takes place in an environment of income and material resources. For older people, lower income levels are associated with less access to health and preventative services, as transported by McMaughan, Oloruntoba and Smith (2020), due to the constraint of transport and competing demands, and high costs. Ifejika *et al.* (2025) theorize that stroke survivors from lower income groups might have difficulty covering the cost of transportation to rehabilitation, as well as cost of private therapies or making home modifications to become more accessible. The results of this study are similar to those of other research on financial strain and chronic illness, but there is less direct evidence in the UK on the link between income and post stroke service use and adherence.

Neighbourhood deprivation can be considered as an additional space dimension to inequality. Within the same health system, health national health service or within a health unit, Adeniji and Fagbemi (2025) showed that stroke incidence and mortality rates were higher in more deprived neighbourhoods. They propose that these gradients may be due to local variations in resources, service delivery and environmental hazards. Delhey *et al.* (2024) also show that SES impacts safe neighbourhoods and community resources that are important factors in physical activity and social engagement after stroke. However, the longer-term impacts of neighbourhood characteristics on stroke recovery is an important research focus, and few studies have specific interest in this.

For people who are able to work after a stroke, work reintegration and employment are a significant issue. Zhang *et al.* (2025) highlight that work with a low salary or insecure employment may not offer adequate sick leave or flexible working options and/or employer-funded rehabilitation, which can make it challenging for survivors to make it to therapy or slowly return to work. The loss of employment can also add to material hardship, and loss of social identity (as well as material loss), which can affect psychological recovery as well as material recovery. However, as Trusson *et al.* (2025) point out, employment outcomes rarely are reported as primary outcome measures, and few studies have explored the effect of labour market structures and employment protection on the post-stroke trajectory in depth.

2.6 Theoretical perspectives on socioeconomic inequality and recovery

Theories can be used to interpret the empirical literature. Dahlgren and Whitehead model is a conceptualization of health where health is viewed as a function of concentric circles of influences at the individual, social/community and socioeconomic,

cultural and environmental levels. Based on this model, Fan *et al.* (2023) propose that SES is embedded in a larger structural landscape that affects life course exposure to risk and resources. From this viewpoint, the impact of social disadvantage can be seen as a part of stroke recovery.

The other difference between social determinants approaches is materialist (income, housing and services) versus psychosocial (stress, perceived status and social support). Both paths are important as lower SES is correlated with less access to care and increased psychosocial strain in older adults, as demonstrated by McMaughan, Olorunjoba and Smith (2020). These frameworks are used in the context of stroke, suggesting that stroke recovery inequities may be due to inequities in the use of health services and chronic stressors as well as diminished social support systems.

Interpretivist and constructionist approaches also open an understanding of recovery in terms of experience and understanding. But according to Pykett *et al.* (2022), recovery studies in mental health care have been largely individualistic, not paying enough attention to the impact of poverty, homelessness and discrimination on recovery possibilities. The review urges to pay more attention to socio-structural disadvantage and power relations. It appears that the same problems are relevant to stroke: while survivors of a disadvantaged group may also suffer more stigma and be provided with less welcoming service and face fewer institutional barriers, their voices may also be under-represented in the research. Combining interpretivist and social determinants frameworks is thus a way to better understand the stroke recovery as a clinical and socio-structural process (Kariasa *et al.*, 2024).

2.7 Critical evaluation and gaps

The overall picture from the literature is that there are socioeconomic inequalities in the incidence, mortality and recovery from stroke. A large cohort study, such as Cheng *et al.* (2026), is statistically well powered, and the authors do not provide the details of the statistical analysis required, is adequate with regard to sample size, and provides a high-level summary of HRQoL outcomes; a systematic review, such as McLeese *et al.* (2021), is statistically powerful and has sufficient sample size, but it is inadequate with regard to statistical analysis and provides a high-level summary of HRQoL outcomes. However, there are a number of limitations that are apparent. First, in many observational studies, the amount of theorisation of mechanisms is limited, in that SES is treated as a covariate and not as an essential mechanism to explain (Hammerton and Munafò, 2021). Second, SES is measured in different ways and composite indices can mask differences between education, income, neighbourhood and employment

(Rahimi *et al.*, 2022). Third, there is a minimum of research that brings together quantitative results with qualitative descriptions of experience, especially for those who experience severe disadvantage (Pyo *et al.*, 2023).

Evidence of incidence and mortality is relatively good in the UK setting, while evidence for systematic synthesis of evidence on SES and post-stroke recovery (HRQoL, participation and return to work) is limited (Kunz *et al.*, 2026). In addition, there is a need to apply theory specifically to stroke, for example, the Dahlgren and Whitehead model and socio-structural view of recovery (Dahlgren and Whitehead, 2021). These gaps highlighted the need for the current study to combine evidence that is pertinent to the UK with respect to socioeconomic inequalities and stroke recovery, and to look for patterns and themes in published evidence.

2.8 Chapter summary

In this chapter, academic and scholarly literature pertaining to socioeconomic inequalities and stroke recovery has been surveyed. Higher incidence of stroke and earlier onset, greater co-morbidity, lower survival rates and worse post-stroke HRQoL have been found in those with lower SES. Themes of education and income are both introduced and become significant factors, with structural disadvantage emerging as a key factor that influences recovery potential, and theories from social epidemiology and interpretive recovery research used to frame these concepts. At the same time, there are important dimensions of unmet need, including multidimensional recovery outcomes, and how the different dimensions of the SES relate to each other, and to highly disadvantaged groups. The gaps cited represent a satisfactory substantiation of the systematic methodology given in Chapter 3 which explains how the relevant studies to support the research aim were identified, appraised and synthesised.

Chapter 3: Research Methodology

3.1 Introduction

The methodological approach used to explore the impact of socioeconomic inequalities on stroke recovery in the United Kingdom is described in this chapter. The study uses a systematic literature review (SLR) methodology oriented by the principles of PRISMA to make sure that the review process and synthesis of the existing evidence are transparent and rigorous. The study design follows the research onion model suggested by Saunders, Lewis and Thornhill (2023) which enables coherent research alignment between the research question, philosophical approach and analytical approach.

3.2 Philosophical Framework

The research philosophy adopted for the study is interpretivist as it focuses on the understanding of the social realities within the context of subjective meanings and contextual interpretations rather than the only objective measurement (Saunders, Lewis and Thornhill, 2023). In the context of stroke recovery, the fact that clinical interventions are not the sole factor determining outcome is relevant, and social and economic factors are clearly important.

As socio-economic inequalities affect access to healthcare services, opportunities for rehabilitation and long term recovery, it is important that an approach is adopted which reflects the complexities of this (McMaughan, Oloruntoba and Smith, 2020). Through Interpretivism, the researcher can gain a deeper understanding of how other studies conceptualize and explain these inequalities and understand the experiences of recovery across various population groups (Nikkhah *et al.*, 2026).

In an ontological perspective, the study assumes a relativist view which recognizes that reality is socially produced and depends on the context of each person's life. For the purpose of this study, stroke recovery is not a one-size-fits-all process, and factors like income, education, and social support influence the recovery process (Dongen *et al.*, 2021). Systemic barriers that can have a marked impact on recovery outcomes may exist for people from disadvantaged backgrounds, in contrast to those from more wealthy backgrounds (Karadzhov, 2021).

Epistemologically, the study is in line with constructionist perspective because knowledge is built up by interpreting and synthesizing previous literature (Hyde, 2020). Instead of finding one "true" answer, the research is designed to build up a knowledge base of the ways in which socioeconomic differences impact recovery processes. This

philosophical approach justifies the application of qualitative synthesis methods, and further validates the appropriateness of thematic analysis (Naeem *et al.*, 2023).

3.3 Methodology of Systematic Literature Review

The research approach adopted is systematic literature review (SLR) which is a structured and comprehensive approach to identifying and synthesising relevant studies. This approach is commonly known and provides for minimised bias and transparency of procedures (Page *et al.*, 2021). In this research, SLR is well suited to the particularity of this research because it will allow for a comprehensive review and analysis of the evidence available on socioeconomic inequalities and stroke recovery in the UK.

It's a review conducted according to Guidelines of PRISMA (trusted guidelines used for the identification, screening and selection of studies). This will allow for the documentation of each stage of the review and make it reproducible, which will reinforce the credibility of the findings. The study follows the PRISMA guidelines, demonstrating methodological rigor and transparency in the research process (Torres *et al.*, 2024).

Due to the exploratory nature of the research question, the qualitative synthesis approach is used, rather than the quantitative meta-analysis approach (Maeda *et al.*, 2022). The choice of this decision is justified to consider complex social dynamics and contextual influences that cannot be captured through statistical aggregation alone (Nikkhah *et al.*, 2026). A qualitative SLR can help identify patterns and themes, and provide a deeper understanding of how socioeconomic inequalities influence outcomes for recovery beyond (Torres *et al.*, 2024).

3.3.1 PEO Table of the Study

The study does not compare interventions, so the PICO framework is changed to a PEO (Population, Exposure, Outcome) framework. This modification will help maintain the exploratory research focus on social determinants and not clinical comparisons (Eldawlatly *et al.*, 2018).

Table 1 PEO Framework of the Study

Component	Description
Population (P)	Stroke patients in the United Kingdom
Exposure (E)	Socioeconomic inequalities (income, education, employment status, deprivation)
Outcome (O)	Stroke recovery (physical rehabilitation, functional independence, quality of life)

The PEO framework is a key element of the review process as it provides a clear structure for the study, defining the scope and limitations of the study (Hosseini *et al.*, 2024). The research is focussed on the UK context of stroke patients and the characteristics of the NHS and wider socio-economic environment (Munn *et al.*, 2018). Because the socioeconomic inequalities are an exposure, they account for a broad spectrum of social determinants, and the outcome variable reflects the multidimensionality of recovery (Li *et al.*, 2024).

3.3.2 Identification of Relevant Studies

The systematic search process was carried out using Medline, Embase, Scopus, Cochrane and ProQuest & PubMed databases. It was chosen as the only data source because it is an extensive collection of peer-reviewed biomedical and public health literature that is ideal for research on stroke and health inequalities (Downing *et al.*, 2025). A single, good quality database can also guarantee uniformity in the search process and minimise duplication (Hammer, Virgili and Bilotta, 2023).

The research question was used to develop a structured search strategy, using the PEO framework. Boolean operators were used to connect terms across the keywords, e.g., “stroke recovery” “socioeconomic inequalities” and “United Kingdom” to narrow the search and ensure that most of the results found were relevant. Filters included for contemporary evidence included studies published from 2014-2025, in the English language, and as peer reviewed articles.

Table 2 *Advanced Search Strategy*

Component	Search Terms / Filters	Explanation
1. Stroke Concept	"stroke"[MeSH Terms] OR "stroke"[All Fields] OR "strokes"[All Fields] OR "stroke s"[All Fields]	Includes both controlled vocabulary (MeSH) and free-text variations of "stroke"
2. Recovery Concept	"recovery"[All Fields] OR "recoveries"[All Fields]	Captures studies focusing on recovery outcomes after stroke
3. Socioeconomic Factors	"socioeconomic factors"[MeSH Terms] OR "socioeconomic"[All Fields] OR "socioeconomics"[All Fields]	Includes both indexed and non-indexed terms related to socioeconomic status
4. Inequality Concept (Alternative Path)	"inequality" OR "inequalities" OR "inequity" OR "inequities"	Broadens search to include disparities and inequities
5. Geographic Focus	"United Kingdom"[MeSH Terms] OR "United Kingdom"[All Fields]	Limits studies to UK-based populations
6. Population Filters	"humans"[MeSH Terms] AND "adult"[MeSH Terms]	Restricts studies to adult human populations
7. Language Filter	"english"[Language]	Includes only English-language publications
8. Time Filter (Custom Range)	"2016/02/24":"2026/01/01"	Limits results to recent publications
9. Boolean Logic Structure	Combination of AND OR operators	OR broadens within concepts; AND combines different concepts

Multiple search combinations allowed for a thorough search of related literature, yet the search was focused on the research topic. This systematic approach helps to increase the reliability of the literature base and to minimize the risk of missing important literature (Gusenbauer and Haddaway, 2020).

3.4 Study Selection

After identification of studies, a structured selection process was put into place according to the PRISMA guidelines. To ensure that each study was counted only once, initially duplicate records were eliminated. The rest of the articles were then screened in two stages for their relevance to the research question.

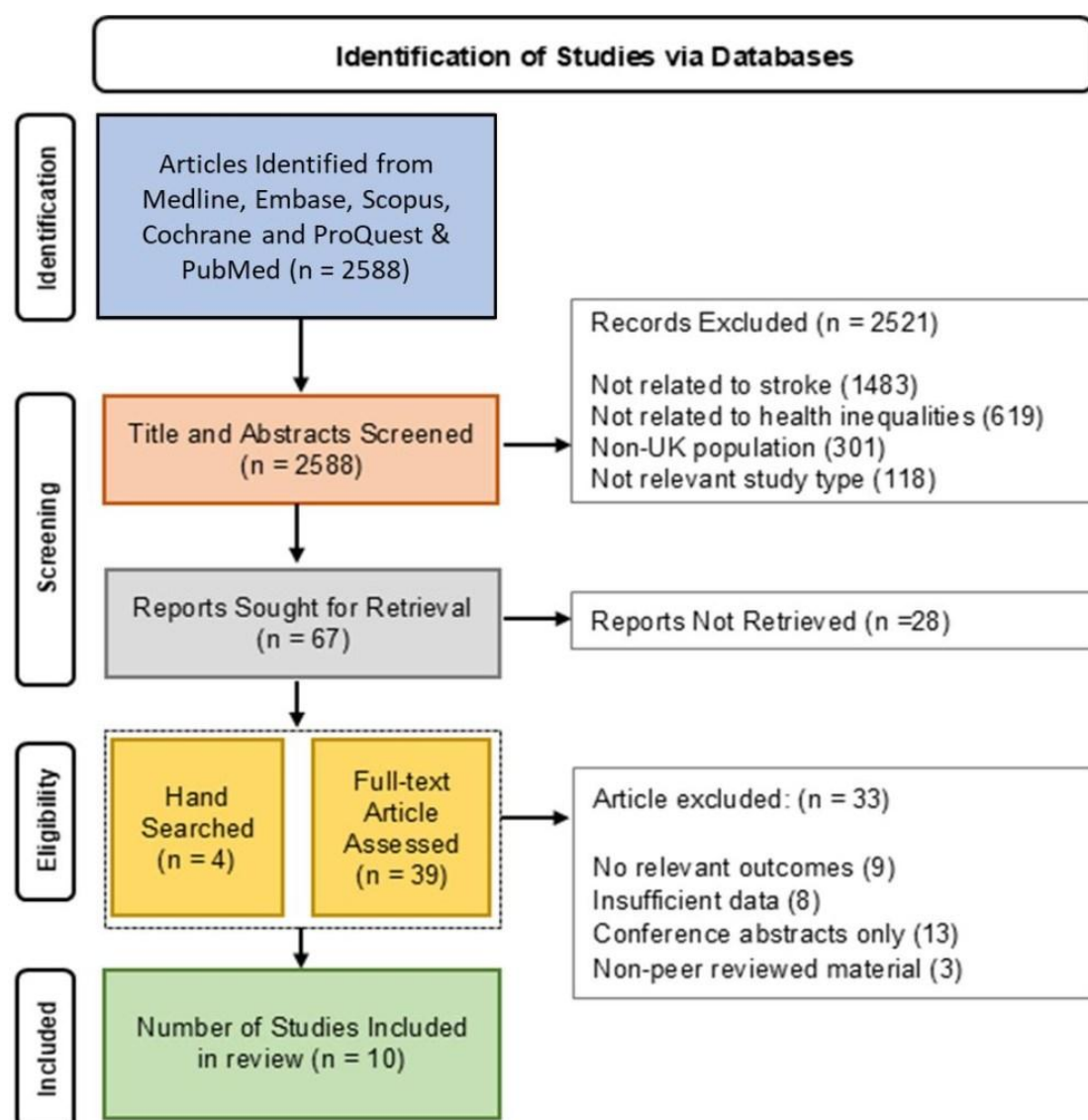


Figure 1 PRISMA Flow Diagram of Study Selection (Page et al., 2021)

This method allows for the final list of studies to be both well-researched and well-documented. The use of a standard protocol to identify studies reduces the likelihood

of bias and increases the trustworthiness of the results (Page *et al.*, 2021). Transparency was further enhanced by using a PRISMA flow diagram (figure 1) to show how studies were identified, screened and included.

3.4.1 Inclusion and Exclusion Criteria

Inclusion and exclusion criteria are carefully designed to limit the scope of the review and to select studies that are consistent. The criteria used are pertinent to the requirement, quality, and relevance to the research objectives (Patino and Ferreira, 2018).

Table 3: *Inclusion and Exclusion Criteria*

Inclusion Criteria	Exclusion Criteria
Studies focused on stroke recovery in the UK	Studies conducted outside the UK
Studies examining socioeconomic inequalities	Studies not addressing socioeconomic factors
Peer-reviewed journal articles	Non-peer-reviewed sources (blogs, reports, abstracts)
Published in 2016-2026	Published before 2016
Articles in the English language	Articles not in English
Studies including recovery outcomes (physical, social, quality of life)	Studies focusing only on clinical aspects without a social context

Using these criteria, the study will only include evidence that is relevant and of good quality to the study. This adds to the overall credibility of the research and applicability to the UK context.

3.4.2 Screening Process

A two-part screening process was used for a comprehensive analysis of all identified studies. Stage 1 involved screening of titles and abstracts to remove studies that were clearly not eligible for inclusion (Stoll *et al.*, 2019). This preliminary screening reduced the data to a reasonable number of studies that seemed to be relevant.

In the second stage, all the articles were reviewed in detail to determine their eligibility for full-text articles. The socioeconomic inequalities focus of the study and implications for stroke recovery outcomes were given special attention. Documentation of reasons for exclusion was implemented to ensure transparency and accountability (Patino and Ferreira, 2018).

This systematic and staged approach increases the validity of the selection process of the studies, and assures the final sample of studies is relevant and strong.

3.5 Data Extraction Method

A structured approach was used to extract the data, which was consistent and accurate. All studies were captured in a standardised form of key information, such as authorship, year of publication, research design, sample characteristics and main findings (Büchter, Weise and Pieper, 2020).

Specific variables included in attention for the specific study, in addition to general variables, related to socioeconomic status and recovery outcomes. It was possible to analyse the impact of inequality on each of the stroke recovery stages (Hosseini *et al.*, 2024). Recurring concepts and patterns were also identified as part of the extraction process to be used for analysis.

The systematic organisation of the data ensures that all the information will be captured and that the data can be compared across different studies (Karadzhov, 2021).

3.6 Quality Assessment

The criteria of Critical Appraisal Skills Programme (CASP) has been used to evaluate the quality of the studies included. This included assessing the methodological quality of each study, such as the clarity of the aims, the appropriateness of the study design, and potential sources of bias (CASP, 2024).

To make sure that the results of the review are based on reliable evidence, quality assessment is important. It also allows the researcher to critically interact with the literature and identify strengths and weaknesses (Shaheen *et al.*, 2023). This is an important prism through which to view research on complex social concerns like health inequalities.

3.7 Data Synthesis and Analysis

Thematic analysis was done and the process followed the six-step framework outlined by Virginia Braun and Virginia Clarke (2006). This approach is useful for systematically recognising and analysing patterns in qualitative data.

Analysis started by familiarisation to the data, then initial codes were made to represent the main points of the data (Braun and Clarke, 2006). These codes were then grouped into wider themes, which showed some commonalities between the studies. Through an iterative process, themes relating to access to rehabilitation services, financial challenges and social supports emerged and were refined (Hodyl *et al.*, 2024).

This method could provide a broader understanding of the effects of socioeconomic inequalities on stroke recovery. Thematic analysis draws on the results of several studies to achieve a comprehensive and detailed analysis of the data (Sun *et al.*, 2023).

3.8 Presentation of Results

The review results are well organized and presented so that it is easy to understand. Key characteristics of the studies are summarised in tables (Table 4) and the PRISMA flow diagram displays the process of selecting studies. Findings are reported thematically, with literature supporting the findings presented in narration. Each theme is elaborated on with regards to the research question and how these socioeconomic inequities relate to recovery outcomes. This type of approach provides both a comprehensive and accessible result (Nayaka *et al.*, 2026).

3.9 Conclusion

The chapter has given a clear and detailed account of the research methodology used in the study. The research systematically reviews literature, yet adopts an interpretivist philosophy that enables the research to tackle the complexities of socioeconomic inequalities in stroke recovery. The methodological rigour and transparency are ensured through the use of PRISMA guidelines, the PEO framework and the thematic analysis. In summary, the selected methodology is robust and offers a solid basis for their analysis of existing evidence, and is also conducive to meeting the research goals.

CHAPTER 4: DATA EXTRACTION AND EVALUATION

4.1 Introduction

The process of data extraction and critical evaluation employed in the systematic literature review are presented in this chapter. Data extraction and critical appraisal were performed to present the key features of the studies selected in a standardized and clear manner, and to evaluate the methodological quality and appropriateness of the studies in answer to the review question. The chapter then provides an explanation of the information drawn from the studies included, outlines the rationale behind critical appraisal, and argues the justification of the appraisal tools used in qualitative, quantitative and mixed-methods studies. It then assesses the methodological quality of the papers selected, based on study design, and comments on the overall strength of the evidence base on which this review is based.

4.2 Data extraction

Data extraction is the systematic process of identifying, collecting and structuring relevant data extracted from the studies included in the review so that they can be compared, analysed and synthesised accurately (Büchter, Weise and Pieper, 2020). As outlined in Chapter 3, data were extracted in this review using a predesigned data extraction form (See Table 3.xxx, Characteristics) that was used. The extracted data consisted of author, year, aim of the study, theoretical framework, research design, study setting, sample characteristics, methods of analysis, main findings, and future research directions. Specific focus was paid to the impact of each paper on the theme of socioeconomic inequalities and stroke recovery outcomes such as education, income, neighbourhood deprivation and employment. This process enabled the creation of a clear characteristics table and an easy comparison of methodological strengths, findings and gaps of the selected studies.

4.33 Summary of the Key Literature Characteristics

Table 4 Key Characteristics of the Articles Chosen for the Systematic Review

No.	Author(s) Year	Study Type	Sample and Size	Location/Setting	Intervention	Socio-economic Variable	Recovery Outcome	Risk and Bias
1	Bray <i>et al.</i> (2018)	Nationwide registry-based cohort study	145,324 adults with first-ever stroke	England; hospitalised patients with acute ischaemic stroke or primary intracerebral haemorrhage (2013–2016)	Observational study examining stroke care quality and outcomes	Socioeconomic status measured using the Index of Multiple Deprivation (IMD) by Lower Super Output Areas	1-year mortality, case fatality, quality of stroke care, age at first stroke, prevalence of pre-stroke disability and diabetes	Moderate risk of bias: observational cohort design; potential residual confounding; deprivation measured at area level rather than individual level; strong nationwide registry data reduces selection bias
2	Chen <i>et al.</i> (2014)	Population-based stroke register cohort study	4,202 patients with first-ever stroke	South London, England; electoral wards in Lambeth and Southwark (1995–2010)	Observational study examining provision of acute and long-term stroke care	Socioeconomic deprivation (SED) measured using the Carstairs deprivation index score	Provision of 20 care indicators (hospital admission, swallow tests, stroke unit stay, imaging, long-term medication and therapy)	Moderate risk: area-based measure (potential ecological fallacy); lack of personal/family income data; potential for missing education and occupational data
3	Chen <i>et al.</i> (2015)	Population-based stroke register cohort study	2,104 patients alive at 3 months after stroke	South London, England; electoral wards in Lambeth and Southwark (1995–2011)	Observational study assessing functional impairment after stroke	Socioeconomic deprivation (SED) measured by the Index of Multiple Deprivation (IMD) based on postcodes	Functional impairment defined as a Barthel Index (BI) of <15 at 3 months and 3 years post-stroke	Moderate risk: lacks NIHSS scores for severity adjustment; did not adjust for recurrent strokes or incident comorbidities during follow-up; area-based SED measure
4	D’Anna <i>et al.</i> (2025)	Multicentre retrospective observational study	1,219 patients with acute large vessel occlusion (LVO) ischaemic stroke treated with mechanical thrombectomy	London, UK; three thrombectomy-capable centres (2021–2023)	Observational study investigating the impact of SES on thrombectomy outcomes	Socioeconomic status (SES) assessed via the Index of Multiple Deprivation (IMD) 2019	90-day functional independence (mRS 0–2), 90-day mRS shift, mortality, symptomatic intracerebral haemorrhage, and haemorrhagic transformation	Moderate risk: retrospective and non-randomised design; risk of residual confounding (e.g., quality of rehab, patient adherence); limited to London metropolitan area
5	Hanna, Mercer and Rowe (2020)	Qualitative study using focus groups and interviews	13 stroke survivors with visual impairment and 1 spouse	Northwest England; participants admitted to a stroke unit	Qualitative exploration of lived experiences and health inequalities	Lower socioeconomic status and associated demographic differences	Lived experiences constructed in terms of "loss" (physical being, psychosocial being, and healthcare organisation)	High risk of bias for generalisation: small sample size; combining focus groups/interviews may yield different results; limited ethnic diversity; potential researcher bias in thematic analysis
6	Lewer <i>et al.</i> (2019)	Cross-sectional survey	1,336 homeless and 13,360 matched housed participants	London and Birmingham, England; hostels, day centres, and soup runs	Observational comparison of quality of life and chronic disease prevalence	Homelessness vs. housed deprivation quintiles (IMD 2007)	Prevalence of 6 chronic diseases (including stroke) and health-related quality of life (EQ-5D-3L domains and VAS)	Moderate risk: cross-sectional design (cannot investigate causality); self-reported diseases; EQ-5D-3L not specifically validated in homeless populations

7	McCormick and Chen (2016)	Population-based registry cohort study	782 patients with first-ever primary haemorrhagic stroke	South London, England; electoral wards in Lambeth and Southwark (1995–2011)	Observational study examining mortality after haemorrhagic stroke	Socioeconomic deprivation (SED) defined by quartiles of Carstairs scores	All-cause mortality at 1, 10, and 17 years post-stroke	Moderate risk: small sample size for subtypes (e.g., SAH); did not adjust for new comorbidities or process variables during follow-up; area-based measure
8	Sterling et al. (2025)	Retrospective observational study	47,947 adults with first-ever stroke	Scotland; linkage of SSCA, hospital, prescribing, and mortality records (2011–2018)	Observational study investigating post-stroke prescribing and mortality	Neighbourhood deprivation assessed using Scottish Index of Multiple Deprivation (SIMD) quintiles	1-year all-cause mortality and community secondary prevention prescribing (antiplatelets, anticoagulants, antihypertensives, statins)	Moderate risk: unmeasured confounding (e.g., smoking, blood pressure, frailty); prescribing data does not indicate treatment to target or over-the-counter use
9	Tod et al. (2019)	Comparative risk assessment linking survey to administrative data	51,468 adults from Scottish Health Survey (585 incident stroke events)	Scotland; pooled cohort study (1995–2012)	Modelling the contribution of modifiable exposures to the burden of stroke	Low education, area deprivation (SIMD and Carstairs), and occupational social class	Stroke incidence (hospitalisation or death) and Disability Adjusted Life Years (DALYs) attributable to exposures	Moderate risk: potential for responder and recording bias; small number of incident stroke events recorded; potential circularity in SIMD health domain
10	Walters et al. (2020)	Post hoc descriptive exploration of RCT data (AVERT trial)	668 stroke survivors of working age (≤65 years)	International (Australasia, UK, SE Asia); hospital stroke units (2006–2015)	Observational analysis of post-acute rehabilitation pathways and 12-month outcomes	Regional healthcare settings and employment status/financial burden	12-month outcomes: disability (mRS), mobility, depression, quality of life, informal care, and return to work	Moderate risk: post hoc analysis; small subgroup sizes in some regions; diversity in health services limits insights for SE Asia; limited 12-month follow-up

4.4 Brief introduction to critical appraisal and paper quality assessment

The systematic assessment of research studies to assess their trustworthiness, methodological quality, relevance and overall contribution to a review question is called Critical Appraisal (CASP, 2024). However, in systematic literature reviews, it is a vital step since, despite appearing relevant to the topic, not all published studies will provide evidence of a similar quality (Shaheen *et al.*, 2023). Evaluating papers allows the researcher to see potential flaws like bias, unclear sampling, inadequate analysis, and poorly justified conclusions, which could compromise the reliability of the paper. There was a strong need for critical appraisal in the present review due to the fact that the evidence base consisted of studies with differing designs, such as qualitative, quantitative, and mixed methods. For the review, methodological quality required careful assessment, to ensure that conclusions were drawn from evidence that was credible and appropriate to the research aim and objectives, particularly given the focus on socioeconomic inequalities, and on stroke recovery.

4.5 Critical appraisal tools

A critical appraisal tool is a systematic structured framework or checklist that is used to evaluate the quality, rigour and relevance of research studies (CASP, 2024). These are significant because they offer a set of standards for assessing whether a study is well-designed, has suitable data collection and analysis techniques, reports the results clearly, and conclusions are supported by the evidence. Selecting the appropriate critical appraisal instrument is particularly critical when reviews involve a combination of research designs, as qualitative and quantitative studies, and mixed methods studies, require different methods of critical appraisal. For instance, an appraisal tool for qualitative research is likely to evaluate things like the fit of the methodology, recruitment strategy, reflexivity, ethical issues, depth of the analysis, while an appraisal tool for quantitative research is more likely to focus on the sampling, measurement, bias, statistical methods and validity of the results. Likewise, mixed methods appraisal tools are likely to assess the quality of the qualitative and quantitative methods as well as the quality of their integration to address the research question. Thus, the use of the appropriate tools improves the credibility of the review, and makes the evaluation appropriate to the evidence being assessed.

4.6 Evaluation of qualitative studies using an appropriate tool

The Critical Appraisal Skills Programme (CASP) qualitative checklist was deemed to be a suitable appraisal tool for the qualitative study part of this review. The CASP qualitative tool is common and easily implemented because it offers a clear and useful framework for evaluating if qualitative research has a clear and clearly stated purpose, is conducted with an appropriate method, is designed appropriately, has ethical consideration, is appropriately analysed and provides valuable findings (CASP, 2024). It was chosen because the review covered a study that examined lived experiences of inequality in stroke recovery which had appraisal criteria that were beyond the statistical validity and instead related to meaning, context and interpretive depth.

The CASP checklist is one of the advantages over other appraisal tools as it is simple, transparent and easy to use in the field of health and social care research. It is especially helpful to determine if a qualitative paper is methodologically coherent and if the conclusions are backed up by the data. An important restriction is that CASP may not always offer a very detailed marking system, making it less possible to make a simple comparison between papers than some other tools. It may also heavily depend on the judgements of its reviewers, for example, in evaluating reflexivity and rigour. However, CASP is still appropriate for this review since it is highly consistent with the interpretivist approach of the study and appropriate for consideration of the quality of qualitative evidence in the context of complex experience of socioeconomic disadvantage.

The principal qualitative study found in the sample was Hanna *et al.* (2020) which examined health inequalities of visually impaired stroke survivors in the northwest of England. The study's aim was clearly relevant and the focus groups and semi-structured interviews were a suitable methodology to explore lived experiences of loss, gaps in services, and power imbalances (Hanna *et al.*, 2020). One strength of using a qualitative design was that participants were able to describe the social and emotional aspects of PSVI in detail, which was related to the review question. The paper also had analytical value in that it extended beyond description and revealed themes of systemic inequalities in care and marginalisation (Hanna *et al.*, 2020). However, like many qualitative studies, these findings were drawn from a relatively focused sample, and may not be easily generalizable. However, the study was appropriate and useful, as it highlighted experiences that quantitative studies could not reveal. The results of the detailed appraisal table for the qualitative study are attached as an Appendix B.

4.7 Evaluation of quantitative studies using an appropriate tool

Critical appraisal of quantitative evidence was the largest component of the quality assessment with 8 of the included studies being quantitative (See appendix B for details). A suitable quantitative appraising framework was used to analyse issues, including study design, sampling, measurement, statistical analysis, confounding and validity of findings. This was particularly significant because the review used observational evidence to assess the association between socioeconomic status and outcome of stroke recovery. Quantitative studies are particularly important in these kinds of reviews, since they enable one to systematically identify patterns, associations, and differences in long-term outcomes across populations.

A total of eight quantitative studies were critically appraised: Bray *et al.* (2018), Chen *et al.* (2014), Chen *et al.* (2015), D'Anna *et al.* (2025), Lewer *et al.* (2019), McCormick and Chen (2016), Sterling *et al.* (2025), and Tod *et al.* (2019). In all of these studies, the overall objective was to explore socioeconomic disadvantage as a risk factor for stroke, quality of health services, functional recovery, mortality, and health inequalities associated with stroke. The overall methodologies were suitable to their goals, with most of these papers aimed at examining the relationship between deprivation and health outcomes in large data sets, cohort designs or by comparing populations.

Regarding study design, there were a few papers that were cohort-based observational studies. The authors, Bray *et al.* (2018), employed a national registry-based cohort study design and negative binomial, multilevel logistic and Cox proportional hazards models to look at socioeconomic differences in rates, quality of stroke care and mortality. This was an excellent design for mapping at a large scale in England with statistical methods suitable for estimating various types of risk and outcome. In the same way, Chen *et al.* (2014) conducted a cohort study of the population-based stroke register to evaluate the association between socioeconomic deprivation and acute and chronic stroke care. The use of multivariate logistic regression and pooled odds ratios enhanced the analysis by controlling for confounding factors. In addition, Chen *et al.* (2015) evaluated functional impairment at short-term and long-term follow-up by a prospective population-based register analysis, with multivariate-adjusted logistic regression analysis.

These cohort-based studies were a very important component of the evidence base as they were ideally designed to investigate temporal and outcome-related associations in large stroke populations. They also were more likely to utilize "standard" data and sound statistical techniques. They were, however, observational

studies; they were only able to conclude association, not causation; and they left residual confounding. However, the design was suitable and the conclusions were mostly in line with the results presented (Bray *et al.*, 2018; Chen *et al.*, 2014; Chen *et al.*, 2015).

Other quantitative research studies were retrospective or observational designs. To explore the impact of socioeconomic factors on mechanical thrombectomy outcomes, D'anna *et al.* (2025) carried out a retrospective multicentre study. This study used inverse probability weighting and Least Absolute Shrinkage and Selection Operator (LASSO) regression which helped reduce imbalance in baseline characteristics and enhance modelling of outcomes. This implies a thorough analytical method. However, retrospective designs rely on available records, the quality and completeness of which can affect the study and control of missing data and unmeasured confounders. Sterling *et al.* (2025) employed a retrospective observational cohort study design also using linked national datasets including audit and prescribing and mortality data. This design was suitable for national analysis of secondary prevention prescribing and mortality and linkage of multiple routine datasets broadened evidence of such analysis. Nevertheless, like other observational analyses, it was not as effective as it could be in explaining the treatment gaps it observed.

McCormick and Chen (2016) carried out a population-based cohort study of mortality following primary haemorrhagic stroke, with multivariate adjusted Cox regression. This method was appropriate for long-term survival analysis and was a valuable addition to short-term results. Tod *et al.* (2019) employed a Comparative Risk Assessment approach (associating survey data with routine health data using Directed Acyclic Graphs and Population Attributable Fractions). It was a methodologically sound approach since it was possible to estimate the proportion of stroke burden that could be explained by socioeconomic and related factors. It also expanded the evidence base from prognosis of individual patients to burden at the population level. In contrast, Lewer *et al.* (2019) employed a cross-sectional survey with age- and sex-matched housed comparison groups. This design was good for comparing health-related quality of life and chronic disease prevalence between homeless and housed groups, but lacked the capacity to determine temporal sequence or causality as the cohort studies. Despite this, it was a good source of information on profound manifestations of socioeconomic marginalisation that are not captured in register studies.

As a whole, the quantitative studies chosen for this review were methodologically suitable for the general objectives of the review. Most used large population-based

data sets, multivariable modelling, and recognised epidemiology methods, which bolster their findings. They have great strengths in sample size, real-life data and the fact that they were able to show consistent socioeconomic gradient in morbidity and mortality from stroke and functional outcomes. The key drawbacks of observational studies were those common to the type of study: potential for residual confounding, difficulty in establishing causality, and the reliance on the accuracy of the data gathered routinely. Nevertheless, there was a strong body of quantitative evidence to support the conclusion that there is a strong association between stroke recovery outcomes and socioeconomic status for the UK. A complete set of quantitative appraisal tables are included in the appendix B and C.

4.8 Evaluation of mixed methods studies using an appropriate tool

A single study, Walters *et al.* (2020), was found in the selected sample that examined the use of post-acute rehabilitation services and the 12-month outcomes of working-age stroke survivors in three geographic regions. One of the key factors to consider for mixed-methods research is that the tool used to evaluate the research must evaluate the quality of the quantitative and qualitative parts of the research, as well as the way the two research methods are meaningfully integrated to answer the research question. A mixed-methods appraisal framework was appropriate as it combined a range of evidence to gain insight into the rehabilitation pathways and implications.

Walters *et al.* (2020) was useful as it covered a complex issue rehabilitation and return to work and it would be difficult to understand this issue using only one approach. The findings of the post hoc descriptive analysis of AVERT trial data enabled identification of four distinct rehab pathways; the result of this exploration pointed to significant variability in rehab services, with 28 per cent of working-age survivors receiving no rehabilitation despite high depression and poor QOL (Walters *et al.*, 2020). This added to the relevance of the study question to the actual situation. One of the strengths of mixed methods research is the ability to gain both breadth and context and this was evident throughout the study and in the ability to relate the differences in pathways to wider recovery outcomes. One potential drawback is that the mixed methods integration is sometimes more theoretical than practical; also, the design needs to be successful when the various methodological elements communicate with each other. Overall, the study was suitable and provided useful evidence of inequalities in recovery from employment. The detailed appraisal is attached (Appendix B).

4.9 Chapter summary

In this chapter, the methods used to extract data and the process of assessing the quality of the selected studies have been explained. To ensure consistency of information and facilitate comparison among the included papers, the data extraction method was employed to gather data on study characteristics, methods and findings. The chapter also introduced an important stage in the review, that of 'critical appraisal' and explained the use of the right appraisal tools for various study designs. The qualitative study was evaluated according to the CASP qualitative checklist, the quantitative studies were evaluated according to an appropriate quantitative appraisal framework and the mixed-methods study was evaluated according to an appropriate mixed methods evaluation approach. Overall, it was found that the evidence base used in the appraisal was suitable and that design-specific strengths and weaknesses need to be taken into account when interpreting the findings from the appraisal.

CHAPTER 5: DATA ANALYSIS AND SYNTHESIS

5.1 Introduction

The analysis and synthesis of the studies used for the systematic literature review is summarized in this chapter. It describes the interpretation of the selected evidence to answer the research question of understanding the impact of socioeconomic inequalities on stroke recovery in the UK. The chapter starts with a description of thematic analysis and analytical framework applied in the review before summarising the characteristics of the identified studies. It then summarizes the main lines and sub-lines of the papers included and discusses the pattern that emerges throughout the body of evidence. In so doing, the chapter demonstrates the ability of selected studies to collectively account for the link between socioeconomic status and stroke recovery outcomes.

5.2 Thematic analysis

Thematic analysis is a technique that involves identifying, sorting and explaining themes or meanings that appear over and over in a data set (Braun and Clarke, 2006). It is often used for analysing interviews, documents or narratives in qualitative research, and also can be employed in systematic literature reviews (SLRs) to synthesise the results from secondary evidence. When used in an SLR it is also referred to as thematic synthesis as themes are produced from published studies, not from the primary field data (Naeem *et al.*, 2023). Thematic analysis can also be applied to the quantitative studies as reported statistical results can be coded into more general conceptual patterns and numbers can then help in the interpretive synthesis process.

5.3 Data analysis tool

The included studies were analysed and synthesized according to Braun and Clarke's thematic analysis framework (Braun and Clarke, 2006) which consists of six phases. The framework includes familiarisation with the data, initial coding, identifying themes, summarising themes, refining themes, naming and defining themes, and writing the final report. It is significant in offering a logical and systematic pathway from the individual discovery to the larger interpretive theme. The framework proved very useful in this review in the sense that it allowed for the incorporation of qualitative, quantitative, and mixed-methods evidence into a thematic narrative of the impact of socioeconomic inequalities on stroke recovery in the UK.

5.4 Characteristics of the identified studies

All studies included were UK-based, but took place in various national and regional contexts. A number of studies had been conducted in England, such as by Bray *et al.* (2018), Hanna *et al.* (2020), Lewer *et al.* (2019) and D'Anna *et al.* (2025), with some using data from South London (Chen *et al.*, 2014; Chen *et al.*, 2015) or English regions (Walters *et al.*, 2020). Research in Scotland was undertaken in the form of Sterling *et al.* (2025) and Tod *et al.* (2019) while deprivation and mortality have also been investigated using population-based analysis within a wider UK context of McCormick and Chen (2016). Taken together, it can be seen that there is a high level of focus in England and Scotland; none of the papers included are specifically about Wales or Northern Ireland. In terms of methods, the sample included one qualitative study, eight quantitative studies, and one mixed-methods study, with an overall mix of study methods but a strong quantitative vein. The data extraction tables in the appendix include full details of the study characteristics (see Appendix C).

5.5 Emerging themes from included studies

The selected papers were thematically analysed leading to the identification of four main themes and eight sub-themes. These were created through coding of recurring ideas throughout the studies and then clustering of similar ideas into larger interpretative groups. The themes align with the study's research aim and objectives and are the dominant themes that emerged from how socioeconomic inequalities have influenced stroke recovery.

Table 5: Thematic Table

Overarching themes	Sub-themes
Neighbourhood context, access and quality of care	Inequalities in acute and secondary care; Place-based survival differences
Educational inequalities and recovery potential	Health literacy and understanding of care; Functional recovery disparities
Income, material deprivation and post-stroke adjustment	Early stroke burden and co-morbidity; Financial insecurity and rehabilitation barriers
Employment, work reintegration and unequal recovery pathways	Rehabilitation access for working-age survivors; Work return, insecurity and long-term participation

5.5.1 Theme 1: Neighbourhood context, access and quality of care

The third theme is around neighbourhood deprivation and how this affects access, quality of healthcare and survival. Bray *et al.* (2018) found a clear socioeconomic gradient in stroke incidence and case fatality in England, with both the incidence of stroke and the risk of poor outcomes being related to where people live. Likewise, Chen *et al.* (2014) reported that those living in socioeconomically deprived neighbourhoods had fewer chances to be admitted to the hospital or screened for swallowing, and that this was more pronounced for Black patients. These results indicate that for the acute stage of care there is a compounding of ethnicity and neighbourhood deprivation and neighbourhood service accessibility.

Inequalities in acute and secondary care is the first sub-theme in this area. Both Chen *et al.* (2014) and Sterling *et al.* (2025) report differences in processes followed in early acute care, and in secondary prevention, stroke patients living in the least deprived Scottish neighbourhoods were more likely to receive anti-coagulants for atrial fibrillation and had lower one-year mortality. Similarly, Hanna *et al.* (2020) demonstrate that there can be inconsistent and inadequate specialist visual care provision following stroke, reflecting wider issues in access to specific provision. Combined, these studies indicate that socioeconomic inequality can impact access to services as well as the quality and duration of services once someone enters the system.

Place-based survival differences is the second sub-theme. McCormick and Chen (2016) have demonstrated that socioeconomic deprivation is a significant risk factor for long-term mortality following primary haemorrhagic stroke, especially in the longer-term (17 years). In a similar fashion, Bray *et al.* (2018) find that case fatality rates are higher in more deprived areas and that place matters well beyond the time of first treatment. Lewer *et al.* (2019) also highlight the importance of place by showing that housing and neighbourhood disadvantage is linked with significantly worse overall health. This theme thus emphasises that stroke recovery is not only an individual and clinical process, but also one which is geographical, influenced by the conditions of the neighbourhood, the distribution of health systems and the availability of support services.

5.5.2 Theme 2: Educational inequalities and recovery potential

The first theme is education and how it can influence the risk of stroke or recovery ability. Education is one of the strongest social determinants across the evidence base as demonstrated by Tod *et al.* (2019) who show that low educational attainment accounts for a significant proportion of strokes in Scotland. This suggests that the

inequality in stroke starts before the recovery period, that is, that the disadvantaged educational backgrounds raise the risk of having been exposed to stroke in the first place. Similarly, Chen *et al.* (2015) demonstrate that deprivation at three months and three years after stroke has a significant association with poorer functional outcomes, particularly in older people and females. While that study addressed deprivation overall, education inequality is interwoven into deprivation in ways that can restrict access to knowledge and resources that can improve health: lower education levels can restrict access to health-promoting knowledge and resources.

A sub-theme of this is Health Literacy and Knowledge of Care. Socio-economic factors such as low education may impair the capacity to comprehend medical directives and rehabilitation strategies and requirements for long-term recovery. That means that education influences not only the risk of stroke, but the ability to participate in recovery. This interpretation is supported by Walters *et al.* (2020) who demonstrate that the working-age survivors had very different rehabilitation experiences; more than a quarter of them did not receive any rehabilitation despite suffering from low quality of life and depression. Likewise, it is probable that patients with lower educational attainment are more likely to have a poor understanding of their service entitlements or to be less able to navigate referral systems leading to inequity in accessing support.

A second sub-theme is inequities in functional recovery. The functional recovery in both short- and long-term follow-up was poorer in patients from more deprived setting, according to Chen *et al.* (2015). Therefore, Tod *et al.* (2019) state that educational inequality plays an important role in the overall burden of stroke among the population. These studies collectively indicate that there are direct and indirect effects of education on recovery, including knowledge, communication, self-management and long-term functional independence. The theme thus shows that clinical intervention is not the only aspect of stroke recovery that needs improvement, but also efforts to minimize educational barriers and increase the availability of information and services.

5.5.3 Theme 3: Income, material deprivation and post-stroke adjustment

The second theme is on income and material deprivation as being significant predictors of stroke burden and recovery conditions. Bray *et al.* (2018) show that people living in more deprived areas experience stroke around seven years earlier than those in the least deprived areas and have higher levels of pre-stroke diabetes. The pattern suggests that material disadvantage is compounded throughout the life course and can lead to more complex experiences of stroke, earlier in life. Similarly, Tod *et al.* (2019) found that area deprivation has a significant influence on incident stroke cases

in Scotland, emphasizing the financial and social disadvantage that impacts the generation of stroke burden.

First sub-theme here is Early stroke burden and co-morbidity. Bray *et al.* (2018) propose that the population at the extreme end of deprivation may be at risk of stroke due to a poorer health status at the outset, and may be more likely to have chronic conditions and more total stroke burden. Likewise, D'Anna *et al.* (2025) identified that lower socioeconomic status was correlated with poorer 90-day outcomes and increased risk of complications following mechanical thrombectomy. This suggests that sicker patients might not be able to make the most of high-level care and achieve recovery, perhaps due to the lack of social, financial and environmental assistance following discharge for poor patients.

Financial insecurity/rehabilitation barriers is the second sub-theme. Lewer *et al.* (2019) present compelling evidence of this, as they found homeless individuals have significantly lower scores in domains of health-related quality of life and greater prevalence of chronic illness than housed individuals. Similarly, Hanna *et al.* (2020) reported that stroke survivors who were visually impaired reported that the services they received were not coordinated, that they felt a sense of loss and that there was a power imbalance in the services received. While Hanna *et al.* (2020) are looking at the situation from the perspective of visual impairment, the study also demonstrates how social disadvantage and service exclusion can exacerbate recovery challenges. Similarly, lower income patients may have transportation issues, living in a place that is not conducive to rehabilitation, lower family support, and competing daily needs that help hinder rehabilitation (Lewer *et al.*, 2019; Hanna *et al.*, 2020). The theme thus demonstrates that material circumstances beyond hospital influences recovery and inequalities in recovery can have direct implications for rehabilitation and long-term wellbeing.

5.5.4 Theme 4: Employment, work reintegration and unequal recovery pathways

The last theme is on employment and work reintegration, especially for working-age stroke survivors. Walters *et al.* (2020) reported the greatest variation in post-acute rehabilitation pathways and that 28 per cent of survivors aged 16–34 had no rehabilitation despite being depressed and having poor quality of life. This implies a strong influence of the organization of rehabilitation on return to work, as well as a broader social status of the survivors. This means that employment is a dimension of socioeconomic status and an important long-term recovery outcome.

The first sub-theme is rehabilitation access for working age survivors. Walters *et al.* (2020) note that there are significant regional variations in rehabilitation pathways which make disparities in recovery and a return to productive roles possible. Similarly, D'Anna and colleagues (2025) demonstrated that lower socioeconomic status is associated with worse recovery following advanced treatment, and this may impact future employability and occupational stability. These results suggest that individuals who have lower-paid or less stable work are less likely to recover fully due to limited resources and institutional support.

The second subtheme is about work return, insecurity and longer participation. While not all the studies included in the analysis make a clear reference to employment, some studies suggest its significance. Lever *et al.* (2019) demonstrate that individuals experiencing severe deprivation and/or homelessness will have poorer health, likely impacting their capacity to return to, and/or maintain, employment. Likewise, Hanna *et al.* (2020) propose that complex impairments, like post-stroke visual loss, cause psychosocial disruptions and dependency that could restrict reintegration for work and social life. Therefore, employment-related recovery is not just about the return to work, but also about independence, social participation and economic security. This theme provides valuable practical lessons on the link between inequalities in rehabilitation and support services and labour market disadvantage.

5.6 Synthesis of findings

The four themes provide a common pattern for the studies included. Low educational status decreases health literacy, decreases ability to navigate services, increases the burden of stroke, and decreases ability to participate in services for recovery; material deprivation decreases access to high quality services, increases burden of stroke, and decreases access to recovery services; deprived neighbourhoods decreases access to high quality services, increases burden of stroke, and worsens access to recovery services; and insecure employment decreases ability to participate in services and work return. Likewise, the evidence indicates that these areas of disadvantage may manifest together in a patient rather than in isolation and that a patient might end up having multiple problems rather than one. In contrast, the studies reviewed do not indicate that clinical severity is the only factor that can account for stroke recovery inequalities. Instead, they regularly demonstrate that social factors influence who is more likely to suffer an early stroke, to receive appropriate and timely treatment, to participate in rehabilitation and to have better long-term outcomes (Bray *et al.*, 2018; Chen *et al.*, 2014; Chen *et al.*, 2015; D'Anna *et al.*, 2025; Hanna *et al.*, 2020; Lewer *et*

al., 2019; McCormick and Chen, 2016; Sterling *et al.*, 2025; Tod *et al.*, 2019; Walters *et al.*, 2020).

5.7 Chapter Summary

As a whole, the themes provided a fresh perspective on the topic by transcending the clinical language of stroke recovery and demonstrating the interplay of recovery experiences within broader social contexts. The synthesis then maps onto the research aims by highlighting the key socioeconomic challenges to recovery and by identifying the areas where policy and practice should be focused to remedy inequity for marginalised groups. The themes identified in the preceding chapter are discussed in depth and critically in the following chapter, placing them in the context of the literature, relevant theory and current health care practice. It also discusses the contributions made by the findings to the wider picture of socioeconomic inequalities in stroke recovery in the UK.

Chapter 6: Discussion

6.1 Introduction to Chapter

This chapter critically discusses the results obtained from the systematic literature review of the impact of socioeconomic inequalities on stroke recovery in the UK. It highlights the themes it has found in Chapter 5 and connects them to the current literature, theories and the practices of healthcare. The four main themes, which are educational inequalities, income and material deprivation, neighbourhood context and employment recovery pathways, are used to structure the discussion. Furthermore, the chapter critically assesses the consistency of the results with previous studies, points out discrepancies and discusses the methodological advantages and shortcomings of the review.

6.2 Discussion of Key Findings

This section critically analyses the results shown in Chapter 5 and provides a context for these results within the broader literature on socioeconomic inequalities and stroke recovery. The four key themes developed by the thematic synthesis are presented, namely educational inequalities, income and material deprivation, neighbourhood context and employment-related recovery pathways. Throughout these themes, the results consistently point to a wider social, economic and structural context being significant in stroke recovery, beyond clinical factors.

The first theme, neighbourhood context, access and quality of care, is the third theme that reinforces the role of structural and geographical factors. Results show that the availability of services, quality of care and survival rates are significantly impacted by place of residence. This is in line with studies on geographical health inequality and the “postcode lottery” in health care delivery. The disparity of services is a symptom of structural inequalities in society.

The sub-theme of inequalities in acute and secondary care calls into focus inequality in treatment processes in the early stages. The results are consistent with studies indicating that disadvantaged groups are less likely to be cared for in a timely and appropriate way. This can be explained using the structural inequality theory, which proposes that some groups can be systematically disadvantaged by institutional arrangements (Marmot, 2010). Furthermore, the relationship between socioeconomic status and ethnicity is in line with intersectionality theory, which states that several types of disadvantage combine to create cumulative disadvantages (Kimberlé

Crenshaw 1989). This view is especially important when considering the interaction between deprivation and ethnicity and their effects on access to care.

That the sub-theme of place-based survival differences further emphasizes the significance of geographical context. This is consistent with long-term studies which have established correlations between neighbourhood deprivation and poor health outcomes. But it's hard to draw cause-and-effect conclusions because the majority of the studies are observational. These outcomes can be influenced by any number of factors, including the healthcare infrastructure, social support systems and environmental factors. These caveats aside, the uniformity of results across different studies bolsters the overall conclusion that neighbourhood context is important to recovery.

The second theme is educational inequalities and recovery potential, which emphasizes the important role of education in both risk and recovery. With lower levels of education, stroke survivors are at higher risk of stroke and worse recovery results, primarily because of lower levels of health literacy and access to rehabilitation services. This is consistent with previous research on the social determinants of health, which has found that education is an important upstream determinant affecting health behaviours, access to services and long term health outcomes (Michael Marmot, 2010). The theory of Marmot focuses on the capacity of the individual to use health related information, which is enhanced by education, and how they use it to improve outcomes. The reviewed studies support this view by showing that patients with less education might find it difficult to navigate healthcare systems, comprehend treatment plans and advocate for proper treatment.

In addition, the sub-theme of health literacy offers a helpful explanatory process, particularly between education and recovery. Poor health literacy correlates with poor self-management, lower treatment adherence and decreased utilisation of preventive services (Berkman *et al.*, 2011). The results are in line with Nutbeam's (2000) model of health literacy which provides a conceptual framework and a critical tool for cultivating the empowerment and participation of individuals in health care. Although the NHS is committed to patient-centred care, unequal access to rehabilitation in the healthcare systems is an ongoing issue, which may not adequately support patients with less literacy. This is a gap between theory and practice and suggests the need for more comprehensive communication strategies and support systems.

The second sub-theme, functional recovery disparities, reinforces the premise that education can have an impact on recovery trajectories. The evidence of poorer

functional outcomes among people from disadvantaged backgrounds in line with cumulative disadvantage theory which posits that disadvantage occurs as a consequence of multiple social factors working together over time (Dannefer, 2003). Thus, education is not a standalone determinant of recovery potential but influences the recovery potential alongside income and occupation and the environment. Although these interactions are recognized in the reviewed studies, there is little insight in the literature into how people actually cope with these concurrent disadvantages.

The third theme, income, material deprivation and post-stroke adjustment, adds to the evidence of stroke recovery inequalities being structural. Results indicate that stroke is likely to happen earlier in lower income individuals and that these patients are more likely to have co-morbidities and to have more difficulties recovering from stroke. These results are in line with the theory of the life course, that exposure to the socioeconomic disadvantage is cumulative over time and is associated with the accumulation of risks (Ben-Shlomo & Kuh, 2002). This fits with stroke happening earlier in deprived groups, emphasising the need to focus upstream rather than downstream in terms of stroke.

The sub-theme of early stroke burden and co-morbidity further supports this argument as disadvantaged people are likely to present to recovery with more complex health conditions. Epidemiological studies have shown that deprivation is associated with greater levels of chronic disease (Marmot, 2010). The results also indicate that disparate outcomes are not always linked to access to higher levels of treatment. This fits the “fundamental cause theory” as laid out by Link and Phelan (1995), that socioeconomic status is a constant influence on health that affects the availability of flexible resources including knowledge, money and social support. Even with access to medical advances, certain groups will be better able to take advantage of them, resulting in inequalities.

The second sub-theme: financial insecurity and rehabilitation barriers: shows the practical challenges of the disadvantaged people. There does seem to be evidence that the cost of transportation, housing instability and competing life demands can be factors that impact the likelihood of rehabilitation engagement. The results are consistent with Andersen's behavioural model of health service use which considers enabling resources (income and access) as important factors to healthcare utilisation (Andersen, 1995). The results, however, also indicate broad problems in the distribution of services, in which services might not adequately address the social contexts of patients. This echoes wider concerns about healthcare systems and the fact that structural inequalities are often perpetuated, not reduced, in service delivery.

However, it is essential to critically analyse the evidence base at the same time. Most of the studies are quantitative, thus restricting the understanding of the experience of financial insecurity in daily life. Also, marginalised populations like the homeless tend to be underrepresented in research, which could result in an underestimate of inequality. This indicates that there is a need to develop more qualitative and inclusive research methods.

Employment, work reintegration and unequal recovery pathways is the final theme on the long-term socioeconomic outcomes of stroke. The results show that return to work is not uniform and highly dependent on rehabilitation and social factors. This is consistent with labour market and health research that indicates that a health shock may increase pre-existing inequalities and result in long-term economic disadvantage (Bartley, 2017). Employment is thus a product of a process of recovery, and a factor to consider in wellbeing in the future.

Access to rehabilitation for working age survivors is a sub-theme, marking inequality in access to services. Access to rehabilitation is not the same for everyone, indicating that services might not meet the needs of working-age people, especially those with a lower socio-economic status. This echoes previous criticisms of not providing rehabilitation services to different patient groups and the structural deficit in healthcare provision.

The theme of return to work, insecurity and long-term participation further highlights the extent of the inequalities in recovery. The results indicate that people with lower socio-economic status are less likely to return to work and more likely to be insecure in their jobs in the long term. This is in line with the notion of social exclusion, defined as the mechanisms by which people are excluded from economic and social activity (Levitas *et al.*, 2007). Stroke, in turn, can be a risk factor for additional exclusion, especially for those already being excluded.

In general, the results of all four themes are in line with the theories and empirical studies. They confirm that social determinants instead of clinical factors play a complex role in stroke recovery. The review also identifies crucial areas of the literature that remain underdeveloped, including the lack of qualitative approaches and the lack of representation for some groups. Also, the majority of studies are from England and Scotland so results may not be generalisable to the rest of the UK.

In relation to methodological critique, the systematic literature review approach offers a structured, transparent and systematic way to synthesize evidence, while at the same time being limited by the quality and scope of the studies included. Because the

information was second-hand, some variables were not accounted for in the analysis. In addition, although thematic synthesis is helpful in synthesising a variety of evidence, there is interpretative subjectivity which can affect findings.

The review is valuable in its comprehensive and theoretically informed analysis of socioeconomic inequalities in stroke recovery despite these limitations. It draws attention to the importance of health care systems being fairer and just and the need to consider broader social determinants to enhance recovery outcomes.

6.3 Strengths and Limitations

This systematic literature review (SLR) illustrates a number of important strengths. The first being that the use of a structured and transparent methodology increases the robustness and repeatability of the findings. Using the principles of SLR, a comprehensive and systematic identification, selection and synthesis of relevant studies was guaranteed (Diana Tranfield *et al.*, 2003). Second, the use of the Braun and Clarke (2006) framework of thematic analysis allowed for the inclusion of the qualitative, quantitative and mixed methods evidence into a coherent analytical narrative, enhancing depth of interpretation (Virginia Braun & Victoria Clarke, 2006). Also, studies at the UK level have a greater focus on the context of the UK and the applicability of policies in the NHS context.

There are however, some constraints that need to be recognised. The review is limited by the quality and scope of the studies included and many of them were predominately quantitative, reducing insight into lived experiences. There is a geographical focus on England and Scotland, which limits the generalisability of the findings throughout the UK. In addition, there is a possibility that some grey literature, or findings of non-significance, were omitted, which could have impacted the breadth of evidence reviewed (Petticrew & Roberts, 2006). Thematic synthesis also has its own subjective element, with the potential to affect the development of themes and analysis.

6.4 Chapter Summary

This chapter critically examined the main results of the review, and related them to current theories and empirical studies of socioeconomic inequalities and stroke recovery. It showed that social determinants, such as education, income, neighbourhood context and employment, are interconnected and influence recovery outcomes. Lastly the chapter also looked at the consistency of the findings with existing frameworks and identified gaps in the existing evidence base.

CHAPTER 7: RECOMMENDATIONS AND CONCLUSION

7.1 Introduction to Chapter

The implications, recommendations and overall conclusions of the study on socioeconomic inequalities and stroke recovery in the United Kingdom are presented in this chapter. It builds on the findings discussed in Chapter 6 and details the implications for policy, clinical practice and future research in light of the evidence. The chapter examines the implications of the findings for healthcare systems and public health more broadly. It then offers detailed recommendations for practice and outlines important areas for further research. Finally, the chapter summarises the main findings of this study, reiterating the research focus and emphasising the importance of addressing socioeconomic disparities in stroke recovery.

7.2 Implications of Findings

Results of this study have implications in the context of healthcare policy, clinical practice and public health in the UK. They highlight how social factors (including education, income, neighbourhood and employment) play a key role in stroke recovery. This indicates that the current healthcare system focused on clinical treatment might not be enough to tackle inequalities in recovery outcomes.

The findings suggest that a more comprehensive and integrated care model and the integration of socioeconomic factors with medical is needed. For instance, differences in access to and outcomes of rehabilitation services indicate that there may be some gaps in NHS services provision, especially for disadvantaged groups. Moreover, the findings indicate that health inequalities are complex and cumulative and interventions are needed on multiple levels, including in health, social services and employment support systems. Overall, the study highlights the need for tackling structural inequalities to enhance recovery outcomes and equity in stroke care.

7.3 Recommendations for Practice

The study findings suggest a number of recommendations that might be implemented to enhance recovery from stroke and to minimize socioeconomic disparities. First, taking more patient-centred and inclusive approach to rehabilitation within the healthcare system. This includes adapting communication to varying levels of health literacy and making sure that the patient can grasp the treatment plan. The use of simplified information material and culturally appropriate support services may increase participation of disadvantaged groups.

Secondly, there is a need to improve rehabilitation services. This can include financing and practical support, including transport services or community-based rehabilitation initiatives, to minimize resources for patients in low-income settings. Reaching out to people and embedding care within the local community may also help to boost uptake and continuity of care.

Thirdly, improved linkages between health and social services are needed. Multi-disciplinary teams should focus on the medical, as well as housing, employment and social support aspects of stroke recovery. Lastly, policy-makers need to ensure that there is more equitable service provision in the UK, with a focus on improving access to the highest quality service provision in all regions.

7.4 Recommendations for Future Research

Research is needed to fill the identified gaps and improve the understanding of socioeconomic disparities in stroke recovery in the future. There is a need for more qualitative studies to better understand the lived experiences of stroke survivors from disadvantaged backgrounds, first. This study would be useful to get a better understanding of the real-world experience of social and economic barriers, and their impact on health service utilization.

Second, future investigations should use more representative sampling methods to include people who are out of the mainstream of society, such as homeless, minorities etc. This would be more useful for the generalisability and relevance of findings.

Third, more long-term studies are needed to explore the long-term effects of socioeconomic conditions on recovery pathways. This would help to identify critical intervention points across the recovery process.

Last but not least, targeted interventions to tackle inequalities in access to rehabilitation, such as community-based rehabilitation programmes or integrated care frameworks should be assessed in future studies. The results of these kinds of investigations would assist in the formation of more fair and efficient health care policies.

7.5 Conclusion

The aim of this study was to explore the impact of socioeconomic differences on stroke recovery in the UK. The key research question was about the effect of education, income, neighbourhood context and employment on recovery outcomes. The study conducted a systematic literature review and thematic synthesis to determine the

relationship between socioeconomic status and stroke recovery, which revealed four themes. The results show that socioeconomic inequalities are very important determinants of stroke risk as well as the recovery process. Educational disadvantage was identified as a factor that restricted health literacy and that decreased rehabilitation service uptake. Factors of income and material deprivation were linked to earlier onset of stroke, higher co-morbidity, and higher problems with recovery. The neighbourhood context had a significant impact on healthcare access, treatment quality and survival, with employment-related factors having a significant impact on long-term participation and economic stability.

More importantly, the study reveals that these factors are interrelated, and that they share common characteristics, meaning that some groups suffer from multiple disadvantages. Therefore, stroke recovery is not a purely clinical problem, but a social problem, that is, affected by the wider structure. The results contradicts the notion that access to healthcare ensures equal outcomes while raising awareness regarding the need to improve equity and inclusion in healthcare. The relevance of these findings is to policy and practice. Focusing on socioeconomic inequalities can have a positive impact on recovery, lower chronic disability and increase quality-of-life for individuals living with stroke. The study highlights the relevance of incorporating social determinants in healthcare planning and delivery and the need for coordination of action in multiple sectors.

To conclude, this work is part of a growing stream of evidence to show that social and economic systems are integral to the problem of health inequalities. Better stroke recovery outcomes need to go beyond medical care and extend to a broader focus on inequality. The identification and resolution of these challenges will contribute to the provision of more equitable and effective healthcare for all patients.

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Appendix

Appendix A: Selected papers and articles

Table 6 *List of Articles Reviewed*

SI	Article Title
1	A qualitative exploration of the sociology of poststroke visual impairments and the associated health inequalities
2	Eating well, living well and weight management: A co-produced semi-qualitative study of barriers and facilitators experienced by adults with intellectual disabilities
3	Educational inequalities in cardiovascular diseases and their mediating factors across different generations: a prospective cohort study
4	Factors, trends, and long-term outcomes for stroke patients returning to work: The South London Stroke Register
5	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
6	Impact of socioeconomic deprivation on mechanical thrombectomy outcomes after acute ischaemic stroke: findings from a London-based multicentre study
7	Perceptions of vision care following neurological impairment: a qualitative study
8	Qualitative Study on Perceived Barriers to Psychological Care for Individuals With Intellectual Disability and Communication Difficulties Post-Stroke
9	The Return to work After stroke (RETAKE) trial: Findings from a mixed-methods process evaluation of the Early Stroke Specialist Vocational Rehabilitation (ESSVR) intervention
10	Trends in Ethnic Disparities in Stroke Care and Long-Term Outcomes

Appendix B: CASP Quantitative Appraisal Table

Table 7 Quality Appraisal of the Reviewed Articles by CASP Checklists

Study	1. Clear focused issue?	2. Cohort recruited acceptably?	3. Exposure accurately measured?	4. Outcome accurately measured?	5. Confounders identified?	6. Follow-up complete/long enough? *	7. Results presented clearly?	8. Results precise?	9. Results believable?	10. Applicable to population?	11. All outcomes considered?	12. Practice implications clear?	13. Presence of Risk and Bias
Bray <i>et al.</i> (2018)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chen <i>et al.</i> (2014)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chen <i>et al.</i> (2015)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
D'Anna <i>et al.</i> (2025)	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓
Hanna <i>et al.</i> (2020)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Lewer <i>et al.</i> (2019)	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓
McCormick and Chen (2016)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sterling <i>et al.</i> (2025)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tod <i>et al.</i> (2019)	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓
Walters <i>et al.</i> (2020)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Appendix C: Summary Table Potential Biases and Limitation

Table 8 Summary of Potential Biases and Limitation of the Reviewed Articles

No.	Author(s) and Publication Year	Study Type	Presence of Risk and Bias	Summary of Potential Biases and Limitations
1	Bray <i>et al.</i> (2018)	Nationwide registry-based cohort study	✓	Ecological fallacy from area-based deprivation measures; unmeasured confounders like smoking and BMI; case ascertainment not 100%.
2	Chen <i>et al.</i> (2014)	Population-based stroke register cohort study	✓	Missing data on individual income/education; potential for measurement bias in long-term follow-up; smaller ethnic subgroup sizes.
3	Chen <i>et al.</i> (2015)	Population-based stroke register cohort study	✓	Selection bias (alive at 3 months only); lacks NIHSS scores for severity adjustment; did not adjust for recurrent strokes.
4	D'Anna <i>et al.</i> (2025)	Multicentre retrospective observational study	✓	Selection bias from retrospective design; residual confounding (e.g., rehab quality not captured); limited to a metropolitan setting.
5	Hanna, Mercer and Rowe (2020)	Qualitative study using focus groups and interviews	✓	Small sample size (n=13); potential researcher bias in thematic analysis; combining focus groups/interviews may yield different results.

6	Lewer <i>et al.</i> (2019)	Cross-sectional survey	✓	Non-causality due to cross-sectional design; self-reporting bias for chronic diseases; EQ-5D-3L not validated in the homeless.
7	McCormick and Chen (2016)	Population-based registry cohort study	✓	Small sample size for specific subtypes (e.g., SAH); no adjustment for incident comorbidities during long-term follow-up.
8	Sterling <i>et al.</i> (2025)	Retrospective observational study	✓	Unmeasured clinical confounding (smoking, blood pressure); prescribing data lacks treatment-to-target or OTC details.
9	Tod <i>et al.</i> (2019)	Comparative risk assessment study	✓	Responder bias (healthy respondent effect); recording bias in self-reported diet/activity; potential circularity in SIMD health domain.
10	Walters <i>et al.</i> (2020)	Post hoc descriptive exploration of RCT data	✓	Post hoc nature (no a priori hypothesis); small subgroup sizes in certain regions (SE Asia); limited 12-month follow-up window.

Appendix D: Summary Table of Selected Articles

Table 9 Key Characteristics of the Reviewed Articles

SI	Citation	Aim	Theoretical Frameworks	Methodology	Findings	Future research direction
1	Bray <i>et al.</i> (2018)	To estimate socioeconomic disparities in the incidence of hospitalisation for first-ever stroke, quality of care, and post-stroke survival for the adult population of England.	Not explicitly stated; draws on general epidemiological concepts of socioeconomic factors.	Nationwide registry-based cohort study using negative binomial, multilevel logistic, and Cox proportional hazards models.	Significant socioeconomic gradients exist in stroke incidence and case fatality; patients from deprived areas experience stroke 7 years earlier and have higher pre-stroke diabetes prevalence.	Investigating causal mechanisms behind associations between low socioeconomic status and stroke risk; guiding health service development for primary prevention.
2	Chen <i>et al.</i> (2014)	To assess the impact of socioeconomic deprivation (SED) on acute and long-term stroke care, including ethnic	References historical public health campaigns and policy-led drives for care equality.	Population-based stroke register cohort study (South London Stroke Register) using multivariate logistic regression and pooled odds ratios.	Patients with SED had significantly lower odds of hospital admission and swallow tests; the impact was stronger in	Understanding how care improvements were achieved to address remaining inequalities in access.

		differences and secular trends.			black patients than in white patients.	
3	Chen <i>et al.</i> (2015)	To assess the association between socioeconomic deprivation and functional impairment (short and long-term) after stroke.	Not explicitly stated; focuses on clinical outcomes in relation to area-based deprivation.	Prospective population-based stroke register analysis using multivariate-adjusted logistic regression models across quartiles of deprivation.	Socioeconomic deprivation is associated with significant functional impairment at both 3 months and 3 years post-stroke, particularly in older patients and women.	Further research including National Institutes of Health (NIH) score adjustment and larger cohorts for haemorrhagic stroke.
4	D'Anna <i>et al.</i> (2025)	To investigate the effect of socioeconomic status on mechanical thrombectomy (MT) outcomes in patients with acute ischaemic stroke.	References intersectional challenges faced by minority populations and biological/social factors in recovery.	Retrospective multicentre study using inverse probability weighting to balance baseline characteristics and LASSO regression for outcome predictors.	Lower socioeconomic status correlates with poorer 90-day functional recovery and a higher risk of complications like symptomatic intracerebral haemorrhage.	Examining long-term recovery, recurrent events, and post-stroke quality of life beyond 90-day outcomes.

5	Hanna <i>et al.</i> (2020)	To explore health inequalities within visually impaired stroke survivors in the northwest of England and discuss potential solutions.	Social constructionism; Goffman's "Spoiled Identity"; Butler's "Gender Performativity"; Psychosocial perceptions theory.	Qualitative research using focus groups and individual semi-structured interviews followed by thematic analysis.	Lived experiences are centered on "loss" (physical, psychosocial, and systematic care); patients frequently reported a complete lack of visual care and power imbalances.	Using purposive sampling to target wider ethnic communities; supporting patients in processing emotional reactions to altered bodies.
6	Lewer <i>et al.</i> (2019)	To compare health-related quality of life and prevalence of chronic diseases in homeless and housed populations.	Not explicitly stated; utilizes comparative health inequality frameworks.	Cross-sectional survey with age-matched and sex-matched housed comparison groups using EQ-5D-3L and prevalence ratios.	Homeless people report substantially worse health than stable housed groups; inequalities are described as a "cliff" rather than a socioeconomic "slope".	Research into the interpretation of quality of life instruments by homeless people; investigating effective healthcare for chronic disease management in this group.
7	McCormick & Chen (2016)	To examine the association of	Not explicitly stated;	Population-based cohort study using multivariate-	Socioeconomic deprivation	Exploring why differences exist

		socioeconomic deprivation with mortality after primary haemorrhagic stroke.	epidemiological association study.	adjusted Cox regression models examining 1, 10, and 17-year mortality.	significantly impacts long-term (17-year) mortality after primary haemorrhagic stroke, particularly for intracerebral haemorrhage subtypes.	between short-term and long-term associations of socioeconomic status and mortality.
8	Sterling <i>et al.</i> (2025)	To investigate the association between neighbourhood deprivation and secondary prevention prescribing and all-cause mortality after stroke in Scotland.	Not explicitly stated; population-based health outcome study.	Retrospective observational study using linked national datasets (audit, prescribing, and mortality records) and Cox/logistic regression.	Ischaemic stroke patients in least deprived areas had lower 1-year mortality hazard and higher odds of anticoagulant prescription if they had atrial fibrillation.	Exploring treatment gaps in secondary prevention; focused follow-up and post-stroke support for patients in more deprived areas.
9	Tod <i>et al.</i> (2019)	To assess the contribution of modifiable exposures	Dahlgren & Whitehead model of the	Comparative Risk Assessment (CRA) approach linking survey data to routine health	Socioeconomic factors explain the largest proportion of incident strokes; low education	Disentangling effects of deprivation transmitted through intermediate

		(socioeconomic, behavioural, and physiological) to the burden of disease due to stroke in Scotland.	determinants of health.	data using Directed Acyclic Graphs (DAG) and Population Attributable Fractions (PAF).	explained 38.8% and area deprivation explained 34.9% of incident cases.	mediators; identifying intervention types most effective for potential gains.
10	Walters <i>et al.</i> (2020)	To explore post-acute rehabilitation service use and 12-month outcomes for working-age stroke survivors across three geographic regions.	International Classification of Functioning, Disability and Health (ICF) Framework.	Post hoc descriptive exploration of data from the AVERT trial, classifying participants into four post-acute rehabilitation pathways.	Considerable variation in rehabilitation pathways exists across regions; 28% of working-age survivors received no rehabilitation services despite reporting high depression and poor QoL.	Researching the most effective and cost-effective rehabilitation service pathways for young adults with varying stroke severity.