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Exploring the drivers of unsustainable pressures in health and social care: A qualitative system dynamics approach

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ABSTRACT

Health and social care systems face immense pressures that emerge from complex interdependencies between system components, transcending conventional explanations of demand-capacity mismatches. Although multiple theoretic perspectives (e.g., "complex adaptive systems", "sociotechnical systems") have been advocated as ways to capture and characterise the nature of that complexity, consolidating it into actionable insights for coordinated stakeholder efforts remains challenging, perpetuating implementation failure. This study introduces a novel application of qualitative system dynamics, using Causal Loop Diagrams (CLDs), to reveal the deeper structural patterns that drive persistent challenges and explain why policies have often fallen short.

Developed through stakeholder interviews in South Lanarkshire, Scotland (24 interviews conducted between February and June 2023), triangulated with UK-wide evidence, our CLD reveals how well-intentioned interventions generate cross-sectoral ripple effects. While stakeholders may recognise isolated consequences, organisational silos and temporal delays obscure the full complexity of feedback structures. Our findings expose inherent trade-offs, demonstrating how multiple, competing perspectives and reactive coping measures create emergent system properties that fundamentally challenge the oversimplified notion of "whole system working", often hailed as a "magic bullet" solution. Significantly, we uncover a paradoxical tension: cross-sector collaboration initiatives can undermine personalised care delivery, highlighting the risk of conflicting strategic and political goals weakening intended outcomes.

Our study advances system dynamics methodology by combining individual and cascaded system archetypes, enhancing clarity in communication of complex issues without losing critical feedback loops. This advancement provides decision-makers with a sophisticated yet accessible tool to visualise and understand complex system behaviour, engaging stakeholders through iterative feedback loop refinements, and steering towards an equitable, improved state.

1. Introduction

Health and social care systems worldwide face mounting pressures from aging populations, rising costs, and increasing demand for services. Despite significant reforms and investments, many countries struggle with persistent challenges such as hospital congestion, delayed discharges, and unmet care needs in the community (Roncarolo et al., 2017). These issues often persist or worsen despite well-intentioned policies, suggesting the presence of complex, systemic factors that resist such policies. This paper employs a qualitative system dynamics (SD) approach to explore the underlying drivers of these unsustainable pressures in health and social care, with a focus on a South Lanarkshire case study, situated within the broader contexts of Scotland and the wider UK. Scotland's emphasis on "whole system" approaches highlights a recognition of systemic complexity (Audit Scotland, 2019), the strategic need to work across entire systems, and the particular value of SD methods for informing Scottish public policy development. By mapping the intricate relationships within the system, we aim to illuminate why

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policy interventions may fall short of their intended outcomes (i.e., policy resistance), informing more effective system-wide improvements.

SD is a systems thinking methodology that is particularly effective for understanding and managing complex adaptive systems, such as health and social care systems (Darabi and Hosseinichimeh, 2020). Health and social care systems are inherently open, interfacing with other systems, such as housing, work and pensions, education, and the justice system. There are also local, regional, and national systems for health and social care. They are characterised by multiple interconnected components that interact in dynamic and often unpredictable ways with fuzzy boundaries, where changes in one area can ripple across the system, affecting other areas in unexpected ways (Braithwaite, 2018; Plsek and Greenhalgh, 2001). Unlike reductionist approaches that focus on isolated parts, SD emphasises understanding the holistic system and how its behaviour is driven by structural feedback—both reinforcing loops, which can lead to exponential growth or decline, and balancing loops, which stabilise the system and seek equilibrium (Sterman, 2000). Causal loop diagrams (CLDs), a qualitative tool within SD, are especially valuable for visualising and mapping the relationships and feedback effects among system components. This visual representation helps stakeholders grasp intricate cause-and-effect relationships, enabling them to identify leverage points–small changes in variables, rules of a system, or even prevailing mindsets (Meadows, 2015)–that can have a significant and lasting impact on the system' behaviour, ultimately leading to more informed decision-making in managing complex systems.

We begin with an overview of the UK's health and social care landscape, followed by a review of SD applications in this field. The methodology section details our approach to data collection and CLD construction. Our results present key feedback loops and system archetypes identified through the CLDs. These system archetypes simplify understanding of feedback structure by identifying and categorising common clusters of feedback loops that drive recurring patterns of behaviour over time (Senge, 2006; Sherwood, 2011; Sterman, 2000; Wolstenholme, 2003). This leads to a discussion of policy implications and recommendations for system-wide improvements. This research offers policymakers and practitioners a comprehensive understanding of system interdependencies, enabling more effective and sustainable interventions in health and social care.

1.1. South Lanarkshire within the UK health and social care landscape

In the UK, the delivery of health and social care is a devolved matter, which means that in Scotland these responsibilities lie with the Scottish Government rather than the UK Government. The health and social care landscape for older adults in South Lanarkshire provides a localised view of the broader challenges and complexities. South Lanarkshire, like other regions in the UK, relies on a complex ecosystem of providers across the public, third, and private sectors to deliver health and social care services. The National Health Service (NHS) provides a broad spectrum of care, from primary care to specialised hospital treatments. Local authorities manage social care, offering support such as care homes and home care, crucial for improving the quality of life for vulnerable populations. As an important partner for the public sector, the third sector—comprising voluntary organisations, community-based groups, and social enterprises—contribute to service delivery, influence service design, and advocate for, represent, and amplify the voice of service users, patients, and carers (Rahal and Mohan, 2024). This mirrors the broader UK trend where third-sector organisations fill service gaps to address unmet needs and debatably aim to offer more flexible, person-centred care options. The private sector is a major provider of adult social care services, and the largest employer in this field, both in Scotland and England (Scottish Government, Scottish Government, 2022; The King's Fund, 2024).

The integration of health and social care has been a long-standing goal across the UK, driving major reforms by successive governments since devolution. In Scotland, the Public Bodies (Joint Working) (Scotland) Act 2014 mandated the establishment of integration authorities and set the framework for integrating adult health and social care support (The Scottish Parliament, 2014). South Lanarkshire University Health and Social Care Partnership (HSCP) is one of the 31 HSCPs in Scotland, bringing together NHS Lanarkshire and South Lanarkshire Council to deliver services tailored to local needs. The HSCP acts as a vehicle for the delivery and development of those health and social care services delegated by the NHS and the council to the Integration Joint Board.

South Lanarkshire, similar to much of the UK, faces significant challenges in its health and social care system, exacerbated by demographic shifts (National Records of Scotland, 2024), resources constraints, and policy resistance. By 2066, a quarter of the UK's population is expected to be over 65, and South Lanarkshire is expected to see a similar trend, dramatically driving up demand for health and social care services (UK Parliament, 2019). Chronic staff shortages in both the NHS and social care sectors compound these pressures, with recruitment and retention challenges driven by factors such as high turnover rates, competitive job markets, and the demanding nature of the work. Financial sustainability is also a critical concern, as costs and demand for expenditure outstrip available funding, threatening the viability of services (National Audit Office, 2023). Nonetheless, the HSCP-managed social care services, including care-at-home services and care homes, are graded as "very good" by the Care Inspectorate, reflecting a strength in performance, and demonstrating success in operating within budgetary constraints (South Lanarkshire IJB, 2024).

South Lanarkshire, with its mix of urban and rural areas, also faces significant health inequalities that reflect broader patterns across Scotland, adding another layer of complexity to its health and care landscape. Significant health disparities between Scotland's most and least deprived areas complicate efforts to achieve equitable health outcomes (Audit Scotland, 2024b). In South Lanarkshire, 12.8% of the population is income deprived (Scottish average–12.1%), with 43% living in the 20% most deprived data zones (South Lanarkshire IJB, 2024). These disparities not only highlight broader societal inequalities but also pose unique challenges for health and social care provision.

Despite South Lanarkshire being actively involved in numerous policy initiatives, aligned with broader national strategies, aimed at improving health and social care, significant gaps persist between policy goals and on-the-ground realities. Policy initiatives like self-directed support (SDS), health and social care integration, the Carers Act, the digital health and care strategy, and preventive health initiatives have shown some promise but struggled to achieve their intended outcomes. This reflects the disconnect between policy rhetoric and the practical realities of implementation, as diverse local needs, resource constraints, and systemic complexities hinder delivery. It is argued that national policies often rely on simplistic frameworks, set unrealistic expectations, and use ambiguous language, which obscures practical challenges. A more nuanced systems approach is needed to uncover barriers and develop system-wide interventions aligned with local realities.

1.2. System dynamics in health and social care

SD has emerged as a powerful methodology for understanding complex health and social care systems, offering insights into policy resistance and unintended consequences of interventions. This section synthesises key applications and findings from SD studies in health and social care, highlighting their relevance to our investigation of unsustainable pressures in these interconnected systems.

SD models have been particularly effective in simulating service dynamics and resource allocation in healthcare. Studies by Lane et al. (2000), Brailsford et al. (2004), Cooke et al. (2010), Rashwan et al. (2015), and Catsis et al. (2023) have consistently revealed how mismatched capacity and demand/expectation patterns across different parts of the healthcare system can lead to inefficiencies, despite

well-intentioned interventions. Our research builds on these insights by applying SD to examine the effects of resource allocation and prioritisation across interconnected sectors and services, particularly focusing on how upstream changes affect downstream outcomes, and vice versa.

A strand of SD research has explored the critical interface between health and social care, particularly relevant to our study's focus on system-wide pressures. Wolstenholme (e.g. (Wolstenholme et al., 2007),) extensively used SD to examine this interface by analysing patient and service user flow, identifying blockages such as delayed discharges, and modelling informal coping strategies to keep the system functional despite design inefficiencies. Studies by Bayer et al. (2007) and Desai et al. (2008) demonstrated how SD could model the delayed impact of social care service redesign, in response to demographic changes, on health outcomes, such as reduced hospital admissions. However, framing the value of social care solely by its impact on hospital pressures oversimplifies its broader role. Many community-based social care needs exist independently of hospital processes, and social care provides critical functions beyond easing hospital pressures. Moreover, it does not acknowledge the work being undertaken within hospitals in relation to performance and productivity. Our research seeks to balance this perspective by using SD to model sector interdependencies, showing how interventions in one area can alleviate pressures in another, while recognising the distinct contributions and complexities of social care.

SD has also been instrumental in exploring unintended consequences and policy resistance within health and social care systems. Studies by Ackermann et al. (2010) and Lane et al. (2016) highlighted the importance of anticipating and mitigating unintended consequences when implementing policy changes in social care. Our study builds on this literature by using SD to identify and address potential policy resistance in our targeted interventions, helping decision-makers understand and mitigate the potential for efforts to relieve pressures in one part of the system to exacerbate issues elsewhere.

2. Methods

2.1. Study setting

The study was conducted in collaboration with South Lanarkshire University HSCP, one of the 31 HSCPs in Scotland. South Lanarkshire University HSCP, encompassing both urban and rural communities with socioeconomic diversity, reflects the varied health and social care needs, challenges and common practices seen across the UK. To ensure UK-wide applicability, we systematically compared our South Lanarkshire findings with national data and policies. This process allowed us to identify common themes and challenges, as well as region-specific nuances, ensuring our model's reliance across the UK while acknowledging potential regional variations.

2.2. Research design

We implemented a qualitative SD approach, specifically CLDs, to gain a holistic system view through triangulating unique insights from stakeholder interviews and data derived from the literature. This approach is well suited for developing a shared understanding of causal mechanisms responsible for the observed system behaviours and effectively conveying these insights to non-modellers (Mingers, 2000).

A CLD uses causality relationships and feedback loops to map the structure of a problem for analysis (Sterman, 2000). It captures the underlying causes of dynamic system behaviours, aiding decision-makers in understanding complex problems through the interpretation of feedback loops. The diagram includes key variables connected by arrows, which represent causal influences. Each arrow links an independent variable (at the tail) to a dependent variable (at the head), with a polarity ('+' or '–') assigned to indicate the nature of the relationship. A positive polarity ('+') signifies that as the cause increases/decreases, the effect also increases/decreases (i.e. changes in the same direction). A negative polarity ('–') indicates that an increase/decrease in the cause results in a decrease/increase in the effect (i.e. changes in the opposite direction). Additionally, a double slash ('//') marks a time delay relative to the rest of the diagram's overall time scale.

CLDs distinguish between two types of feedback loops: reinforcing and balancing (Sterman, 2000). Reinforcing loops, labelled as 'R' (e.g., R1, R2), have an even number of negative signs and amplify changes in one direction, potentially leading to exponential growth or collapse. In contrast, balancing loops, labelled as 'B' (e.g., B1, B2), have an odd number of negative signs and work to counteract changes, maintaining stability within the system. These balancing loops function in a goal-seeking manner, where goals can be either implicit or explicit, acting to correct deviations from a desired state. However, if long delays exist in any part of a balancing loop, this can create oscillatory behaviour.

2.3. Stakeholder interviews

We employed purposive and snowball sampling to recruit participants involved in delivering health and social care for older adults, family carers, and service users, ensuring diverse representation from various stakeholder groups within South Lanarkshire HSCP, third and independent sector organisations, private providers, and the community. Potential participants were identified through publicly available information and the research team's contacts, with invitation emails sent and followed up to maximize recruitment. A vignette depicting a hypothetical scenario of an older adult with complex needs was used at the beginning of semi-structured interviews (Appendix A) to reduce socially acceptable responses, explore context-specific actions, and elicit participants' thoughts and justifications (Barter and Renold, 1999). This vignette was reviewed by six non-participating practitioners and pilot-tested for clarity. Interviews, conducted via Microsoft Teams, were guided by the vignette and an interview guide, treating participants as active research partners. In total, 24 interviews were conducted with representatives from diverse stakeholder groups, most of whom had over five years of experience in the field. Interviews were recorded, transcribed verbatim, and lasted between 29 and 56 min, with an average duration of 48 min.

2.4. Construction of Causal Loop Diagrams

We employed a systemic method to construct the CLDs from interview transcripts, adapted from the approaches described by Kim and Andersen (2012) and Eker and Zimmermann (2016), which were rooted in grounded theory and associated coding strategies (details in Appendix B). In the first step, we open-coded the raw text data by identifying text extracts (i.e., data segments) that explicitly or implicitly indicated causal connections between two concepts (i.e., variables in CLDs). We then labelled these data segments with themes (represented as child nodes in NVivo® software). This process not only identified themes in the data but also enhanced the coder's understanding of the causal relationships expressed by the participants, which proved crucial in step 3 when identifying aggregate causal relationships. Moving on to step 2, which corresponds to axial coding, we categorised and aggregated themes into variables (parent nodes in NVivo®), creating a hierarchical coding tree. In step 3, we identified the causal relationships between variables based on the corresponding data segments identified during open-coding. In step 4, we translated these causal relationships from step 3 into a causal map in Vensim®. To mitigate potential bias in interpreting causal relationships within the data, LN and HM independently coded the data and developed causal links. They then compared and merged their results, resolving differences through discussion, re-clarification with participants or additional evidence from literature.

2.5. Data triangulation towards model completeness

The underlying grounded theory approach, which forms the basis for the above methods of constructing CLDs, suggests that the frequency of occurrence of specific variables reflect their importance, may not necessarily be the case (Ryan et al., 2021). Variables that are deemed critical by a single respondent may not be included by other respondents, leading to their exclusion from the analysis. Therefore, the grounded theory approach can overlook critical variables. More specifically, adding the recurring direct linkages into the model can lead to the omission of several critical variables that only occurred in one interview, leaving the model incomplete. To address this, we triangulated insights from the literature to uncover indirect connections to illustrate causal relationships, thereby developing a complete model with closed feedback loops (Ryan et al., 2021; Yearworth and White, 2013). The literature used to complement interview data for achieving model completeness included: i) SD studies in the UK's health and social care, identified from a literature review, and ii) studies and policy/-government reports related to the main themes identified from the interview data, obtained through a scoping review focused on review and policy papers for each theme (Table A1 in Appendix A). Insights from the SD studies, primarily focusing on hospital care, were aggregated into the CLD where pertinent to our modelling objectives. Notably, the incorporation of insights from work by Wolstenholme were instrumental in capturing the delayed hospital discharges and its critical interfaces with primary care and social care, an aspect that was not extensively covered in our interview data (Wolstenholme et al., 2007, 2008).

2.6. Analysis of the CLD using systems archetypes

While numerous archetypes have been documented (Senge, 2006; Sherwood, 2011; Wolstenholme, 2003), we adopted the four fundamental, generic system archetypes, developed by Wolstenholme (2003) to analyse our CLD. These generic archetypes, delineating the four ways of pairing reinforcing and balancing feedback loops (Fig. 1): i) 'Underachievement'–Intended reinforcing action is undercut by balancing unintended consequences; ii) 'Out-of-control'– Intended balancing control is undermined by reinforcing unintended consequences that exacerbate the initial problem; iii) 'Relative achievement'– Intended reinforcing action is diminished by reinforcing unintended consequences, where achievement in one part of the system is attained at the expense of other parts; iv) 'Relative control'– Intended balancing control aimed at controlling a relative outcome is diminished by balancing unintended consequences. The relative outcome triggers a reaction in another part of the system, compromising the outcome for the initiator.

While generic archetypes are valuable for simplifying complex CLDs into recognisable and understandable structures, using them in isolation may not fully capture the complexity. There is a risk of overlooking feedback loops between different archetypes, as well as cascading effects across multiple archetypes. For instance, unintended consequences in one archetype can become driving actions in subsequent archetypes, thus concealing the solution links spanning across multiple archetypes (Wolstenholme, 2022). To balance the simplicity of individual archetypes and the complexity of the CLD (Appendix D), we developed a simplified collective structure of interlinked system archetypes (i.e., cascaded system archetypes). This was done by retaining only the generic structures of the archetypes within the CLD. This approach highlights actions and reactions at critical interfaces between sectors within complex feedback situations in the health and social care system.

2.7. Confidence building in the CLD

We adopted several approaches to build confidence in the developed CLD, aiming to mitigate any potential unconscious bias that may have been introduced during its development (Andersen et al., 2012; Sterman, 2000). The CLD and its constituent systems archetypes were presented to seven stakeholders selected from the interviewees, ensuring representation from diverse stakeholder groups and individuals with extensive experience in inter-organisational interactions and collaborations. Stakeholders were guided verbally through the CLD to elicit their feedback, with follow-up discussions conducted via email as needed. The CLD also underwent scrutiny and examination by six health and social care professionals and policy practitioners external to the project. Presenting constituent systems archetypes allowed stakeholders to validate specific aspects of the CLD relevant to their system knowledge. We also presented to stakeholders how these systems archetypes integrated into the broader CLD, thereby enhancing confidence in the operation of individual archetypes within the wider structure and in critical interfaces between sectors within the system. Additionally, we used secondary sources of data to build confidence in the CLD, with the links between variables and the constituent systems archetypes compared to findings in the literature, where available.

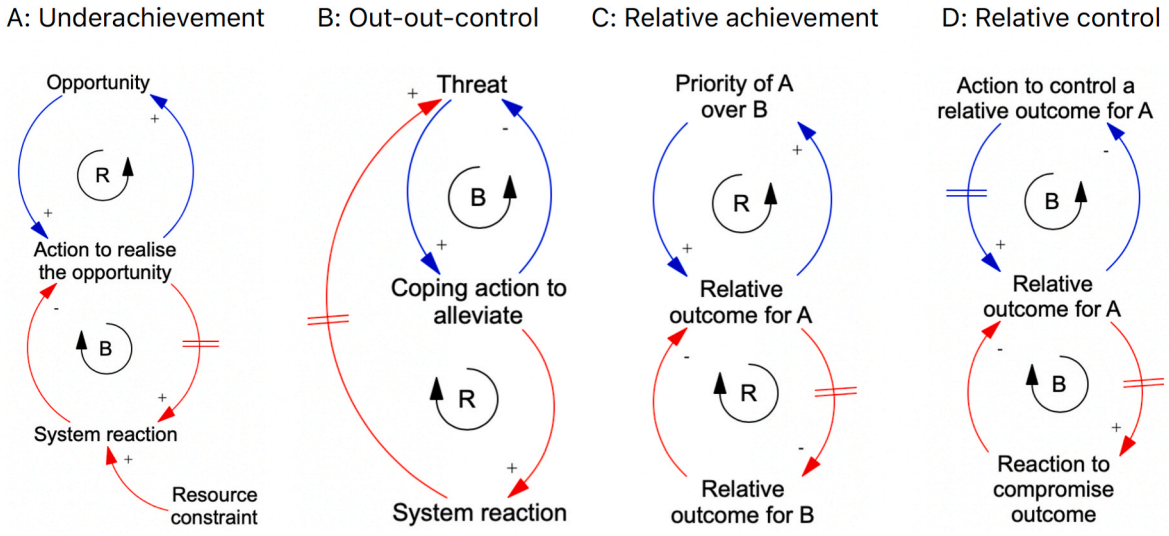

Fig. 1. Generic systems archetypes, each containing an intended action (blue) and an unintended consequence (red). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

3. Results

Below, we discuss feedback structures within the CLD, developed from insights triangulated from interview data and literature.

3.1. Underachievement and out–of–control: the ripple effect of coping actions to hospital congestion

Healthcare underachievement is perceived to be the result of an interplay of feedback loops, illustrating the 'underachievement' archetype, where intended reinforcing actions are undercut by balancing unintended consequences (Fig. 2, R1–B1a/B1b). Healthcare demand is driven by population growth and increased life expectancy, the latter is paradoxically a result of a healthcare system's own success (R1). As one consultant noted, "*The more we* support *people like [vignette person], it isn't as thought the hospitals would be less busy. They [hospitals] will be just as busy because of demographic changes and people's expectation of healthcare*". However, this growth trajectory can be impeded by balancing unintended consequence loops characterised by capacity constraints and delayed discharges (B1a and B1b respectively).

The delayed discharge issue spans the critical interface between social care and healthcare and often manifests after a delay, complicating timely intervention efforts through hospital admissions (B1b). According to interviewees, insufficient social care capacity, which leads to patients waiting for assessment and continuing care packages, is a primary cause of delayed discharges. However, perceiving its effect is masked by delays and a focus on the problem symptom.

> *"It's quite frustrating when you hear people are stuck in hospitals because there's no package of care for them, or a care package that they are waiting for is delayed. I don't think there's enough places from the social work, like the interim care, the 24-hour care, the sheltered housing, available for that [discharged patients] and to support people living independently."* (Nurse)

In contrast to this belief, English data indicates the NHS alone is responsible for about 60% of delays, with social care–solely or jointly–accounting for the other 40% (Cavallaro et al., 2023). Over 20% of delayed discharges stems from issues with the hospital discharge process Nuffield Trust (2024). In Scotland, around 20% of delays are due to awaiting commencement/completion of post-hospital social care assessments, involving both the NHS and social care (Public Health Scotland, 2024a).

Hospitals have employed various local coping strategies to temporarily relieve delayed discharges (Fig. 2, B2). However, interviewees described how these efforts often inadvertently trigger multiple reinforcing unintended consequences that exacerbate the situation further (R2a, R2b, and R2c). These feedback structures correspond to the 'out-of-control' archetype (B2–R2a/R2b/R2c). Coping strategies, such as premature discharges, demand management, and temporary admissions accommodation, can ultimately generate cumulative unmet needs for hospital care (Wolstenholme et al., 2007). One nurse described the situation, *"The hospitals were running way above capacity; they were having to put extra beds in treatment rooms and extra beds in the bays and corridors. And there's like 20 h wait for ambulances to get patients into hospitals"*. Premature discharges can pose serious risks to patient safety, often leading to unplanned readmissions and further delays in discharges (R2a) (Oxtoby, 2016). Demand management merely shifts the burden upstream, ultimately placing strain on primary and community health services and society. Interviewees believed that this shift could result in families, charities, and communities being left to handle the accumulative unmet needs, further escalating demands on social care, and diverting its valuable capacity from hospital discharges (R2b, R2c). Temporary admissions accommodation, intended to absorb more patients awaiting hospital admissions, can lead to the cancellation of elective procedures, contributing to increasing unmet needs (Denburg et al., 2020). The unmet needs resulting from these coping strategies eventually continue to drive demand for hospital services, perpetuating the cycle of reliance on coping mechanisms rather than addressing the root causes. Due to delays, the sudden surge in demand for hospital admissions can be perplexing rather than recognised as an inevitable consequence of earlier actions.

Delayed discharges occur due to a combination of factors, which can

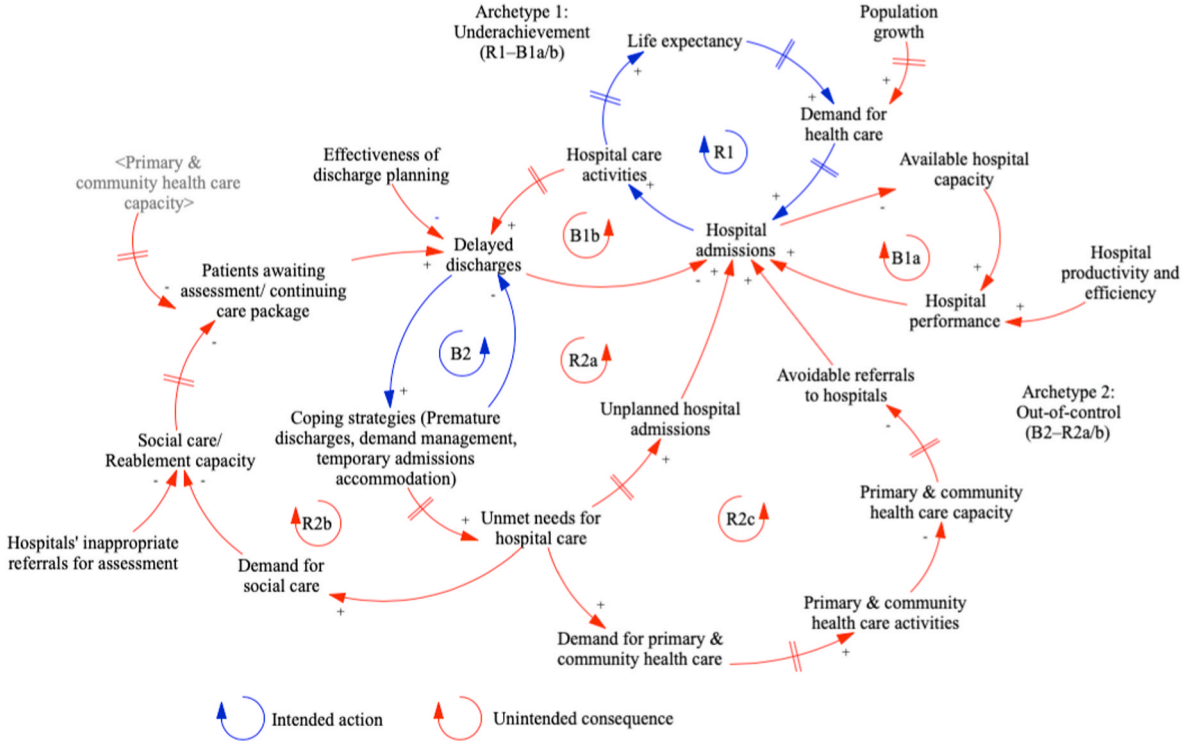

Fig. 2. Health care underachievement (Archetype 1) and out-of-control effects of coping actions to hospital congestion (Archetype 2).

include the lengths of stay of patients in hospitals before they are deemed medically fit-for-discharge,demand surpassing the capacity of social care, approaches to discharge planning, and levels of referrals for social care assessments. Within South Lanarkshire, the HSCP has introduced proactive strategies to reduce reliance on short-term fixes (B2) and their unintended consequences (R2a/R2b/R2c). Key initiatives, such as establishing Home First Transition Teams, expanding MDT capacity, serving as a Discharge Without Delay pathfinder, and adopting the new Optimal Discharge Planning Target Operating Model, have cut delays, shortened hospital stays, improved patient flow, and individual satisfaction (South Lanarkshire IJB, 2024). Despites these gains, both the NHS and social care sectors remain overstretched, amplifying the challenges for scaling up transformative changes and achieve sustainability. Nonetheless, the HSCP continues to deliver a number of transformational changes under these pressures-for instance, Blantyre Life and Home Assessment Teams in adult social care. Consequently, expanding capacity alongside these reforms–and addressing potential overlaps (e.g., between Home First teams and MDTs)–is crucial to counteract the unintended feedback loops (B1a/B1b/B1c). Yet, this goal is complicated by persistent uncertainty in Scottish Government funding for social care (Scottish Government, 2024), and a recurring £33 million shortfall for 2024/25.

3.2. *Relative achievement and relative control: access difficulty within underinvested primary and community health care*

This section demonstrates the 'relative achievement' archetype (Fig. 3, R3–R3a/R3b), where achievement in one part of the system (hospital care)–intended reinforcing action–is gained at the expense of other parts (primary and community health care)–resulting in reinforcing unintended consequences. Investments in primary and community health care have been disproportionately low compared to hospital care, depleting the community-based care capacity, and increasing strain on hospitals over time. In England, spending on acute care and hospital staff has surged, while funding for primary and community health services, along with the number of district nurses and GPs, has declined (Wickens, 2023). In Scotland, although funding for both acute and community-based care has increased, their relative shares have remained static (Public Health Scotland, Public Health Scotland, 2024b). Notably, increased investment in acute care does not guarantee improved performance. Despite higher NHS funding and staffing than pre-pandemic, reduced hospital activity suggests a significant fall in measured NHS hospital productivity in Scotland (Warner, 2024).

As hospital admissions and coping strategies discussed above are used, interviewees suggested that hospital spending could increase,

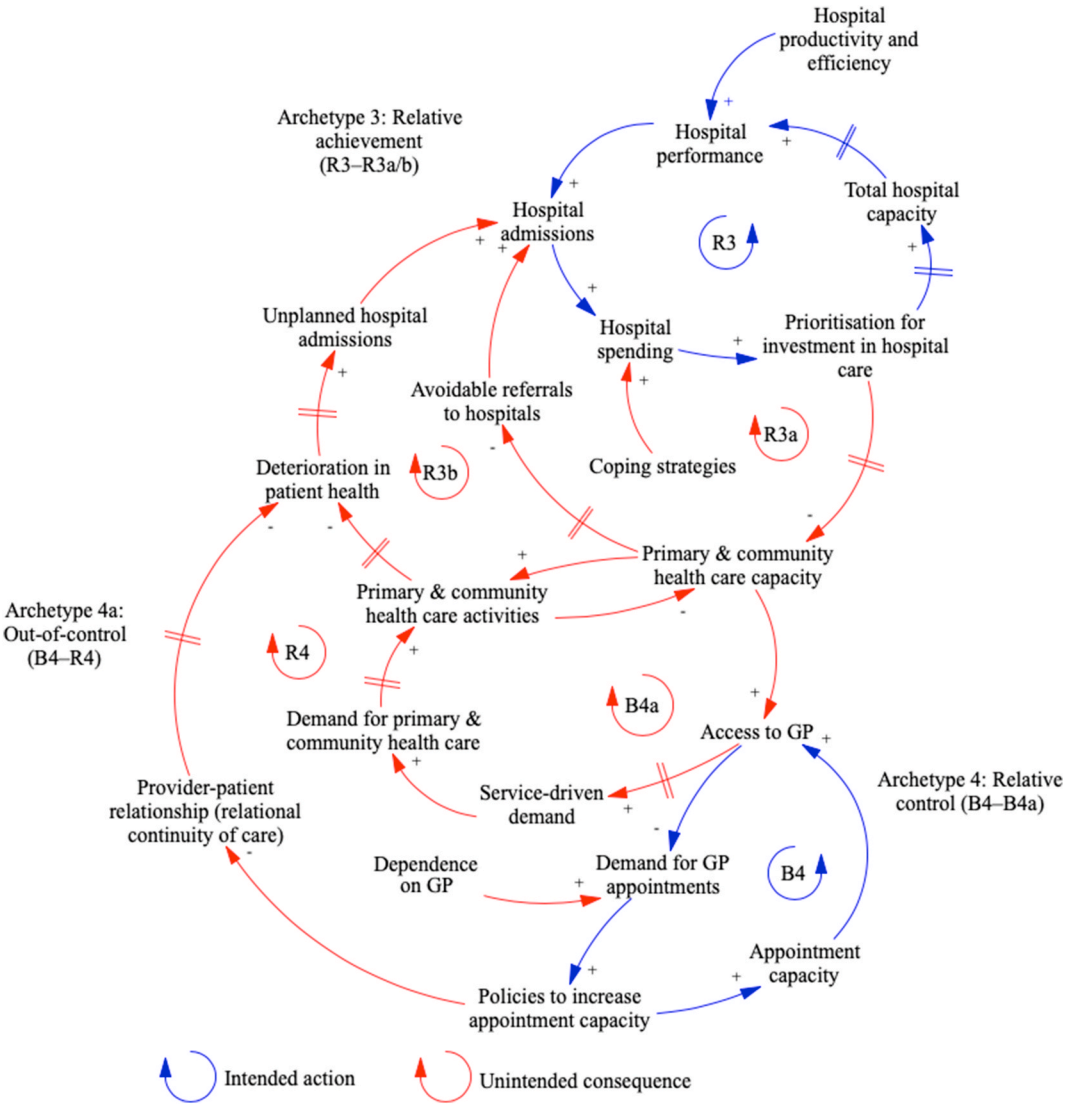

Fig. 3. Health care relative achievement (Archetype 3) and relative control of GP access difficulty that leads to out-of-control consequences (Archetypes 4 and 4a respectively).

further reinforcing the prioritisation of investment in hospitals over primary and community health services, allowing hospitals to absorb more patients (R3). Due to inadequate capacity, primary and community health services have struggled to meet health care needs. Interviewees described the burden being pushed back to hospitals through avoidable referrals and hospital admissions, often stemming from patient frustrations (R3a). A nurse suggested, *"we get a lot of hospital admissions that are maybe unnecessary. So sometimes when you're asking for a medical review, the GP will just request you phone an ambulance"*. Limited capacity in primary and community health services can also create significant access barriers to individuals who could otherwise benefit from community-based care. Consequently, those unable to access these services may experience health declines and unplanned hospital admissions (R3b). The unintended feedback loops (R3a and R3b) initially appear to benefit hospital investment (R3), but they ultimately highlight that while hospital care appears to improve temporarily, neglecting primary and community care increases the burden on hospitals. This dynamic shows that the initial gains are unsustainable, ultimately harming both population health and system performance.

Despite the UK devolved governments' stated policy commitment to shift spending from acute services to community-based care, actual investment patterns suggest that local-level reforms–rather than substantial new funding–have to drive this transition. The HSCP has pursued this goal through initiatives such as Integrated Community Support Service, Primary Care Action Plan, and House of Care Model, all aimed at strengthening community-based care capacity and reduce avoidable hospital referrals by fostering collaboration between acute and community services (i.e., mitigating R3a/R3b). However, interviewees noted that local innovations often face constraints beyond senior leadership's control. For example, the simultaneous need to meet operational targets, such as the 4-h A&E wait time, can undermine sustained community-focused reforms by pressurising leaders to bolster hospital capacity again (R3).

The 'relative control' archetype (Fig. 3, B4–B4a) illustrates the challenge of improving access to primary and community health services, under capacity constraints. There was a concern that efforts to control a relative outcome–access to GPs by focusing on increasing the supply of appointments (B4)–could be diminished by a balancing unintended consequence. Access to GPs remains a critical policy issue, as the healthcare system is heavily dependent on GPs, with access to many broader community health services requiring GPs' referral. A pharmacist commented, *"The way the primary care is set up right now, it's very GP dependent. And that's why they're probably leading to a lot of burnouts from GPs."* While easing access to GPs is necessary, it alone might erode people's ability to assess which symptoms warrant medical attention, leading to rising service-driven demand (R4).

The policies to increase appointment capacity amidst workforce shortages could lead to reinforcing unintended consequences that ultimately hinder access to GPs (out-of-control' archetype: B4–R4) (Fisher et al., 2024; McCartney et al., 2024). Policy initiatives aimed at expanding appointment capacity by facilitating quick access to GPs external to a patient's practice or local practice network or incorporating a broader range of health professionals into GP settings, such as nurse-led care, pharmacists, social prescribers, may have weakened provider-patient relationship, resulting in decreased health outcomes and increased uses of emergency services (R4). This can reinforce the prioritisation for investment in hospital care as described above and further needs to increase GP appointment capacity to cope with the increased supply-demand mismatch in primary and community care. For instance, although the new Scottish GP contract, aimed at supporting GPs' expert generalist role through MDTs, was welcomed by patients for improving first-contact care, patients continued to value continuity of care and longer face-to-face GP consultations (Donaghy et al., 2024). Mega-practices, which often rely on nurses and allied health professionals for first-line primary care, could improve accessibility but diminish continuity of care (McCartney et al., 2024).

Addressing the policy resistance in Archetypes 4 calls for a broader perspective beyond merely increasing appointment supply. In fact, Lanarkshire's Primary Care Improvement Team found that 44% of calls did not require GP appointments and GPs spent 13 h per week handling non-clinical related queries, highlighting avoidable GP visits. Understanding how people assess their symptoms and decide when and where to seek care can help manage demand more effectively and reduce the unintended consequence of the relative control action (B4a). Enhancing capability to navigate community-based health services and addressing barriers to accessing underutilised services can also improve access without necessarily increasing GP appointment supply (i.e. eliminating the relative control structure of Archetype 4). Additionally, a clearer understanding of the absolute demand-supply gap in primary and community health services–the difference between the number of healthcare staff required to meet patient needs and the actual number of staff available, measured in full-time equivalents–would clarify the actual need for investment to expand capacity and diminish the need for relative control over access B4.

3.3. Out of control: reactive risk-based prioritisation practice in social care exacerbating both health and social care demand

Efforts to cope with insufficient social care capacity amidst rising demand through risk-based prioritisation, as reported by interviewees (Fig. 4, B5), can be eroded by reinforcing unintended consequences, which ultimately intensify demand pressures (R5a, R5b, and R5c). This dynamic is captured within the "out-of-control" archetype. As interviewees described, this approach involves allocating resources to deliver care primarily to individuals with critical and substantial risks, leaving the support needs of those with low-to-moderate risks unmet. While not all individuals at this level, especially those with low risks, will inevitably deteriorate without immediate intervention–and early intervention can sometimes foster dependency or deconditioning–interviewees cautioned that neglecting certain unmet needs risks increased demand over time, further straining social care capacity and reinforcing the use of risk-based prioritisation practice (R5a). However, risk-based criteria serve an important gatekeeping function to ensure the system remains manageable, especially when public expectations of entitlements can exceed available resources. A social worker highlighted,

> "*We have that legislative duty to meet substantial and critical risks. We are quite clear that our approach is to meet the substantial and critical risks that we identify and generally not put or direct our funded resources to low and moderate risks.*"

Moreover, as interviewees observed in many cases unmet needs can lead to frustration among service users and their families. An older adult commented, *"It's only when someone dies that they have sheltered housing facility becomes available"*. This, combined with lack of collaboration across organisations and sectors, prompts unnecessary escalations via routes like GP referrals or referrals that do not strictly meet Adult Support and Protection (ASP) thresholds, "*Cynically, they [referrers] know it [escalation to ASP] is a way to get somebody to be seen faster knowing that the person doesn't really meet the ASP criteria"* (Social work manager). Although most of these referrals are closed at an early stage, this still creates additional burdens for both social care and primary and community health services (R5b). The unnecessary escalation to GPs, coupled with prioritisation for investment in hospital care, can crowd out resources allocated for community-based care–key to promoting healthy and active ageing and ultimately reducing social care demands (R5c). An independent sector stakeholder suggested,

> "It's reactive as opposed to proactive models that we're in that situation. We put the money into the reactive care, but that creates more cost. So, if you're on a waiting list for social work and you don't get your assessment because the waiting list so long, you end up in

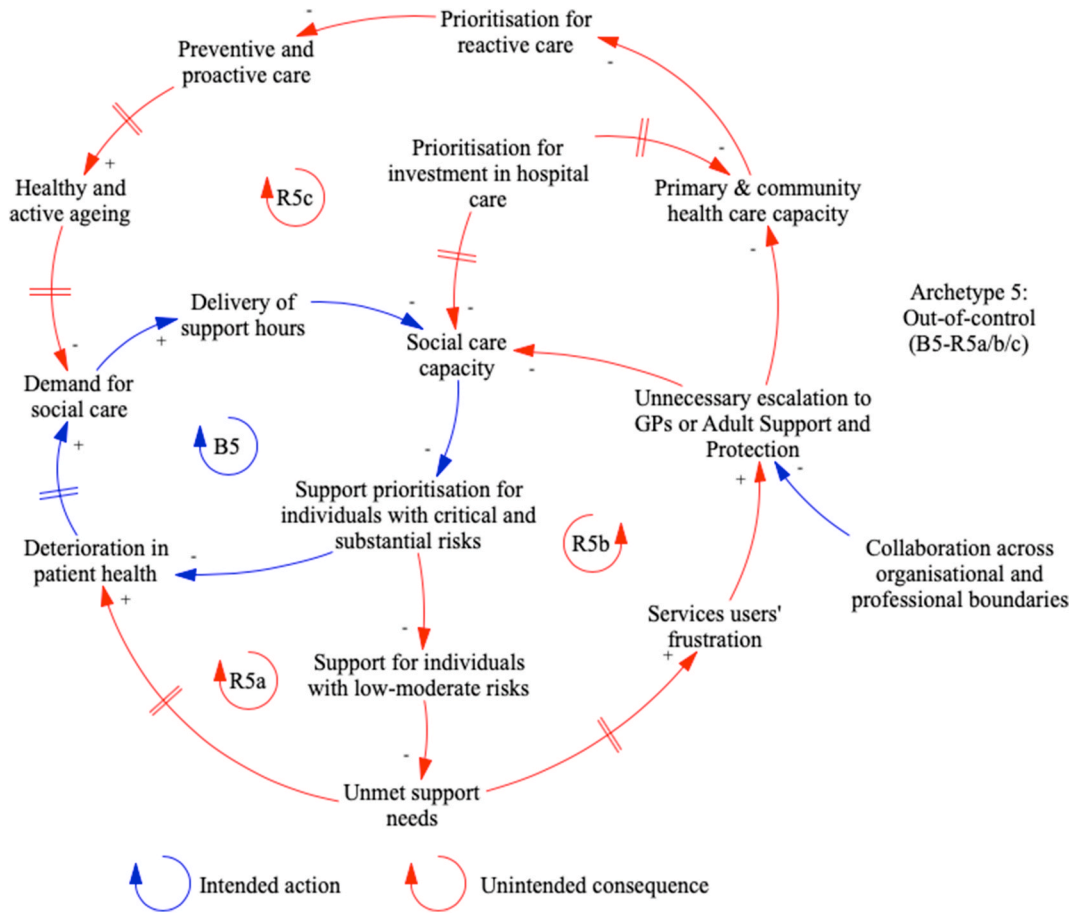

Fig. 4. Out-of-control effects of prioritising support for individuals with critical and substantial risks (Archetype 5).

hospital. So, we know that the highest percentage of admissions and the biggest cost of unplanned admissions is older people. And actually, most of that be preventative. We've known this for years."

When combined with instances of insufficient collaboration across organisations and sectors, resources constraints make it difficult to prioritise proactive and preventive care, as its long-term benefits are overshadowed by more immediate pressures. Financial constraints and tightened eligibility criteria have shifted focus to reactive services, limiting capacity for preventive investment (Audit Scotland, 2024a). Decision-makers need to make choices to safeguard prevention initiatives from the many other urgent pulls on resources (i.e., mitigating R5c).

The HSCP has geared resources towards prevention and early intervention through initiatives such as Physical Activity Prescriptions, New Frailty Pathways and expanding step-up/step-down services. While individuals with lower-level needs are often signposted to third-sector services, their roles have not been fully appreciated and funding cuts have limited their preventive capacity (Audit Scotland, 2024a). Interviews also highlighted a lack of coordination and duplication among these services, which could be refocused, aligned with identified service gaps to leverage asset-based approaches (i.e., mitigating R5a). Enhancing clarity on and actor awareness of available services and referral criteria and processes can further prevent unnecessary escalation of needs (i.e., mitigating R5b).

3.4. Relative achievement and underachievement: self-directed-support and personalised care-collaboration

SDS, underpinned by the Social Care (SDS) (Scotland) Act 2013, aimed to foster personalised care, create opportunity for service development, reduce gaps in service, and thus reinforce this transformation (Fig. 5, R6). Despite growing recognition of its importance, implementation challenges and the lack of desired impact are rooted in the legislation's failure to adequately account for its complexity and impracticality, given the insufficient capacity of the system to deliver its goals (Pearson et al., 2018; Scottish Government, 2023; The Scottish Parliament, 2024). The 'underachievement' archetypes (R6–B6a/B6b/B6c/B6d) highlight the system's unintended responses to SDS, leading to low uptake and individuals' continued preference for services organised and provided through the local authority (Option 3 of SDS).

Social workers and social work managers interviewed indicated that they seldom handle SDS cases, *"we get that [SDS] a lot less with older people"*. This is partly attributed to an increase in bureaucratic and administrative burdens inherent in achieving the desired level of personalisation. These burdens discourage frontline staff, already overstretched due to insufficient system capacity, from offering SDS options to supported individuals (Audit Scotland, 2017; Critchley and Gillies, 2018), thus hindering its adoption (B6a/B6b).

> *"I think when you get the SDS, there's then a level of process you need to get through. And I know it could take anything from three, six months. So, there's additional paperwork, additional process and I think social work don't particularly like that. I would say the main reason it's not happening is because it's not being pushed by the council."* (Private home care provider)

The bureaucratic and administrative burdens can also leave staff feeling overwhelmed and disempowered, impeding innovation and improvement on the ground, thus diminishing personalised care (B6c). For example, some interviewees from the independent and private

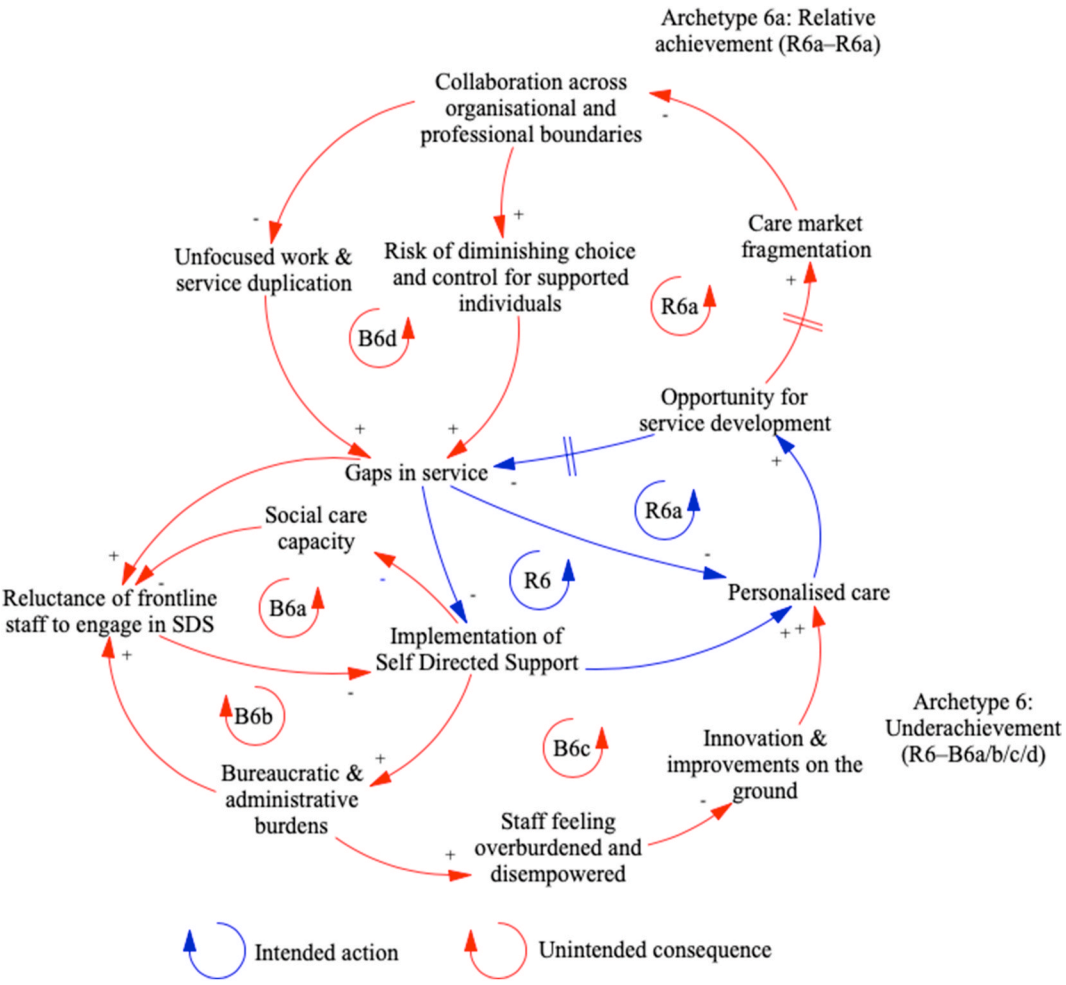

Fig. 5. Underachievement of Self-Directed Support implementation (Archetype 6) and relative achievement between personalised care and collaboration (Archetype 6a).

sectors suggested that the eligibility and priority frameworks employed by partnerships to allocate resources, informing the risk-based approach, have hindered staff from adhering to the principles and values of SDS. *"The difficulty is the eligibility criteria, which got brought up in the review of social care but sit there as a blocker, as preventative care is not something we do"* (Independent sector stakeholder). Personalised care can also fragment the care market, making collaboration more difficult and creating an unintended balancing loop that leads to the underachievement of personalised care (B6c).

Personalised care–beyond the scope of SDS–and collaboration appear to have a complex relationship. Although interviewees believed that collaboration among organisations can mobilise resources and skills, refocusing efforts to narrow service gaps and promote personalised care, broader studies–primarily from England–suggest it can clash with personalisation, resulting in a relative achievement of both (R6–R6a). Allen et al. (2023) found local authorities, by focusing on collaboration with health and population-level commissioning, drifted away from fostering a diverse care market and supporting personalised care. Enhanced collaboration between organisations can curtail user choice and control, while individualised funding risks fragmenting already varying social care markets (Needham et al., 2023). It can be argued that providers need time to develop the skills and networks necessary to integrate services around the individual, achieving both personalisation and collaboration. Yet, these dual agendas often have contradictory aims and actions that undermine each other. These effects may differ in Scotland, which has relied on less extensive market intervention and commissioning practices compared to England.

3.5. Cascaded systems archetypes

This section presents a diagram of interlocking, cascaded archetypes (Fig. 6), which illustrates the key underlying structures contained in the archetypes discussed in sections A–D and highlights their interrelationships. The diagram illustrates how well-intentioned local actions can trigger a chain of unintended consequences throughout the system, ultimately exacerbating the original problems.

Despite the expansion of hospital care to meet rising healthcare demand, this growth can be undermined by hospital congestion, with delayed discharges, capacity constraint, and declined hospital productivity and efficiency being contributing factors. Delayed discharges are often attributed to inadequate social care capacity to provide continuing care packages for discharged patients, as perceived by most interviewees (Fig. 6, Archetype 1—'underachievement'). However, while these issues are frequently cited by stakeholders as arguments for increased social care funding, they reflect a broader systemic problem, with inadequate discharge planning also playing a significant role. Faced with limited discharge solutions, hospitals often resort to short-term, local coping strategies to manage congestion. However, these measures often result in unintended consequences (Archetype 2—'out-of-control'), triggering a cascading chain of coping actions and their side effects throughout the system, ultimately fuelling healthcare demand—the fundamental driver of the first archetype.

The focus on meeting hospital care demand, achieving operational targets, and increased hospital spending was perceived to come at the expense of community-based care, resulting in only relative gains for

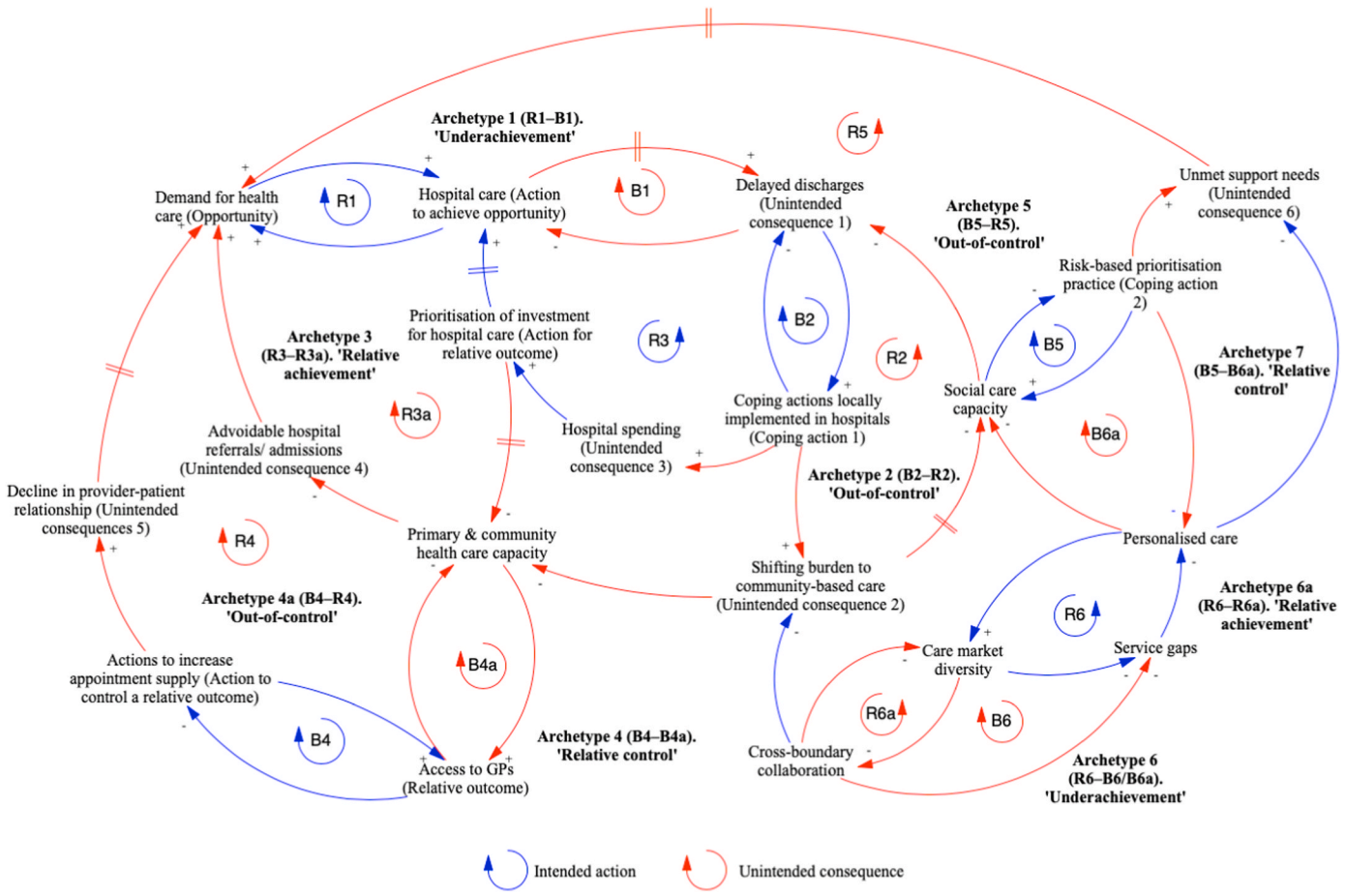

Fig. 6. A cascade of interlocking system archetypes.

population health and system performance (Archetype 3—'relative achievement'). This increased spending is partly driven by these coping strategies in Archetype 2. Additionally, a significant portion also goes toward pay awards for existing staff (Scottish Government, 2024). Furthermore, strong political and public pressures also favour maintaining hospital services; proposals to close or reconfigure wards—and certainly entire hospitals—consistently meet with substantial political, professional, and public anxiety (Morris et al., 2025). These factors reinforce the strength of R3, favouring hospital investment. Few initiatives aimed at shifting the balance of care have succeeded, as they often focus on resource reallocation, which reinforces the competitive dynamic of Archetype 3. This increases the risk of destabilising hospital care (i.e., diminishing R1 in Archetype 1) and amplifies public fears of losing access to essential services. A clearer understanding of what is being shifted, why, and what it can truly improve is needed to break the competitive nature of this archetype.

With insufficient capacity in primary and community health services, attempts to increase appointment availability only control a relative outcome—improving access to GPs—which can further drive demand for these services (Archetype 4—'relative control') or strain the provider-patient relationship, escalating demand for hospital care (Archetype 4a—'out-of-control'). Despite substantial local efforts invested in community-based reablement and other proactive care initiatives, social care also faces capacity constraints, which limits its ability to manage rising demand. As a result, social care prioritises support for high-risk individuals, leaving the needs of those at low to medium risk unmet and unintentionally diverting focus away from proactive care and prevention. This reactive approach leads to delayed future increases in acute care demand and more severe social care needs (Archetype 5—'out-of-control').

Additionally, the policy agendas of personalised care and collaboration across organisational and professional boundaries, while seemingly aligned, can conflict if not carefully designed. Personalised care, aimed at increasing market diversity and closing service gaps, may be undermined by the complexities of cross-boundary collaboration needed for its delivery (Archetype 6—'underachievement'). Collaboration could also reduce user choice, counteracting the goals of personalised care (Archetype 6a—'relative achievement'). These dynamics traverse multiple archetypes, eventually influencing healthcare demands and feeding back into Archetype 1. Furthermore, delivering personalised care places additional strains onto social care capacity (B6a), unintentionally driving the need for risk-based prioritisation practice and potentially tightening eligibility criteria (B5). This could, in turn, undermine personalised care efforts and give rise to Archetype 7–'relative control' (B5/B6a), a dynamic not fully captured within the analyses of individual archetypes.

4. Discussion

The CLD systematically maps the interwoven dynamics of the UK health and social care ecosystem for older adults, visually unmasking how decisions made in one sector—such as hospitals—can reverberate across primary care, community health services, and social care. Although the interdependencies between the NHS and social care have been acknowledged (The Health Foundation, 2021), the granularity of the CLD reveals previously obscured feedback loops, illustrating why seemingly well-intentioned, siloed strategies repeatedly backfire. Additionally, cascaded feedback effects across system archetypes often remain concealed by bounded organisational and professional perspectives and time delays within feedback loops, which can mask unintended

consequences of earlier actions. This level of systemic clarity makes an important theoretical contribution to the literature on complex adaptive systems, as it goes beyond merely stating that different services affect one another to demonstrating precisely where and how these feedback loops unfold. In doing so, the CLD not only theoretically advances the understanding of complex adaptive health and social care systems but also provides stakeholders with a powerful tool for identifying leverage points and designing interventions that genuinely span organisational boundaries.

The study uncovered an entrenched "coping culture", often manifested in shifting burdens to other parts of the system, driven by the urgent need to curtail demand, accelerate throughput and meet operational targets within limited resources. While some degree of coping is often inevitable, participants acknowledged that over-reliance on these strategies would ultimately impact individuals receiving care and drain resources across organisations and the broader system. These negative outcomes frequently outweigh any short-term gains, although existing organisational metrics may fail to capture the full extent of the damage (Wolstenholme et al., 2007). Despite recognising these risks, they found it difficult to abandon coping measures under relentless demand pressure. Additionally, although participants were aware of some unintended consequences of current reactive practices and proposed changes to address the problems of these practices, their focus remained constrained by organisational and professional boundaries, which limited their view of the system's complexities.

A central value of the CLD is its practical application for local leaders. When presented during strategic planning meetings, they valued how CLDs can effectively illustrate system interdependencies and allow for iterative refinement of feedback loops to challenge and explore issues with stakeholders. CLDs enable local leaders and stakeholder representatives to navigate complex trade-offs in resource allocation, evidence-based interventions, and care delivery priorities–these trade-offs, if poorly managed, often lead to frustrations and disappointments. By fostering a shared understanding of systemic complexities among stakeholders, CLDs help build consensus on goals and actions. Local leaders also highlighted the complexities of the system, which are frequently oversimplified in both stakeholder discussions and in policy formulation, underscores the need for methodologies like this. Otherwise, when stakeholders cannot fully grasp the interconnected nature of the system, they at times expect and request contradictory solutions, notably in respect of SDS. Additionally, the power of CLDs lies in identifying and developing leverage points. For local leaders responsible for commissioning this local health and social care system, CLDs can support them to identify effective ways to intervene explicitly or tacitly to help move the system toward a state of equilibrium that delivers more consistent, equitable, and improved outcomes.

The CLD helps explain a noteworthy and counterintuitive observation: rather than enhancing personalised care as commonly believed, cross-sector collaboration can conflict with it, particularly when the dual agendas of health and social care are alternatively prioritised. However, this dynamic does not apply equally across all services or service users. Some argued that third-sector providers may be reluctant to adopt new ways of working or to collaborate closely, partly due to unspoken competition within the sector. This finding aligns with Pearson et al. (2018), who noted that in Scotland, the agenda to transform social care through SDS has been overshadowed by the demands of changes in the administration of health and social care joint-working agenda and hindered by the impact of austerity. This insight highlights the risk of diverse strategic decision-making and political goals at the government level clashing with each other and with local priorities, diluting the intended outcomes of both. Such conflicts often arise from an incomplete understanding of holistic feedback loops and the time delays involved–which CLDs can help illuminate.

This study advances both the methodological aspect of system archetypes in complex adaptive systems and their practical application for decision-making support. It demonstrates how integrating multiple system archetypes can capture cascaded effects within complex systems often lost when complex CLDs are subdivided into individual archetypes. While individual archetypes help improve clarity in communicating complex problems and explain the occurrence of unintended consequences, they often require breaking down complex CLDs into more manageable structures, potentially losing feedback loops that span multiple archetypes. In contrast, cascaded archetypes retain these feedback structures while aggregating them at a higher level, making it easier to grasp broader system interactions. This approach is particularly valuable in contexts where solutions to individual archetypes are difficult to implement, and reactive actions by multiple stakeholders dominate. Cascaded thinking also encourages reflection not only on whether a balancing feedback loop (a coping action) might lead to unintended consequences but also on whether that action itself is an unintended consequence of a previous archetype.

While this study drew from data in South Lanarkshire and UK-wide literature, its findings have broader applicability. The systemic issues identified—such as the challenges of integrating health and social care services and balancing acute and community-based care—are common to many healthcare systems globally (Exley et al., 2024; Reed and Dodsworth, 2023). However, the specific manifestations of these issues may vary depending on local contexts, funding structures, and cultural factors. Future studies could explore how these dynamics play out in different settings to develop more nuanced and context-specific interventions.

Looking ahead, future research could adopt CLDs to explore how developments in areas such as technology and workforce dynamics might reshape existing feedback structures within the health and social care system–a crucial step toward sustainable solutions for these complex challenges. Given the inevitable increase in demand for health and social care services, one area is investigating the role of digital technologies and data analytics in enhancing care delivery efficiency and effectiveness. This research should examine both potential benefits and unintended consequences of digital interventions. Furthermore, while our current work touches on staffing issues, future research should delve deeper into the interaction between the health and social care workforce and the broader economy. This expanded focus could provide a more comprehensive understanding of the workforce challenges and their implications for the overall health and social care system. Notably, an ageing population not only increases demand but also means fewer people in working age population to pay tax to fund services under current models and fewer people to take up vacancies within the system.

The study has a number of limitations. The primary data was collected from 24 stakeholders in South Lanarkshire, which may limit the generalisability of the produced insights. To address this, we purposively sampled interviewees to cover a wide range of perspectives and cross-validated our results with relevant literature reflecting the wider UK contexts. Even then, we have not fully and explicitly accounted for the differences in the policies and legislative arrangements for health and social care across the four nations of the UK. Additionally, the research focused on health and social care services for older adults, limiting its generalisability to other service user groups. An inherent limitation of the qualitative SD approach is that while it provides a holistic view of the system, it does not offer definitive quantitative solutions. To quantitatively understand the implications, it is necessary to focus on specific elements within the system and conduct further testing. Another limitation is the use of the term "out-of-control" to describe one of the generic system archetypes. Although this terminology is established in the literature, it can appear pejorative and may not accurately capture the nuances of what is often better described as "unintended escalation". Using the latter term encourages stakeholders to focus on the underlying dynamics rather than simply perceiving the system as chaotic or unmanageable, thereby ensuring that CLDs remain both analytically rigorous and practically useful.

5. Conclusion

The study clarifies the complex interdependencies within the UK health and social care system and generates learning that are relevant to health and social care systems in other countries. While existing literature has highlighted these interdependencies in isolation, our study offers a more holistic view, clearly identifying critical interfaces across sectors and enabling the tracking of feedback effects throughout the system. Methodologically, the study demonstrates the usefulness of combining individual and cascaded systems archetypes to communicate policy insights and identify system-wide interventions.

CRediT authorship contribution statement

Le Khanh Ngan Nguyen: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Holly McCabe:** Writing – review & editing, Investigation, Formal analysis, Data curation. **Susan Howick:** Writing – review & editing, Validation, Methodology, Conceptualization. **Itamar Megiddo:** Writing – review & editing, Validation, Methodology, Conceptualization. **Soumen Sengupta:** Conceptualization, Validation, Writing – review & editing. **Alec Morton:** Writing – review & editing, Validation, Methodology, Conceptualization.

Ethics approval

This research was approved by the Ethics Committee of the Department of Management Science at Strathclyde Business School.

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Abbreviations

ASP	Adult Support and Protection
CLD	Causal Loop Diagram
NHS	National Health Service
HSCP	Health and Social Care Partnership
SD	System Dynamics

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2025.117913.

Data availability

The data that has been used is confidential.

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