



Mapping the service system that supports children and families in the context of place-based-disadvantage: Potential leverage points for intervention

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ABSTRACT

There is strong evidence to suggest that children are negatively impacted by growing up in places where there are high levels of disadvantage present. However, these children can reap substantial developmental benefits (even more so than those who do not experience disadvantage) from access to and engagement with community and social services supporting health, education, and wellbeing. Yet, due to the complexity of service provision, access, and outcomes for children and families living in disadvantaged places, the service system in these contexts often is found to be ineffective in meeting the needs of the community. This study utilises a participatory approach, engaging service providers working with children and families in a disadvantaged place to identify key leverage points that have the potential to promote systems reform. Using participatory systems mapping, the findings illustrate aspirations (or the ideal state) of the service system that are characterised by early intervention, high levels of service coverage, and interconnected services, all of which enable wellbeing for children and families. User orientated and service orientated factors that act as barriers or enablers are also identified and key levers of service reform are discussed, particularly increasing accessibility of services and reducing vulnerability of service users.

1. Introduction

The early years are the most critical periods of our lives as they set the foundation for cognitive, physical, social, and emotional development all of which have major impacts on health and wellbeing during childhood and extending into adulthood (Heckman, 2007). It is well-established that the risk of exposure to adverse events and non-optimal growth conditions in early development is geographically concentrated such that children growing up in disadvantaged neighbourhoods have poorer outcomes compared to those living in more advantaged neighbourhoods (Minh et al., 2017; Pérez et al., 2020; Tanton et al., 2021). Place-based disadvantage, meaning the condition where it is more difficult for people living in particular locations to achieve positive life outcomes, is both complex and multifaceted (Price-Robertson, 2011). Specifically, geographical forms of disadvantage can be understood as an interaction between features of 'place' (e.g., low

levels of social capital, lack of opportunity and infrastructure, limited access to employment or services, discrimination) and factors linked to the experiences of residents themselves (e.g., unemployment or under-employment, low levels of education, drug, and alcohol use) (Cheshire et al., 2014).

Place-based disadvantage has resounding effects on children, with studies finding those living in geographic regions experiencing high levels of disadvantage have reduced feelings of safety, belonging, and cohesion as well as decreased community involvement (amongst many other negative indicators). These, in turn, result in effects on language and emotional development as well as poorer behavioural outcomes for children (Brown and Ackerman, 2011; Callahan et al., 2011; Froiland et al., 2014). Studies have also found that growing up in contexts of place-based disadvantage is linked to vulnerability across the life course, influencing mental health and physical capability above and beyond family and individual characteristics during adulthood (Hertzman et al.,

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2010; Moore et al., 2015). Adding to this complexity, there is evidence for dynamic interactions between people and places across generations such that children's experiences of living in economically disadvantaged neighbourhoods are strongly related to parental exposure to poverty and housing tenure (Hedman et al., 2015; van Ham et al. 2014). As such, the effects of disadvantage on individuals, families, and communities have been conceptualised as complex problems, such that it is difficult to understand, unclear how to tackle, strongly contested, and seemingly insurmountable (Head, 2008).

Given the complexity and systemic nature of the issues some communities face, it stands to reason that 'systems thinking' is essential when seeking to create positive sustainable change. Systems thinking is a perspective that highlights the need to consider the dynamic and interconnected nature of systems (a perceived collection of interrelated but independent parts that are linked by a common purpose and, through their interactions, function as a whole) that comprise the social world and how they impact outcomes (Best and Holmes, 2010). Systems thinking encourages a consideration of the context in which complex issues occur and focuses attention on the patterns of interrelationships amongst parts of a system that give rise to both problems and their solutions (Best and Holmes, 2010). Taking this perspective, to shift complex problems such as place-based disadvantage, it is not enough to simply examine and seek to change the behaviour of individuals; multi-level change must occur involving individuals, organisations, and the wider social sector (Kania et al., 2018). Applying a systems thinking lens enables us to shift attention away from examining the experiences of individuals, to investigating the impact of factors in the system and the underlying systemic conditions that give rise to disadvantage in place (Foster-Fishman and Watson, 2012). In this research, we focus on how the service system operating in a disadvantaged place acts to exacerbate and/or mitigate the impacts of place-based disadvantage on the health and development of children and young people.

1.1. Service systems in the context of disadvantage

There is strong evidence to suggest that children who are vulnerable due to the influence of disadvantage reap substantial developmental benefits (even more so than children who do not experience disadvantage) from access to and engagement with community and social services supporting health, education, and wellbeing (e.g. Adamson and Brennan, 2014; Fordham and Kennedy, 2017; Warren et al., 2020). It has been argued that one of the reasons for this is that in contexts where families have fewer resources or are strained, channelling efforts into community and social services can be compensatory, providing opportunities for wellbeing and disrupting negative pathways to health and wellbeing in the long-term (Gray, 2003; Law and Levickis, 2018; Van Haute, Roets and Vandebroek, 2018). Funding and resourcing for services have been found to be greater in communities experiencing socioeconomic disadvantage as compared to both upper and middle socioeconomic areas (Small and Stark, 2005; Small and McDermott, 2006).

Despite significant financial investment by government, non-government organisations, and community groups into services in disadvantaged contexts, positive outcomes do not always result. Although there are often more services located in the lowest socioeconomically resourced or disadvantaged communities, residents still experience limited access to and engagement with quality health, social, and early childhood services (McCormack and Verdon, 2015; Conway et al., 2022). This can be due to high levels of demand (that outweigh investments), complex needs or multiple vulnerabilities faced by families, and the tension between targeted and universal service provision (Small and Stark, 2005; Small and McDermott, 2006; Nicholson et al., 2012; Goldfeld et al., 2018). Notably, the most vulnerable families tend to be more likely detached from services due to multifaceted forms of inaccessibility including, but not limited to, physical or logistical issues, difficulties in navigation or referrals, and feelings of fear or stigma

(Winkworth et al., 2010; Butler et al., 2012; Morris, 2013; La Placa and Corlyon, 2014).

Due to the complexity of issues concerning service provision, access, and outcomes for individuals living in disadvantaged places, it is critical to understand how to increase the functioning and effectiveness of the service system in meeting the needs of the end users. An emerging body of evidence finds that an interconnected, flexible, and collaborative service system is the most effective way to assist families and children in the context of complexity and disadvantage (Winkworth and White, 2011; Moore et al., 2016; Jose et al., 2021). Of note, in their research La Placa and Corlyon (2014) suggested that for vulnerable parents to be successfully engaged in services, the service system itself must be progressive, relationship focused, and adopt evidence-informed approaches. Knight and Baldwin (2022) echo this sentiment suggesting that in an attempt to improve the service system for families and children, all stakeholders (e.g., individual service providers, organisations, funders, and policy) should actively avoid making fragmented, discrete, ill-informed, or short-term decisions. They highlight the need to identify leverage points, or places where a small shift in one thing can produce big changes in the broader system (Meadows and Wright, 2009). Effectively, the extant evidence suggests that to undertake relevant, targeted, and interconnected activities that have the potential to create system change, the system itself must first be scrutinised. Therefore, the current research seeks to understand the service system supporting the health and wellbeing of children and families living in a disadvantaged region and to identify leverage points for systems transformation from the service providers point of view.

2. Methods

2.1. Research design

This research used qualitative methods, comprising three four-hour workshops undertaken with service providers and professionals working in the Logan region of Queensland, Australia. As one of Australia's largest Local Government Area (LGA) this highly multicultural region has over 300,000 residents and is made up of over 60 suburbs, with experiences of disadvantage concentrated within several suburbs. The workshops employed a qualitative research design with an interpretivist paradigm acknowledging the subjectivities of the participants and the researchers throughout data collection and interpretation. Such an approach highlights the interactions amongst stakeholders within and across the research settings in shaping the understanding of the phenomenon. Due to the focus of the research on understanding perceptions of the *service system* and its functioning by service providers and professionals (rather than a focus on the lived experiences of working, living, or being a recipient of the system) the research involved multi-levelled processes of interpretation. Specifically, participants were asked to engage in sense-making about the service system and its interdependencies by applying their lived experiences of barriers and enablers in the local context, but at the same time to decentralise these experiences in an examination of broader service level issues.

Consistent with the research design, an interactive workshop protocol (outlined in the procedure section) was developed guided by principles of Community Based Participatory Research (CBPR: Minkler, 2005). CBPR is an overarching framework comprised of a range of approaches to research, intervention, or action that centralise participation with (rather than on) those most affected by the issue under investigation (Minkler, 2005). This approach aims to engage with stakeholders in ways that acknowledge and mobilise their diverse contributions to research questions and solutions, uphold the values of experiential knowledge, and seek to create transformative and sustainable change beyond knowledge production (Israel et al., 2010).

2.2. Participatory systems mapping

An adapted version of Participatory Systems Mapping (PSM) was used to structure the substantive data collection across the three workshops (Barbrook-Johnson and Carrick, 2021; Barbrook-Johnson and Penn, 2021). PSM is a technique to map (and thus scrutinise) a system utilising input from diverse viewpoints, and from those who are core stakeholders in the system. In doing so, PSM provides a more comprehensive understanding of the way complex systems operate (Wilkinson et al., 2021). The approach involves teams of people collaborating to construct a depiction of the key factors and their interrelationships within a defined system; in this case, the service system supporting the health and wellbeing of children, young people, and families in a disadvantaged region of Australia. The method was chosen because it combines a participatory approach with the ability to explore, describe, and refine understandings of complex systems.

Barbrook-Johnson and colleagues provide a series of adaptable stages to conduct a PSM that is briefly synthesised here; 1) system of interest must be identified, 2) a set of focal factors (represented as nodes on the map) within the system are chosen as a starting point to “seed” the system map, 3) participants brainstorm factors that influence or are influenced by the focal factors, 4) connections are drawn between factors, and 5) verification and reflection on the system map is undertaken. These stages are described in line with the workshop procedure detailed in Table 1. This study received ethical approval from Griffith University Human Research Ethics Committee (no#2021/505). All participants provided written consent.

2.3. Participants and procedure

A multistep approach was used to identify participants who were experts concerning the system in question. Firstly, informed by an assets

Table 1
Description of the workshop procedure, as aligned to each stage of PSM.

PSM Stage	Description of Activity
1	The service system supporting the health and wellbeing of children, young people and families in Logan was identified by as the geographic location of focus and used to frame the sample selection of participants.
2	A comprehensive mapping of all community assets and resources for children and young people (unborn to 15 years) and their parents/carers was conducted as part of the broader program of research. These assets were then synthesised into 66 distinct types of programs and activities that were currently being run in the region and described for participants in a written resource book. As the first workshop activity (beyond icebreaker activities) participants were asked to review the current activities independently in consideration of the following question; “According to your experience and knowledge, what do you consider the most important factors in the system of care to support the thriving of children and families in Logan?”. From this activity each participant identified what they considered to be their main two focal system factors.
3	Participants formed small groups of 3 to 5 to brainstorm the service system using the independently selected focal factors to “seed” the map. To initiate the session, each participant discussed their chosen focal factors and why they were considered to be important.
4	Following the introduction of the focal factors, emergent system factors and their connections were visually depicted by a group scribe using the following prompts; what are the most important factors, what are the connections between these factors, and what is working well and what is not working well (within the service system).
5	The small groups then each selected 2 to 4 key system factors and using the round robin technique, the facilitator solicited one factor from each group. These were listed onto a whiteboard for the whole group to view and were further refined through facilitated discussion seeking clarification, elaboration and/or removal of duplication. The explicit purpose of this activity was to use the diverse viewpoints from experts working within the system to develop a deeper understanding about system factors, such that emergent themes or topics were extricated and then further explored.

mapping activity a stakeholder register was created including details of all relevant contacts for programs and services being conducted in the region. Secondly, service providers were categorised as key, primary, or secondary stakeholders in service system. Finally, from the list of key and primary stakeholders 91 individuals from 68 distinct organisations were identified as potential participants and were invited to join a workshop session.

Of those invited, 39 registered to attend (response rate of 42.9%) and 32 (participation rate of 35.2%) attended. Three workshops were held during October and November 2021 and included 9, 12, and 11 participants respectively. The majority of the participants were female ($n = 25$, 78.2%) and born in Australia ($n = 27$, 84.4%). Participants were from a range of ethnic backgrounds, with more than half ($n = 21$, 62.5%) identifying as White Australian or New Zealand European (Pakeha), 2 identifying as Aboriginal and/or Torres Strait Islander peoples, 6 identifying as Pacific Peoples (Māori and Samoan) and 3 not indicating their ethnicity. The participants were, on average, highly educated with 21 (65.6%) graduating with a Bachelor’s or advanced degree. The majority of participants ($n = 26$; 81.3%) indicated that they engaged in paid work in the region, and of the remaining participants 3 indicated that they engaged in voluntary work and another 3 undertook both paid and voluntary work in the region. The amount of time participants had worked (paid or unpaid) in the region ranged from 3 months to 35 years with a median of 15 years.

All workshops took place in person in Logan, Australia, two of which were conducted in rooms on a university campus and one in community rooms. These workshops were conducted during the COVID-19 pandemic at a time when there were no local restrictions on assembly in place. Therefore, precautionary measures were instated (e.g., check-in processes, sanitisation) but no specific regulations were enforced. The workshops were facilitated by two researchers who guided the participants through the distinct stages of the workshop (see Table 1 for details). These facilitators were assisted by two additional research assistants, all of who were trained by the lead researcher (author 1) to support stage four of the workshop; the visual depiction of system factors and their connections within small groups. These systems maps were developed on large sheets of flip paper in small groups (3 or 4 in each workshop) as supported by a trained member of the research team. Furthermore, in each workshop, an overall depiction of the system was also summarised by participants with the support of the facilitators on a white board. The lead researcher (author 1) was an active observer throughout the process of the workshops and took field notes to support observations.

2.4. Data analysis

Data analysis comprised two main steps. In the first step all factors identified and the connections between them from the participatory systems maps created in the workshops were collated and digitised into an excel database. The second step comprised the creation of a digital systems map in kumu.io (an online tool that visualises relationships through systems mapping; Kumu, 2023), conducting a leverage analysis, and developing causal loop maps. These steps are outlined in more detail below.

2.4.1. Collation of systems database

Across the three workshops, 15 maps were produced (12 small group submaps and 3 high-level workshop maps each depicting a summary of the submaps). The different factors that influence the health, education, and wellbeing of children, young people, and families in the service system, and their connections (the positive or negative links) were collated by the first author. This process consisted of coding each unique factor and its connection to other factors as represented in each of the 12 submaps into an excel database by the lead researcher. This initial coding used the discourse of the workshop participants to name factors. Connections between factors were depicted as per the direction of the

arrows captured in the submaps and were weighted by the number of times they uniquely appeared; where a connection was depicted once across the 12 submaps it was weighted as 1, but where it was depicted in two distinct maps it was weighted as 2. Therefore, the total possible weighting ranged from 1 – 12. The connections between factors also provided the direction of association (sometimes labelled polarity or valence) identifying whether the relationships between system factors were positive (as one increases, so does the other) or negative (as one factor increases, the other decreases). After coding the submaps, the 3 overall workshop maps were examined to ensure no unique connections were missing, and finally a complete set of factors and connections were developed. Upon enumerating all of the unique system factors and connections present across the submaps, the coding was checked for replication and was condensed to reduce redundancy. Furthermore, factors were clustered into thematic categories to better illustrate the complexity of the system. The data were checked to ensure all information had been collated correctly by another member of the research team.

2.4.2. Systems mapping

Once the database was complete this was imported into kumu.io (Kumu, 2023) to create an interactive system map and analyse the influence of each factor within the overall system. Social network analysis was used to assess the structure of the system, to examine influential factors, and to highlight leverage points (which represent potentially modifiable parts of a system that influence other factors, Meadows and Wright, 2009) via the calculation of centrality metrics. Following the methods of leverage analysis as outlined in Murphy and Jones’ (2020) research, we report on both weighted and unweighted centrality metrics of degree (the number of connections), indegree (the number of incoming connections), outdegree (the number of outgoing connections), as well as metrics of betweenness (frequency of being in a pathway between factors), closeness (average length of pathways between factors), and eigenvector (degree of connectedness to highly connected factors). Given the complex nature of the final system map, focused causal loop diagrams (CLD) were created to highlight key pathways and intervention points that could be leveraged between highly influential factors to elicit change within the system (Baugh Littejohns et al., 2018; Brereton and Jagals, 2021).

3. Results

The initial data comprised 52 distinct factors and 179 unique connections. To reduce redundancy, the data were condensed into 36 factors and 149 connections. The full set of factors are defined in Table 2 and the overall systems map can be viewed online at: <https://kumu.io/jstuart/participatory-systems-map#full-map>. Factors were clustered into three domains based on thematic similarities. Aspirations were defined as the ideal result of service system reform. Service factors were defined as focused on the operations, needs, strengths, and/or weaknesses of services, and user factors were defined as those focused on characteristics and/or needs of residents in place and of service systems users. Both service and user factors were further conceptualised as either positively (enabler; E) or negatively (barrier; B) contributing towards aspirations. Of the service factors, 14 were categorised as enablers and 4 as barriers; of the user factors 7 were enablers and 7 were barriers.

The results of the leverage analysis (see Table 3 for full details) highlight that aspirations were consistently the most linked in terms of centrality metrics; number of connections (degree), number of incoming connections (indegree), and connections to highly connected factors (eigenvector). The key reason for this is that these factors represent idealised outcomes of the system which is evidenced by the much lower number of outgoing connections (outdegree) as well as low ratings on betweenness and closeness. The interrelationships between aspirations in the system are examined in the analysis of the subsequent CLD, and as such are not described further in this section.

Table 2

Factors of the service system that influence the health, education, and wellbeing of children, young people, and families, as grouped by aspiration, service and user domains.

Factor	Description
Aspiration	
Connected Places	Safe, local, and accessible spaces within community for positive engagement between services and residents and/or between diverse services, where connections, collaborations, and relationships can be built and maintained. These represent both physical and social spaces where services are integrated and/or co-located in commonly accessed locations such as community hubs or schools as well as places and spaces where residents can come together as a community.
Early in Pathway	Availability and accessibility of proactive and positive health and education to support children, young people, and families early before problems emerge or become entrenched. This could be early in life, or early in the developmental trajectory, where support is both targeted and embedded in a universal framework.
Service Coverage	Presence and delivery of services that are provided when and where they are culturally appropriate, and suitable to those who want and need them. They support health, education, and wellbeing across the lifespan, and are inclusive of diverse needs and characteristics of children, young people, and families.
Wellbeing	Communities, families, and children who are residents in place, achieving and maintaining positive outcomes. This includes service systems promoting holistic forms of wellbeing – rather than acting to reduce the impact and likelihood of adverse experiences or focussing on health/developmental issues.
Service	
Accessibility (E)	Services that are easily utilised by community members/users in an appropriate time and space of their choosing. This includes awareness of community strengths, referral pathways, location, service opening hours and ongoing involvement.
Advocacy (E)	Championing the needs of families within service systems in ways that leverages on the power of providers to take action on behalf of, support, or defend community residents.
Capability Building (E)	Increasing the capacities of existing providers and services, as well as residents and communities, via intentional skill building (i.e. education, training, and development).
Collaboration (E)	Engagement, meaningful coordination, and connections between service providers including co-case management, joint service delivery, warm referral pathways, shared funding, and understanding of other providers within the service system.
Continuity (E)	Consumer experience of consistency and stability of practitioners, services and programs that are provided.
Cost (B)	User-pays or need for additional financial outlay to access needed services, particularly for positive and preventative activities which support and maintain wellbeing for children, young people, and families.
Evidence (E)	Action and activities that are research and data driven, where providers to have access, capacity, and support to evaluate, assess, and adapt services based on evidence.
Funding (E)	Effective and responsive economic support models that are consistent, ongoing, commensurate with need and are adaptable to community/client needs as opposed to fitting needs to available funding such as pre-determined dosage, timeframes, acceptance criteria or unstable funding.
Governance (E)	Operational accountability and decision-making structures that are inclusive of community voices, accountable to needs, and transparent in decision-making.
Inclusion (E)	Services and service models where users feel welcome and are accepting of diverse experiences and backgrounds. This reflects, but is not limited to, diversity across cultures, socio-economic resources, abilities, and/or family experiences.
Location (E)	Physical proximity of service site to transport, alternative means of accessibility, and other key or frequently used providers (i.e., co-location).

(continued on next page)

Table 2 (continued)

Factor	Description
Rationing (B)	Activities taken by services due to inadequate resourcing, such as narrowing acceptance criteria, triaging and long or closed wait lists, which result in children, young people, and families unable to receive the support they need.
Referrals (B)	Pathways to engage with services and programs that require referrals from third parties, adding additional steps and difficulties for families and young people accessing care.
Service Culture (E)	Internal attitudes within service provider settings often have downstream impacts from leadership approaches.
Support and Relationships (E)	Supportive, ongoing relationships amongst community members and service providers, as well as connections and/or relationships between service providers.
System Navigation (B)	Skills and knowledge required to identify, access, and engage with providers within the service system.
Universal Services (E)	Services that are to be available to everyone at all stages of life or severity/complexity, rather than just remedial or with narrow/topic-specific acceptance criteria.
Workforce (E)	Sufficient, skilled, and supported paid and volunteer provider staff working within the service system.
User	
Disability (B)	Children and carers experiencing differences in abilities (physical, psychiatric, developmental, neurotypicality) which impact both service needs and their capacity to access support.
Diversity (B)	Diversity of experiences and backgrounds of children and young people within communities. Diversity across cultures, socio-economic resources, health and disability status, immigration status and family experiences (and other forms of diversity).
Domestic Violence (B)	Experiences of and exposure to violence within family and intimate relationships – including physical, verbal, emotional, sexual abuse, and coercive control.
ECE and School (E)	The availability, accessibility, policies, and procedures of formal educational activities and facilities including early learning, primary and secondary education.
Help-Seeking (E)	The ability for those who need assistance to seek help in a safe and effective way.
Housing Instability (B)	Lack of safe and stable housing including limited social or affordable housing, lack of renter's rights or tenancy stability, only transitional housing for families leaving violence.
Lack of Knowledge (B)	Gaps in information around childhood and adolescent development and needs, as well as service access and service navigation.
Life Skills (E)	Universally required skills, such as cooking, budgeting or shopping that enable community residents to effectively function.
Parenting (E)	Engaging and supporting healthy parenting practices including practical and holistic home-based assistance and involves the whole family unit, in particular fathers.
Play and Fun (E)	Orientation of services towards positive, developmentally and age-appropriate experiences that promote enjoyment and recreation while at the same time serve a purpose of positive outcomes.
Stigma and Shame (B)	Disengagement from services or reluctance to access services due to negative experiences or perceptions concerning services cultures, service provisions, and the effectiveness of these.
Trust (E)	Trusting relationships existing between users and service providers to support users to access and navigate the system.
Voice (E)	The need for children, young people, and families to have a voice in and agency over the services they access and are available to them.
Vulnerability (B)	Experience of high levels of exposure to risk factors (such as experiencing trauma, exposure) and unmet basic needs. Some children and young people experiencing multiple areas of vulnerability which lead to poorer outcomes within systems.

Note:
 (B) = Barrier.
 (E) = Enabler.
 ECE, Early Childhood Education.

3.1. Leverage analysis

In identifying the key leverage points, *aspirations* were excluded, and the remaining 32 *service* and *user* factors were ranked based on their ratings the centrality metrics of eigenvector, betweenness, and closeness. Factors with high eigenvectors are closely connected to other influential factors, suggesting that if they are modified they can stimulate change within the rest of the system directly. *Help-seeking*, an enabler representing the ability of those who need assistance to seek help safely, was ranked the highest on this metric. This was followed by *support/relationships*, an enabler indicating the need for supportive, ongoing relationships amongst community members and service providers. Ranking based on betweenness, indicating the key factors through which changes could be spread through the system, found that *play/fun*, an enabler highlighting the need to orientate services towards positive developmental experiences and joy, and *funding*, an enabler representing ensuring that services have enough and appropriate economic support, were most highly ranked on this metric. Ranking based on closeness - indicating the shortest path from a factor to all separate factors in the system both directly and indirectly (via gateways / bottlenecks) connections found distinct levers. The highest ranked factors on this metric were two user-orientated barriers; *vulnerability*, a barrier highlighting the difficulties of the most vulnerable residents in utilising services, and *stigma/shame*, a barrier representing disengagement due to perceptions that service users have negative characteristics. However, there were also two highly ranked service-orientated enablers; *universal services*, the need for services to be open to everyone, and not just be remedial, and *inclusion*, where services make users feel welcome and are accepting of diverse experiences and backgrounds.

3.2. Degree analysis

Ranking based on the number of total connections (degree) as well as connections into the (indegree) and out of the factor (outdegree) were then conducted on the 32 *user* and *service* factors. Because high-degree factors are well-connected; they are sensitive to changes in the system. *Accessibility*, an enabler that highlights the need for services to be easily able to be utilised by users, and *support/relationships* had the largest overall number of weighted connections ($n = 27$). For *accessibility* half of the connections were in-degree (12) and half were out-degree (15), indicating that this factor influenced and was influenced by other factors in the system relatively equally. In contrast, for *support/relationships* only 6 connections were in-degree and 21 were out-degree, meaning this factor tended to influence other factors more than it was influenced itself. The next most connected factors were *parenting*, an enabler that highlights engaging and supporting healthy parenting practices, and *vulnerability*, a barrier representing high levels of exposure to risk factors ($n = 20$ respectively). *Parenting* had 8 in-degree 15 out-degree connections, whereas *vulnerability* had 4 in-degree and 16 out-degree connections. The top-10 factors with the highest degree of connectivity are shown in Fig. 1. Of note, *help-seeking* received the highest number of incoming connections, where *vulnerability* had the highest number of outgoing connections, overall both *vulnerability* and *accessibility* had the highest degree of connectivity. These ten factors represent the *service* and *user* factors that are the most sensitive to changes in the system. Due to the large number of potential levers identified, the final CLD analyses focus only on the factors with the highest degree of connectivity; *vulnerability* and *accessibility*.

3.3. Causal loop diagrams

Given the complexity of the system, a series of CLD were developed to examine specific areas of the overall PSM. Firstly, a CLD on the factors defined as *aspirations* was conducted to examine their interrelationships. Secondly, two CLDs were developed focusing on *accessibility* and *vulnerability* as these represented key leverage factors as per subsequent

Table 3

Leverage analysis of factors of the service system that influence the health, education, and wellbeing of children, young people and families, as grouped by aspiration, service and user domains.

Factor	Degree		Indegree		Outdegree		Betweenness	Closeness	Eigenvector
	UW	W	UW	W	UW	W			
Aspirations									
Connected Places	30	64	21	47	9	17	0.250	0.380	0.130
Early in Pathway	23	35	15	23	8	12	0.100	0.340	0.110
Service Coverage	14	30	12	27	2	3	0.010	0.240	0.100
Wellbeing	25	66	25	66	0	0	0.000	0.000	0.150
Service									
Accessibility (E)	11	27	6	12	5	15	0.030	0.310	0.040
Advocacy (E)	4	6	0	0	4	6	0.000	0.300	0.000
Capability Building (E)	5	13	2	3	3	10	0.000	0.260	0.010
Collaboration (E)	5	7	0	0	5	7	0.000	0.320	0.000
Continuity (E)	4	4	1	1	3	3	0.000	0.230	0.000
Cost (B)	3	5	0	0	3	5	0.000	0.270	0.000
Evidence (E)	5	6	1	2	4	4	0.040	0.270	0.030
Funding (E)	9	14	4	4	5	10	0.050	0.320	0.010
Governance (E)	5	7	2	2	3	5	0.000	0.280	0.000
Inclusion (E)	5	5	0	0	5	5	0.000	0.350	0.000
Location (E)	4	7	0	0	4	7	0.000	0.300	0.000
Rationing (B)	3	5	0	0	3	5	0.000	0.270	0.000
Referrals (B)	4	5	0	0	4	5	0.000	0.290	0.000
Service Culture (E)	4	5	1	1	3	4	0.000	0.270	0.000
Support and Relationships (E)	9	27	3	6	6	21	0.040	0.320	0.060
System Navigation (B)	7	13	4	6	3	7	0.010	0.260	0.030
Universal Services (E)	5	7	0	0	5	7	0.000	0.360	0.000
Workforce (E)	9	13	7	11	2	2	0.020	0.250	0.020
User									
Disability (B)	4	5	1	1	3	4	0.000	0.270	0.000
Diversity (B)	7	11	1	1	6	10	0.000	0.340	0.000
Domestic Violence (B)	6	8	2	3	4	5	0.000	0.300	0.000
ECE and School (E)	6	8	3	5	3	3	0.010	0.240	0.030
Help-Seeking (E)	8	9	8	9	0	0	0.000	0.000	0.100
Housing Instability (B)	4	5	2	2	2	3	0.000	0.240	0.000
Lack of Knowledge (B)	8	18	3	6	5	12	0.010	0.300	0.040
Life Skills (E)	5	5	0	0	5	5	0.000	0.310	0.000
Parenting (E)	10	23	5	8	5	15	0.020	0.290	0.020
Play and Fun (E)	6	13	2	2	4	11	0.050	0.280	0.030
Stigma and Shame (B)	8	13	2	3	6	10	0.000	0.360	0.000
Trust (E)	6	8	3	4	3	4	0.010	0.250	0.050
Voice (E)	10	19	7	9	3	10	0.010	0.260	0.050
Vulnerability (B)	11	20	3	4	8	16	0.010	0.380	0.000

Where: B, Barrier; E, Enabler; ECE, Early Childhood Education; UW, unweighted; W, weighted.

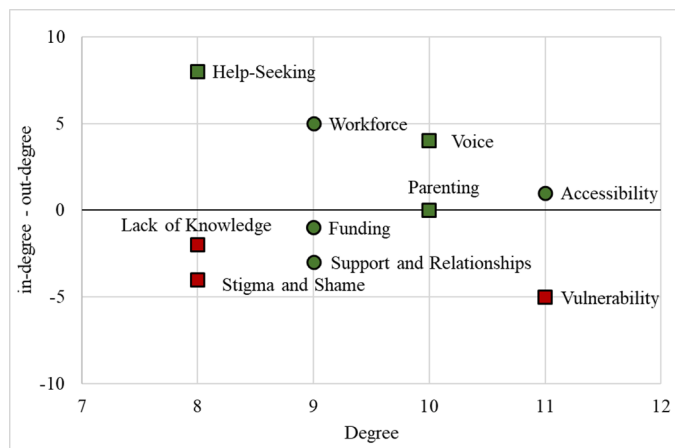


Fig. 1. Connectivity of the top-10 most connected factors, showing the unweighted difference in-degree and out-degree connectivity, versus overall degree for the service system.

Where: circle = service domain factor; square = user domain factor; red shape = barrier; green shape = enabler

analyses.

As illustrated in Fig. 2, the interrelationships between the four aspiration factors clearly illustrate that wellbeing is exogenous, with a

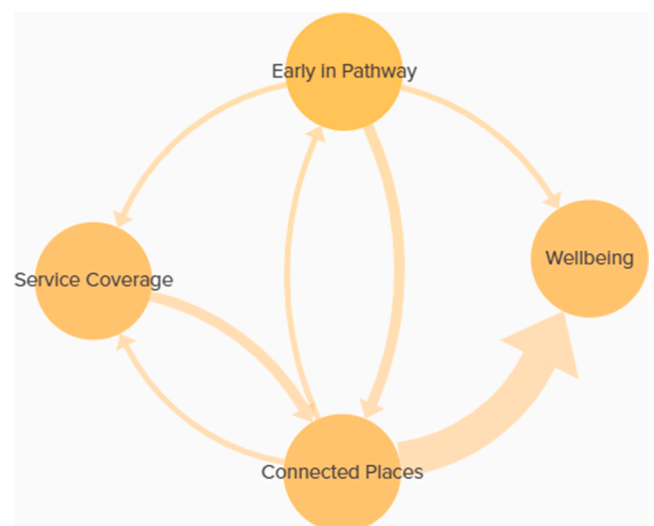


Fig. 2. Causal loop diagram of aspirations.

Note: Solid lines represent positive relationships, the thicker the line the more heavily it was weighted

strong pathway (weight = 7) leading from *connected places* and a weaker pathway from *early in the pathway*. Furthermore, there is evidence for a mediated relationship (a gateway) between *service coverage* and *wellbeing* such that the greater focus on increasing the number and variety of people who receive support from the service system, the more likely *connected places* are to be viable, and in turn, to increase child, family, and community wellbeing. The CLD also shows evidence for loops between *connected places* and both *service coverage* and *early in the pathway*, with stronger in-degree than out-degree connections. These results suggest that *connected places* are a critical gateway for systems to achieve desired positive change for children, young, people, and families in place.

As illustrated in Fig. 3, the interrelationships between *accessibility* and other factors of the system highlight that this factor is a key conduit between other factors and *aspirations*. Specifically, *accessibility* strongly promotes *connected places* (weight = 7) as well as relating directly to both *early in the pathway* and *wellbeing*. Most of the sub-factors have direct relationships to *accessibility*, with *funding*, *location*, and *diversity* positively impacting, with only *parenting* showing an indirect positive effect via *aspirations*. The CLD also illustrates a critical negative feedback loop between both *stigma/shame* and *domestic violence* whereby the more vulnerable a child or family is, the more stigma they experience and vice versa.

loop between *lack of knowledge* and *accessibility* whereby the more readily people can access services, the less prevalent *lack of knowledge* of available services is (weight = 4), and the less knowledge, the lower the levels of *accessibility* (weight = 2).

As illustrated in Fig. 4, similar to *accessibility* (but in the opposite direction), the CLD for *vulnerability* highlights that this factor is a critical influence on *aspirations*. Specifically, *vulnerability* is strongly negatively associated with *wellbeing* (weight = 5) and less so (weight = 2) with both *early in the pathway* and *service coverage*. In contrast to *accessibility*, which was predominantly a mediator (a gateway) of other factors, *vulnerability* is a strong influence on key *user barriers* (a bottleneck), which compounds its negative effect on *aspirations*. Specifically, *vulnerability* is positively associated with *housing instability*, *stigma/shame*, and *domestic violence*, all of which have negative associations with *aspirations*. The CLD also illustrates critical negative feedback loops between both *stigma/shame* and *domestic violence* whereby the more vulnerable a child or family is, the more stigma they experience and vice versa.

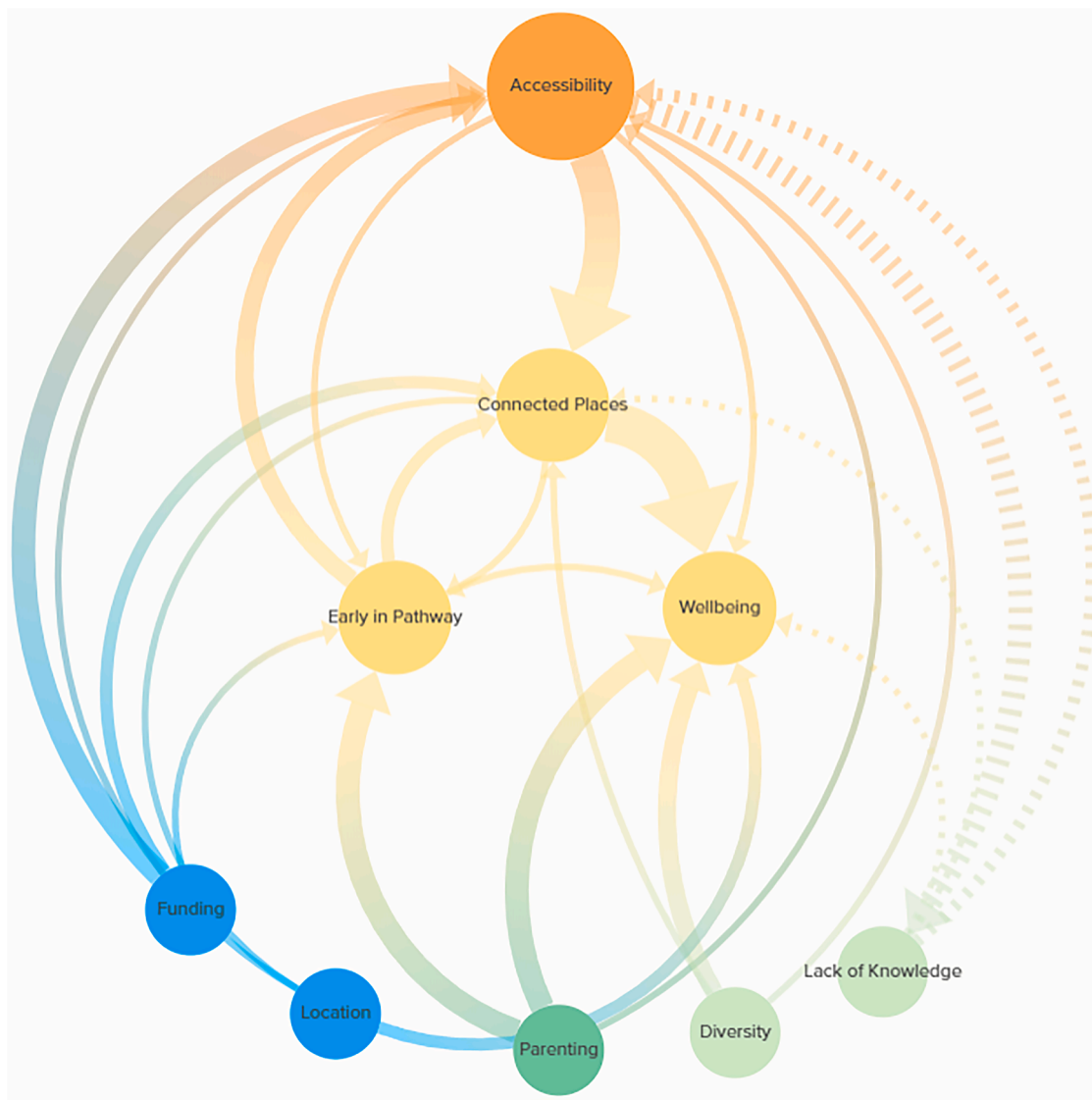


Fig. 3. Causal loop diagram of accessibility.

Note: Solid lines represent positive relationships and dashed lines represent negative relationships. The thicker the line the more heavily it was weighted. The key leverage factors are coloured orange, *aspirations* are coloured yellow, *service enablers* are dark blue, *user enablers* are dark green and *user barriers* are light green.



Fig. 4. Causal loop diagram of vulnerability.

Note: Solid lines represent positive relationships and dashed lines represent negative relationships. The thicker the line the more heavily it was weighted. The key leverage factors is coloured orange, aspirations are coloured yellow, and user barriers are light green.

4. Discussion

Systems thinking suggests that to shift complex problems (such as place-based disadvantage) it is necessary to understand what levers have the greatest chance of achieving a desired improvement (Meadows and Wright, 2009; Pourbohloul and Kienny, 2011; Atun, 2012). However, before we can identify the appropriate drivers for change it is important to illustrate and make sense of core factors comprising the system and the interrelationships between these. In this research, using a PSM approach, we demonstrated that the service system supporting children, young people, and their families in a region experiencing disadvantage, is a complex and densely connected network. Our approach helped us to understand the patterns in system behaviours from service providers perspectives (those who are deeply embedded in and knowledgeable) to identify potential opportunities to engage in service system reform. We found that at the centre of this system were four key aspirations, or shared understandings amongst providers of the most important factors

to support the wellbeing of children and young people.

Wellbeing, meaning the dynamic process that emerges from the interactions between a person and their environment in ways that enable good health to emerge and be maintained (Minkinen, 2013), was found to be a central factor. In fact, wellbeing can be seen to be the ultimate aim of the service system, where resources are allocated, distributed, and managed based on enabling a healthy and well resident population in place. Our research found that the other aspirations; connected places, early in the pathway, and service coverage, were conceptualised as directly or indirectly promoting wellbeing, meaning that these were understood as the most prominent levers for positive outcomes at the level of the community, family, and individual child.

Together the aspirational factors identified represent an idealised system structure that, (1) enables physical and social spaces and places of community, family, and service connection (i.e. connected places) where, (2) relevant, comprehensive services are offered and taken up by those who need them when they need them (i.e., service coverage), (3)

such that prevention and intervention efforts are early, and thus more efficacious (i.e., *early in the pathway*). Effectively, our results support previous research, finding that to be functional in achieving its aims of increased wellbeing amongst residents, the service system must be available when and where people need it, as well as being interconnected, proactive, and adaptable (Winkworth and White, 2011; Moore et al., 2016; Jose et al., 2021). Recently Knight and Baldwin (2022) argued that to improve the service system for families and children in disadvantaged contexts all stakeholders should actively avoid making fragmented, discrete, ill-informed, or short-term decisions, although they did not provide specific ways to achieve this in practice. Our findings highlight leverage points to shift the system and improve outcomes (i.e., *aspirations*), indicating areas of action as well as outlining barriers and enablers to enacting changes.

4.1. Levers of system change

In mapping the service system from the perspective of service providers we were able to identify a variety of factors that are predicated on community knowledge and expertise, and thus likely to be highly influential in the system supporting children, young people, and families in this specific region (Minkler, 2005; Israel et al., 2010). Indeed, we found that there is a great degree of complexity in both the features of the system and their interrelationships, with 36 unique factors considered to be important in the functioning of the system. Importantly, factors identified as barriers or enablers (those factors that are risks to or promote *aspirations* respectively) of system functioning were relatively evenly distributed across characteristics and needs of users ($n = 14$) and of services ($n = 18$). This finding supports systems thinking approaches where to mitigate place-based disadvantage and encourage wellbeing in contexts of marginalisation or deprivation, it is not enough to work at the level of the individual (Kania et al., 2018). Rather positive outcomes need to be understood to result from a complex interplay between individuals and their environments, which can be achieved by shifting attention to the system itself.

In taking this approach we were able to highlight key leverage points, or places where changes in a particular factor are likely to be influential to the reforming, or achieving the ideal state of, the whole system. For example, *connected places* were identified as a service aspiration with an influence on child and family wellbeing and as a gateway to between other aspirations (*service coverage* and *early in pathway*) and wellbeing. This suggests increasing local and collaborative spaces within community for positive engagement between residents as well as with and/or between diverse services is an important mechanism to facilitate access to early-intervention support across more of the community as a key lever to promote positive outcomes.

A variety of specific factors were also evident when assessing different metrics of centrality and analysing connectedness including notable *service* factors (*accessibility, support/relationships, funding, evidence, universal services, and inclusion*) and notable *user* factors (*vulnerability, stigma, play/fun, parenting, help-seeking, and voice*). Although it is outside of scope of this study to discuss each of these features of the system in detail, there are evident feedback loops for *accessibility* and *vulnerability* in particular. For instance, supporting previous research, the results indicate that when accessibility is increased, relationships are centralised, and inclusion is promoted, the most vulnerable service users are likely to become more engaged, stigma is reduced, and help-seeking is increased, leading to reduced inequities in health and wellbeing (La Placa and Corlyon, 2014). Yet when these enabling features of the service system are absent, it has been found that users are likely to avoid services, and experience increased shame, judgement or guilt when engaging (Kemp et al., 2019; Winkworth et al., 2010). Vulnerability was identified as a critical factor in the service system and strategies to target key drivers of this issue for people in community (such as housing and family violence service provision) could be highly influential in improving the effectiveness of the system, and in turn, outcomes for

children and families. Our findings highlight the complexity and interrelationships between barriers and enablers of systems change whereby there are possibilities for both positive and negative feedback loops.

It is noteworthy that within this study that the description of system factors as “barriers” or “enablers” was based on the discourse used by participants in the workshops, however, these are not a static representative of factors as they currently exist. Specifically, some of the service-orientated factors such as *accessibility* and *funding* models were identified as enablers of positive outcomes, but these were noted as lacking within the context of the research. That is, participants discussed these enablers in terms of the ways that they *could* enable a positive future state of the system. Whereas some of the user-orientated factors such as *diversity* and *vulnerability* were identified as barriers due to how they were perceived to operate in the current system to either exclude, marginalise, or decrease positive outcomes for some groups of residents. Notably, participants discussed that such factors could be changed from barriers into enablers through systems reforms focused on support and inclusion. These results emphasise that the PSM should not be taken as a full and complete representation of the system as it is, but rather as a co-created depiction of the factors salient to the participants at the time of data collection. Therefore, depending on who the participants are, the modelling results may vary and there is a need to focus on meaning-making for the specific community in question rather than attempt to generalise the findings across contexts.

4.2. Strengths and limitations

A key strength of this research was the participatory nature of the design whereby the system was not defined by outside experts, but rather by those who know, experience, and understand the issues as they manifest in place (Vaughn et al., 2013). As such, the research can be seen to focus on problems of importance to the community, generate culturally relevant knowledge connected to lived experiences, and thus be more readily translated into action (Leung et al., 2004). However, as this study was conducted in one community and results are not suggested to be generalisable, but may certainly be considered to be robust in terms of validity and, as such, offer many possibilities for transferability to other, similar contexts. Although we were able to gather rich, comprehensive, and novel insights from these data, a limitation of this research was the diversity of voices represented in the workshops. We sought to examine the perspectives of service providers broadly (using a targeted sampling approach), but there is a risk that the diversity of voices did not reflect the diversity within the community, or did not include those more niche, hard to reach, or already overburdened providers. It is also recognised that the perspectives of service providers are distinct from service users and more generally from the community of residents who may (or may not) utilise services.

4.3. Implications and future research

There are critical policy implications concerning the barriers and enablers for service systems reform that were found in this research, both within the location where the research took place as well as more broadly. Specifically, exploring system factors (and pathways between them) can help to shape where priority areas of additional research and investment should be targeted, as well as highlighting reasons why current resourcing models may be ineffectual in reducing the negative effects of place-based disadvantage. Additionally, as suggested by Stewart and Ayres (2001) adopting a systemic perspective can assist policy makers in anticipating implications of change in one part of an interconnected system and offer new ways to conceptualise the impacts of policies. We concur with the importance of understanding reciprocal, often misunderstood or unexplored connections between the parts of a complex, real-world system to achieve reform. Therefore, while this study did not aim to generalise, further research should be conducted to

identify whether similar approaches to systems mapping and even similar systems factors identified here can be applied to other communities. Future research should also seek to broaden perspectives, potentially extending the method to combine mapping activities with community residents, service providers, and other decision makers (e.g., funders, government representatives, and researchers) to help identify gaps in understanding. Finally, future research may consider how the process of PSM can be employed as a methodologically sound decision-making tool for identifying areas where social and economic investments are most likely to lead to positive change. In turn, taking such a rigorous, evidence-based approach to explore complex and intractable issues can assist policy makers and researchers alike to effectively address the interconnected problems associated with and contributing to place-based disadvantage.

4.4. Conclusion

By highlighting the perspectives of community experts (rather than those outside of the system), we created a novel, nuanced, complex, and interdisciplinary map of factors that influence the service system in supporting children, young people, and families living in a disadvantaged region. The many connections between these factors and potential gateways and bottlenecks demonstrate the challenge with finding solutions to complex problems such as place-based disadvantage. Entrenched disadvantage poses major difficulties for efforts to improve health and wellbeing, particularly within rapidly changing social contexts that are continuously responding to new opportunities and risks. It is well established that the experiences of children and families are closely intertwined with their neighbourhood living conditions and their access to health, educational, and social services - yet, there is not a singular approach to promoting positive outcomes that will fit all conditions. This research shows that identifying relevant leverage points can enable progress towards mitigating complex problems themselves without the need to solve the issue of complexity beforehand. Further work with community to identify specific factors will help to isolate relevant and contextualised leverage points in the system is needed, but this research provides the foundation for effective and efficient system reform.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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