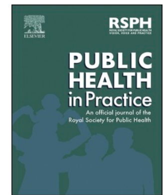
Public Health in Practice 9 (2025) 100579

Contents lists available at ScienceDirect

Public Health in Practice

journal homepage: www.sciencedirect.com/journal/public-health-in-practice



Developing and implementing whole systems approaches to reduce inequalities in childhood obesity: A mixed methods study in Dundee, Scotland

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ARTICLE INFO

Keywords:
Whole systems approaches
Public health
Childhood obesity
Health inequalities
Qualitative research
Peer researchers

ABSTRACT

Background: UK local authorities are developing and implementing Whole Systems Approaches to childhood obesity to tackle persistent and complex health inequalities. However, there is a lack of research on the practical application of these approaches. This paper reports on findings of a study into the initial implementation of this approach in Dundee, Scotland.

Study design/methods: We applied a mixed methods research design: 1) semi-structured interviews (n = 9) with partnership members; 2) training members as peer researchers to interview their wider networks; n = 17); 3) an online survey among wider stakeholders (n = 27); and 4) two action learning sets with decision makers. Interview data was analysed using thematic framework analysis and survey data was analysed using descriptive statistics.

Results: Dundee stakeholders stated that they had good knowledge of childhood obesity prevention efforts, but their engagement with working groups around identified priority themes was still limited, due to a lack of awareness about existing structures and knowledge about sustainable, impactful strategies, which were not always well-aligned between key organisations.

Conclusions: Our findings extend current literature on facilitators for Whole Systems Approaches in public health by highlighting that understanding of strategies and wider structures are crucial to build capacity and maintain engagement to address inequalities. We identified an ongoing need for targeted communication and diverse involvement opportunities for different stakeholder groups.

1. What this study adds

- While many local authorities across the UK are developing and implementing Whole System Approaches (WSA) to reduce inequalities in childhood obesity address health, there is a lack of research on their practical application.
- Developing and implementing a WSA to child obesity takes time and long-term commitment from stakeholders. This includes a willingness to accept that many factors that influence healthy child weight are outside individual actors' control and, therefore, a need to relinquish control and power as an individual organisation. This is not well supported and incentivised by existing funding and decision-making structures within UK local authorities.
- Trusting relationships alone are not sufficient to work across organisations and sectors, with understanding of strategies and the wider structures being crucial to build capacity and maintain engagement.

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https://doi.org/10.1016/j.puhip.2024.100579
Received 30 April 2024; Received in revised form 10 September 2024; Accepted 12 September 2024
Available online 21 December 2024
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2. Implications for policy and Practice

- Public health practitioners need to increase their understanding of available strategies to prevent childhood obesity and wider structures in their region in order to action local priorities identified in a WSA to child obesity.
- Targeted communication (e.g. for different ethnic community groups) and diverse involvement opportunities (events, activities, workgroups, online forums and newsletters) is important to increase the visibility of the approach at community level and for maintaining engagement in whole system approaches.
- Existing models and guidance, such as the Leeds Beckett model, need to be tailored to local needs and existing structures. Clear guidance in initial phases of WSA set-up should be combined with aligning the implementation with the organisations' values and goals.

3. Background

Childhood obesity is recognised as a significant public health challenge in the UK, including Scotland. Twenty-four percent of children in primary 1 (age 5 years) in Scotland have overweight or obesity. The proportion increases with deprivation: children and young people growing up in the most deprived communities are twice as likely to live with obesity as their peers living in affluent areas and this tracks into adulthood [1]. Research has highlighted the complexity of tackling obesity among children, with multifactorial causes that include genetic, behavioural, socioeconomic, and environmental factors [2], [3].

In response, systems approaches have been promoted in the UK over the last 10 years by Government [4,5] and funders [6], with resources and support being made available to local government to implement a Whole Systems Approach (WSA) to Obesity, including practical guidance [4].

A complex systems model of public health conceptualises poor health and health inequalities as resulting from multiple interdependent elements within a connected whole. These elements may sometimes affect each other in subtle ways, impacting the entire system [2]. WSA therefore require a combination of upstream policy actions, which aim to improve social, cultural, economic and environmental factors that support a healthy weight, with downstream individually focused approaches [7]. These approaches need to be flexible and adapt over time in response to changes in dynamic contexts [8,9].

Therefore, WSA can take many forms; researchers [10] have identified ten key features that these approaches require to be more likely to be successful in tackle child obesity inequalities, ranging from strong leadership, and full engagement of all partners, to consistency in language used across organisations, and sufficient financial support and resources. These features have been validated and extended in recent research [11–13]. However, there is still a notable scarcity of published research on the evaluation of systems approaches in public health [2,10, 14], although studies have highlight the potential of this approach to drive community diffusion of knowledge and engagement in simulations [15].

Moreover, many studies focus predominantly on individual level interventions. For example, a Cochrane Review of 153 childhood obesity prevention studies [8] found that 60 per cent of interventions targeted educating people, mostly children, on how to make healthier decisions. Even if interventions focussed on changing the school environment, typically this meant training individual teachers on how to help children make healthier choices. The review urged researchers to evaluate changes and adaptations to system-level, by using alternative study designs (such as natural experiments and mixed design studies), which are more suited to complex issues like the prevention of obesity.

This paper offers the results of a mixed design study that evaluated stakeholders' views and experiences of being involved in the initial stages of the development and implementation of a WSA to Child Healthy Weight (CHW) in Dundee, Scotland, UK. In this evaluation we are mindful of context-specific circumstances and the need to localise evaluations by involving stakeholders in the design and conduct of the study. We built on existing approaches in the literature to evaluate system-level interventions; for example, by adapting an existing survey tool on the importance of stakeholder knowledge and engagement [16]. We also framed our interview using key themes developed in previous qualitative research with stakeholders by Jenkins et al. [17] in Australia (See Methods below and Supplementary file 2).

3.1. *Introducing healthy weight Tayside*

Dundee is Scotland's fourth-largest city with a population of approximately 148,000 people, of which 16 % are aged 0–15 years [18], and part of Tayside; the Scottish region combining the local authorities of Dundee, Angus and Perth and Kinross.

Levels of childhood obesity in Dundee City are above the Scottish average and show a marked social inequality. In school year 2021/22, 14.3 % of children in the most deprived areas were at risk of obesity and almost one third (30.5 %) at risk of overweight/obesity combined. In contrast, 7.9 % of children in in the least deprived areas were at risk of obesity and around one fifth (20.8 %) at risk of overweight and obesity combined [19].

Local strategy in 2019 set out ambitions to enable Tayside's children and young people to thrive, reduce the healthy weight disparity between the most and least disadvantaged communities and increase the percentage of children who have a healthy weight. The following year, Dundee City became a Scottish Government Early Adopter Area in applying the Public Health England WSA to Obesity Guide, piloting the approach to enable stakeholders to work differently and explore novel prevention strategies [20]. A core working group of two individuals from NHS Tayside's Public Health Directorate and one member of Dundee City Council Children & Families Service were trained [4].

Between December 2020 and September 2021, the core working group organised several stakeholder workshops and online events attended by over 100 local authority, NHS and third sector workers, community members and policy makers, to map the system, identify priorities, actions and set up working groups. NHS Tayside Public Health was keen to apply learning from the Dundee pilot, and implement the WSA to the other two Local Authority Areas within NHS Tayside (Angus and Perth & Kinross). They applied successfully for support from NIHR-funded Public Health Intervention Responsive Studies Teams (PHIRST) [21] in June 2021 to evaluate the initial development and early implementation of their approach [22].

4. Methods

The developmental evaluation aimed to understand the experience of initiating a WSA to CHW in Dundee and apply that learning to inform roll-out to the other Tayside local authorities. The evaluation followed the early development of the approach in Dundee (April 2022–March 2023) and was co-designed during three evaluability assessment workshops with stakeholders (n = 36) in Dundee between May and October 2021 (see Supplementary file 1 for more detail). The study asked: Does the approach taken in Dundee support key stakeholders to recognise what they can do in relation to actions at different levels within the system?

We applied a mixed methods research design consisting of semi-structured interviews (n = 9) with Dundee Healthy Weight Partnership's (DHWP), which is a multi-agency strategic group of 20 members from LA, NHS, third sector and charitable organisations who led on the development and implementation of the WSA. We trained these members as peer researchers in two online training workshops (n = 9) to interview their wider networks (n = 17). This method leverages established relationships between peer researchers and their interviewees [23]. Interviews lasted between 45 and 60 min and focused on participants' perceptions of the WSA and their understanding of the actions

they could take at different levels within the system, particularly in relation to child healthy weight in Dundee. Interview data was analysed using thematic framework analysis and survey data was analysed using scale and factor analysis.

The interview results were verified in an online survey among a wider group of stakeholders (n = 27) and developed into actionable recommendations using Action Learning Sets (ALS) facilitated by the research team (n = 2) [24].

The online survey employed a validated questionnaire: the Stakeholder-driven Community Diffusion Survey [16]), which comprised 43 statements across 11 domains. We modified this survey with the peer researchers to improve item comprehension and reduce response error. This resulted in 33 items across 8 domains. More detail on the survey responses can be found in Supplementary file 3.

The Action Learning Sets (ALS) brought together 18 commissioners, practitioners, third-sector representatives and local academics. Using deliberative dialogue [25], including structured questioning and reflection, participants explored the evaluation findings and agreed recommendations which they developed into action plans.

We report on the findings from interviews with local stakeholders and peer researchers (n = 36), complemented with findings from the survey and ALS. Interviews topic lists were co-developed with the peer researchers and structured around themes used in a study by Jenkins et al. [17], focusing on the development and implementation of WSA and exploring the participants' individual attitudes, beliefs, and experiences (More details in Supplementary file 2).

5. Findings

We identified four key themes in our analysis: 1) motivations and significant occurrences, 2) positive and negative factors, 3) areas of concern, and 4) adaptations for scaling up and sustainability.

5.1. Motivations and significant events

Participants were passionate and personally keen to contribute and committed to making a difference to communities as part of their work. Yet high interest did not always translate into engagement, with just over half of all stakeholders (57 %) feeling they have the influence and power to affect change, and are able to influence individual people or improve places (e.g., school environments, health centres and play space). Dundee stakeholders felt more able to leverage their role flexibly (88 %), based on mutual trust (96 %).

Interview findings demonstrated that the early stages of implementation took shape by bringing a range of people together across different organisations. They pooled rich knowledge and expertise, and developed joint responsibilities around the priority themes identified from the mapping exercises. Workshops and meetings organised by the core working group, helped participants defining their roles within this approach in relation to others.

> *"… this approach by Dundee, with many partners, from different streams attending the events organised showed its success …"* (DHWP member)

> *"And we put together, what our role was within that group at the time was to look at all that and try to put it all together in a sort of driver diagram."* (peer interviewee)

This resulted in commitment from participants and enhanced joint working within organisations with sharing of knowledge and ideas between organisations and other sectors. Wider stakeholders understand the issue of childhood obesity and underlying intervention factors, with the majority of stakeholders being aware of available resources and examples of local interventions to tackle this issue and factors.

> *"it is ensured through the team work, that you're part of the whole system …"* (peer interviewee)

> *"For me, it is sharing the skills to work with partners, and sharing the knowledge, and providing feedback, that's making it work well."* (DHWP member)

5.2. Factors negatively affecting the WSA

The approach was not always seen as a priority, particularly in the early phases. Stakeholders felt there were missed opportunities for joined-up working due to lack of awareness and communication between teams and organisations. This resulted in stakeholders not making full use of existing events, structures and networks.

> *"There are other pressing issues for all the groups involved, and WSA isn't a priority at the moment."* (DHWP member)

Underlying this silo-working, appears to be a lack of awareness among stakeholders about existing structures, such as regional partnerships, departmental groups and early years interventions programmes, and sustainable strategies for preventing unhealthy child weight in Dundee. For example, stakeholders felt that strategies and plans that make it easier for children to eat and drink well, play and be active were not well aligned between key organisations (31 % (strongly) agreed), and only 38 % (strongly) agreed that senior leaders in these organisations were working well together towards this goal (Fig. 1).

Stakeholders felt less knowledgeable about how to intervene to achieve sustainability in relation to long-term development and implementation of the WSA to CHW. Whilst 58 % of survey respondents felt comfortable in identifying strategies that were acceptable and appropriate for children and young people, 70 % struggled to identify strategies that could be sustained over time or have the greatest impact (67 %; .Fig. 2).

This suggests that more awareness of structures and strategies is a priority for the future development of the WSA. Silo-working and competing and wide-ranging priorities risk slowing down progress in embedding the approach. Stakeholders also highlighted the limited resources available to support the work in the context of public sector funding cuts.

5.3. Areas of concern

The WSA was not always visible at the community level in Dundee with local people often not being aware of the approach and activities taking place. Stakeholders wanted more opportunities for communities and parents to engage and more awareness-raising and training for members.

> *"Local people really being involved in maybe creating some kind of health promoting activities in the area for themselves and their children, but I don't see anything happening."* (DHWP member)

5.4. Adaptations for scaling up and sustainability

Stakeholders expressed concerns both around scaling up of the approach across other local authorities in Tayside and its sustainability over time in terms of resources (money and staff) in the context of ongoing public sectors cuts in Dundee. Mapping and linking of WSA-related activities across Tayside, such as cooking classes, nutritional advice for parents, physical activity sessions in community centres, and breastfeeding and weaning support, were seen as important next steps to align priorities and identify additional resources.

> *"the three councils of Tayside must collaborate and do the same thing as each other at the same time as each other, and must work tightly together, to get a nationwide approach."* (DHWP member)

> *"So, my concern would be that all the information they've gathered just sits there but nothing actually happens."* (DHWP member)

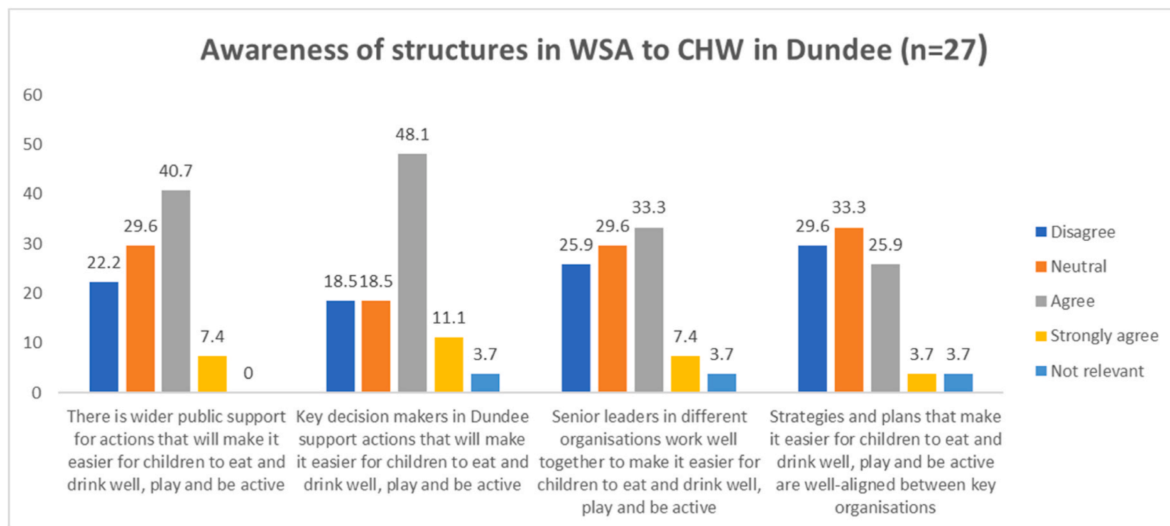

Fig. 1. Awareness of structures in WSA to CHW in Dundee (n=27).

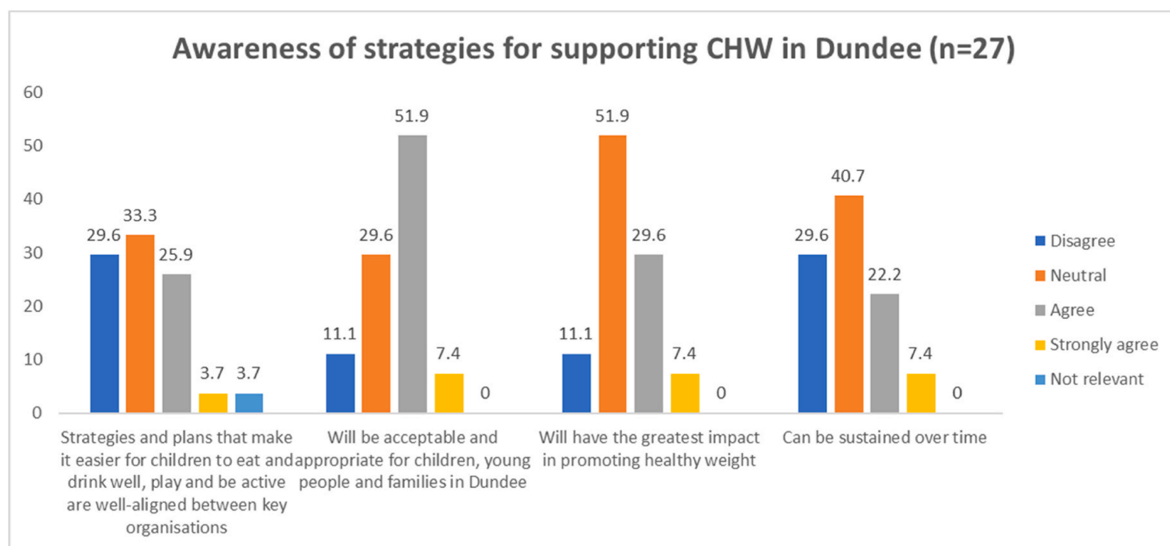

Fig. 2. Awareness of strategies for supporting CHW in Dundee (n=27).

To address participants' concerns about next steps, ongoing targeted communication and diverse involvement opportunities for different stakeholder groups were recommended by stakeholders in the ALS. Members of the Tayside Regional Improvement Collaborative (TRIC), who took part in one of the ALS, set promoting collective responsibility for the WSA to CHW across organisations and local authorities as one of their five priorities, including the sharing and co-production of resources (Table 1). They also prioritised visibility of the approach across Tayside by actioning the creation of a unifying brand and recognizable logo with tagline. To ensure sustainability, they started action planning around the concept of 'stickability': pledging as senior leaders to champion the WSA and supporting others in their networks to do so across the three local authority areas. Similar suggestions were made by DHWP members who took part in the second ALS.

Table 1
Top 5 priorities for the WSA to CHW identified in Action Learning Sets.

Dundee Healthy Weight Partnership Meeting	Tayside Regional Improvement Collaborative Meeting
1. Messaging around CHW/Using data to tell a story	1. Focus resources on Early Intervention and Assessment Planning
2. Development of a Community Engagement Plan with Community Partners	2. Promote collective responsibility for CHW
3. Alignment of Strategies and Agendas	3. Coproduction of resources/smarter resource sharing/3 tier mode – universal, targeted, specialist
4. Visibility – Celebrate the Small Wins	4. Visibility – Create a brand/ recognizable/logo/tagline
5. Solution Focused Approach to Addressing Resource Issue (at all levels)	5. Stickability – At senior level leadership across the three areas

6. Discussion

Stakeholders in Dundee had good general knowledge of early childhood obesity, but their engagement was still limited. This was due to a lack of awareness about existing structures and knowledge about sustainable and impactful strategies to prevent unhealthy child weight. Better alignment of activities and strategies delivered by key organisations and senior leaders working closely together is needed to achieve

their common goals. This can be described as systems stewardship: someone or a group of people who take responsibility for nurturing a healthy (obesity) system by helping create the conditions in which multiple actors and decisions makers can work effectively. For example, by making best use of collective relationships, insights and resources [26].

6.1. Added value

The key findings from our study build on the current knowledge base about WSA in public health. They confirm and extend the findings from the systematic review of Bagnall et al. [10] and others, which identified ten facilitators for WSA (see Table 2). For example, Breslin et al. [11] identified enablers which map well onto the ten key features, while their barriers highlighted lack of progress on features, such as inadequate training in WSA methodology (Capacity) and reverting to 'old ways' of non-WSA working (Embedding initiatives within a broader policy context).

Other studies [12] have looked at key mechanisms that contribute to a supportive whole systems environment. These expand on features, such as Engaging the local community, Capacity, and Good governance and shared values, by adding the need to tailor interventions to community needs and the usefulness of a specific focus within WSA on early years interventions to gain commitment from stakeholders.

Our study extends five of the facilitators for WSAs that emerged in the systematic review by Bagnall et al. (see Table 2). Workshops and events to map the system and identify priorities have allowed time for stakeholders to build relationships and trust across organisations (facilitator 2). In line with findings from Bird et al. [13], our study highlights the importance of public health specialists with funded time at a local level to act as champions and facilitators of whole systems approaches and to support engagement of local NHS leaderships (facilitator 3).

However, stakeholders in Dundee lack knowledge about strategies to prevent unhealthy child weight and this requires capacity building (facilitator 4). High interest does not always translate into engagement, with only a small majority of stakeholders feeling they have the influence and power to affect change. Although stakeholders in Dundee felt able to leverage their role flexibly, based on mutual trust, our evaluation adds that trusting relationships alone are not sufficient, with understanding of strategies and the wider structures being crucial to build capacity (facilitator 4) and maintain engagement.

There remain differences in priorities between organisations with work still going on in silos, resulting in missed opportunities to align and connect activities that need to be addressed through clearer communication strategies (facilitator 6) as mentioned in Bagnall et al. Our evaluation expands this facilitator by adding an ongoing need for targeted communication (e.g. for different ethnic community groups) and diverse involvement opportunities (events, activities, workgroups, online forums and newsletters).

Our study also highlights that communication is a particular concern for engagement with local communities (facilitator 7). Stakeholders felt that a lack of visibility of the WSA to CHW at community level meant that there were limited opportunities for local community participation. Previous research [27] has highlighted three core elements for community engagement in WSA: undertaking research with communities to gain insight and provide compelling stories of people's health and wellbeing for system redesign (community insight); working with existing communities through community development, social action, and support for grassroots approaches and community asset transfer (active communities); and developing infrastructures for ongoing engagement, co-production and participative decision-making, such as neighbourhood forums (participation infrastructures). Although community insight has been collected in Dundee through the WSA development process, sufficient support for grassroots approaches and community asset transfer was lacking. The priority themes workgroups

Table 2
Confirmation and extension of facilitators for whole systems approaches in public health based on Bagnall et al. (2019), Breslin et al. (2023), Salm et al. (2023).

Bagnall et al.'s (2019) list of 10 facilitators	What our evaluation confirms/extends	Breslin et at. 2023	Salm et al., 2023
Strong leadership and full engagement of all partners	Confirmation	The working group responsible for coordinating the system development comprising individuals with diverse expertise. Barrier: engaging all relevant stakeholders.	
Time to build relationships, trust, and community	Confirmation but trusting relationships are not enough	positive relationships between key personnel; barrier: high staff turnover	
Engaging the local community	Confirmation but understanding of strategies and the wider structures are crucial	buy-in at community and national levels	the ability to tailor interventions to community needs
Capacity	Stakeholders need to have knowledge for capacity building to be effective	Barrier: inadequate training in WSA methodology	governance structures and capacity that enable cross-sectoral collaboration
Good governance and shared values	Confirmation	belief in WSA effectiveness; and existing governance structures.	a citywide framing of obesity solutions in the context of a 'whole system' approach; governance structures and capacity that enable cross-sectoral collaboration; a commitment to early years intervention such as breastfeeding promotion
Appropriate partnerships to create sustainable multilevel environmental change	Confirmation but there is an ongoing need for targeted communication and diverse involvement opportunities		
Consistency in language used across organisations	Confirmation but language must be framed appropriately to encourage engagement with different languages used for community engagement compared	good communication	
Embedding initiatives within a broader policy context	Confirmation	Barrier: reverting to 'old ways' of non-WSA working	a supportive local political context
Local evaluations	Confirmation		
Sufficient financial	Confirmation	funding availability;	

(continued on next page)

Table 2 (*continued*)

Bagnall et al.'s (2019) list of 10 facilitators	What our evaluation confirms/extends	Breslin et at. 2023	Salm et al., 2023
support and resources		barrier insufficient funding	

provided some infrastructure for ongoing engagement, but this was limited to a small number of residents. The need for community engagement activity further supports the rationale for ongoing system stewardship in enabling multiple actors to work effectively.

Some community-based workers expressed stigma surrounding obesity; thus, terminology needs to be consistent and framed appropriately to encourage engagement. As Salm et al. [12] highlighted, community engagement can become a form of resilience, with the pandemic demonstrating the importance and ability of the community to mobilise rapidly and respond to vulnerable people's needs.

Additionally, our study confirms the other five facilitators identified by Bagnall et al. [10]. These foreground the need for strong leadership, good governance and shared values, embeddedness in the wider policy context, sufficient resources and the benefit of local evaluation.

These studies [10–12] demonstrate that developing and implementing a WSA to CHW takes time and long-term commitment from stakeholders. This includes a willingness to accept that many factors that influence healthy child weight are outside individual actors' control and, therefore, a need to relinquish control and power as an individual organisation. This is not well supported and incentivised by existing funding and decision making structures within local authorities in the UK.

Lack of long-term commitment and resources can threaten sustainability of the approach, as highlighted in our fourth theme. The literature [27] suggests that having a strategic and long-term ambition, which is shared and communicated between agencies and communities is important to sustain WSA. This strategy needs to be supported by a comprehensive outcomes framework based on the things that mattered to communities in the long term (community insight). Finally, tailoring of existing models and guidance to local needs and existing structures is important, as highlighted by Breslin et al. [11]. Clear guidance in initial phases of WSA set-up needs to be combined with aligning implementation of the WSA with the existing ethos of the organisations' goals and targets.

6.2. *Strengths and limitations of this study*

Our mixed methods approach and the involvement of multiple stakeholders, including peer researchers added depth and understanding to the evaluation. Peer researchers generated rich insights from a range of stakeholders on how they perceive their role and ability to engage at different levels of the system. Peer researchers were able to refer to their own experiences and perspectives and follow a more conversational approach to the interview that yielded additional information on experiences and perspectives. While this may create bias in the interviews, the co-construction of knowledge in peer interviews is more appropriate in complex and diverse contexts, such as the WSA to CHW in Dundee, while building understanding and relationships between stakeholders in the system that is crucial for its development and implementation.

We were not able to capture the views of community members in the peer researchers' interviews. This might reflect the current limited representation of community members in the social networks of stakeholders and emphasises one of our key findings: a need for increasing involvement opportunities and developing clear communication strategies with local communities. We had a low response rate to our online survey, in spite of several efforts to boost it, including the offer of shopping vouchers. Therefore, the findings from the survey only provide an indication of knowledge and engagement of stakeholders. We feel that the pressures on local authority and NHS staff due to COVID-19 severely limited participants ability to engage in the research. Despite these limitations, our analysis of the workshop data provided new insights and our findings are in line with previous studies, which suggests a degree of validity of the results.

7. Conclusion

In the practical application of WSA to address inequalities in childhood obesity, local health professionals, community members and policy makers need to understand the wider structures in which they operate and have knowledge of effective strategies for sustaining healthy child weight to ensure engagement of stakeholders across organisations. This requires an ongoing need for targeted communication and diverse involvement opportunities for different stakeholder groups, particularly community members.

Ethics approval and consent to participate

Our study complies with the appropriate national research ethics process and R&D and governance processes. The study was externally reviewed by Teesside University School of Health research ethics committee. Data are not publicly available, as it includes individual level data that allows for the identification of participants in our study, but are available from the corresponding author on reasonable request.

Consent for publication

Individual written informed consent for participation in the research and for publication of anonymised data was obtained from each respondent in our study.

Availability of data and material

The datasets, which include anonymised interview transcripts and a description of our coding trees, are available from the corresponding author on reasonable request. They will be made available in the Teesside University's Research Repository (TeesRep), http://tees.openrepository.com/tees/. The final evaluation report with more details on the findings can be accessed from the NIHR PHIRST website: https://phirst.nihr.ac.uk/wp-content/uploads/2023/06/NIHR-PHIRST-Fusion-Evaluation-of-WSA-to-CHW-in-Dundee-Final-Report-1.pdf.

Competing interests

Jenny Gillespie is involved in development and implementation of the Whole Systems Approach to Child Healthy Weight in Dundee. Peter van der Graaf, Nai Rui Chng and Andrew Passey are/were members of NIHR PHIRST Fusion, who resourced the evaluation.

Authors' contributions

Dundee city council conceived the idea for the study, PvdG, NRC and AP developed the study design with input from all authors. Data collection and analysis were undertaken by MPS and PvdG. Data interpretation was supported by all authors. The paper was drafted by PvdG and was commented on by all authors, who approved the final version.

Funding

This article presents findings from independent research funded by the NIHR PHIRST. The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health. NIHR PHIRST Fusion is a partnership between the Universities of

Newcastle, Durham, Northumbria, Sunderland, Teesside, Sheffield, Glasgow, Edinburgh, and Queens Belfast.

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.

Acknowledgements

We would like to thank the peer researchers who gave up their time to contribute to this study and without whose input and support in the data collection, analysis and interpretation, this study would not have been possible.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhip.2024.100579.

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