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From Incidental to Intentional: Co-developed Recommendations for Collecting, Analysing, and Using Complex Implementation Data in Behavioral Nutrition and Physical Activity Research

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Research Article

Keywords: implementation science, nutrition, physical activity, process data, complex data, qualitative data

Posted Date: November 4th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11271995/v1

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Additional Declarations: No competing interests reported.

Abstract

Background

Implementation science emphasizes the importance of context, adaptation, and processes in understanding the successful delivery of evidence-based behavioural interventions. Complex implementation data - i.e., information on the context and process of delivery - provide valuable insights into implementation outcomes. These data, which emerge before, during, and after intervention delivery, can be challenging to collect especially in nutrition and physical activity-focused research. Thus, this study aimed to: (1) explore challenges and strategies associated with collecting, analysing, and using complex implementation data; and (2) co-develop recommendations to support their systematic collection, analysis, integration, and dissemination.

Methods

This co-development project was guided by the five stages of design thinking: empathize, define, ideate, prototype, and test. The empathize and define phases were undertaken through an organized session at the 2026 International Society of Behavioral Nutrition and Physical Activity conference. Researchers and practitioners participated in presentations and facilitated breakout discussions to explore their experiences with collecting, analysing, and applying complex implementation data. Discussion data were analysed using inductive thematic analysis. Initial themes were constructed, then refined through member checking and iterative participant feedback. The ideate, prototype, and test phases were accomplished through developing an initial set of recommendations, which were iteratively reviewed, refined, and expanded.

Results

Forty-one individuals from 11 countries participated who work in nutrition and physical activity research. Challenges for using complex implementation data included limited capacity to conduct implementation research, uncertainty regarding effective use, conducting research in capacity-constrained settings, and perceptions that complex data are undervalued by journals and funding agencies. Approaches included strengthening partner and participant communication, developing practices for data integration, proactively planning data collection through study protocols and ethics approvals, aligning data collection with existing workflows and resources, and using complex data to inform adaptations. These findings informed recommendations across three research phases: (1) preparation and training; (2) data collection, analysis, and interpretation; and (3) dissemination and feedback.

Conclusions

Complex implementation data provide valuable insights into context, adaptation, and processes that are often overlooked by conventional implementation measures. These co-developed recommendations offer practical guidance to improve the rigor, transparency, and utility of complex implementation data in behavioural research.

Background

Dissemination and implementation research seeks to bridge the gap between evidence, practice, and policy (1). Although the field has made progress in measuring implementation outcomes, successful adoption, implementation, and maintenance are increasingly recognized as being highly dependent on context, community partner interactions, and adaptations that unfold over time (2). This challenge is particularly relevant to nutrition and physical activity behavioural researchers who often deliver and evaluate complex, heterogeneous interventions across diverse settings, unlike pharmaceutical trials or other highly controlled clinical research contexts (3–5). To better understand the influence of context on implementation success, implementation scientists have developed frameworks that conceptualize implementation outcomes as being shaped by interacting factors operating across multiple ecological levels, including individuals, organizations, communities, systems, and policy environments (6–8).

Despite advances in conceptualizing implementation determinants, researchers continue to face challenges in capturing the dynamic contextual conditions that shape implementation efforts. Systematic reviews have identified substantial variability in how context is defined, measured, and reported within implementation research, highlighting the need for pragmatic approaches that can capture implementation realities as they evolve over time (2). To address this challenge, researchers often draw on information generated through routine implementation activities, including field notes, stakeholder conversations, researcher reflections, implementation team meetings, emails, text messages, adaptation logs, and site visit records (9, 10). These sources of information are frequently described as "messy" or unstructured data because they emerge organically during implementation rather than through formalized data collection procedures. However, such data can provide rich insights into contextual influences, implementation barriers and facilitators, adaptations, and decision-making processes that may otherwise remain undocumented (11). To acknowledge both their value and complexity, the term 'complex data' is used throughout this manuscript.

The value of qualitative and process-oriented data for supporting successful implementation is increasingly recognized within implementation science (12). Emerging rapid qualitative methods, including Rapid Implementation Feedback and Lightning Reports (2), have demonstrated the potential of timely qualitative insights to inform implementation planning, adaptation, and continuous learning. While these approaches provide practical analytic strategies, they offer limited guidance on the broader processes involved in preparing, collecting, managing, integrating, and disseminating complex implementation data (2, 6, 13, 14).

Adaptation has likewise become a central focus of implementation science, with recent methodological guidance emphasizing the importance of understanding when adaptations occur, who initiates them, and how they influence implementation outcomes (15–17). In behavioural research, studying adaptation often depends on access to complex contextual information, including observations, communications, and implementation experiences that can be difficult to systematically document, integrate and analyse (15). Consequently, the collection and use of complex implementation data are essential for identifying the needs for adaptation, informing implementation support strategies, and understanding how implementation unfolds in practice. Without clear guidance on how to collect, integrate, interpret, and disseminate these data, valuable opportunities for learning, adaptation and continuous improvement may be missed. To address this gap, we convened an interactive workshop at the 2026 International Society of Behavioral Nutrition and Physical Activity (ISBNPA) conference that focused on the use of complex implementation data. Here, complex implementation data were defined as *data collected before, during, and after formal implementation of interventions, programs or policies that are not part of a formalized measurement tool, which provide valuable insights into implementation outcomes*. The session brought together cross-disciplinary researchers and practitioners with varying levels of implementation science experience to discuss challenges, share strategies, and identify opportunities to advance the use of complex implementation data in research and practice. We aimed to: (1) explore challenges and strategies associated with collecting, analysing, and using complex implementation data; and (2) co-develop recommendations to support their systematic collection, analysis, integration, and dissemination.

Methods

Study Design

We employed a co-development approach informed by design thinking methodologies that have been successfully applied in other behavioural research (18, 19). Ethical approval for the study was obtained from the Temple University Institutional Review Board (IRB #33266).

Setting and Recruitment

The project leaders (GMM, AS, TS, NN) facilitated an in-person session at the 2026 ISBNPA conference in Cádiz, Spain entitled "*Working with 'Messy' Implementation Data in Real-World Settings: A Brainstorming Session*". Participants who were conducting or planning implementation research were recruited through a promotional flyer (Appendix) distributed via the ISBNPA Implementation and Scalability Special Interest Group leadership team (~ 10 people) and promoted on LinkedIn before and during the conference. Recruitment relied on self-selection and snowball sampling, with attendees and network members encouraged to circulate information about the session among colleagues. All participants provided written consent prior to participation and completed a brief demographic survey (see Appendix 1) at the start of the workshop.

Procedures and Data Collection

The co-development process was aligned with the five principles of design thinking (18, 19): Empathize (understanding experiences and needs), Define (synthesizing insights to identify key challenges and themes), Ideate and Prototype (generating solutions and developing an initial set of recommendations), and Test (gathering feedback to refine recommendations). The Empathize and Define phases were conducted during the ISBNPA session, while the Ideate, Prototype and Test phases were completed through a series of email exchanges and videoconference meetings involving a working group during the months following the conference. Figure 1 demonstrates how each phase informed the next.

Phase 1: Empathize

Examples of using Complex Implementation Data

The purpose of the Empathize phase was to develop an understanding of the needs and challenges of researchers working in behavioural interventions. During the session, two implementation scientists (GMM + NN) presented examples from nutrition and physical activity implementation-effectiveness trials conducted in the United States and Australia. Presentations highlighted approaches for capturing observations, informal conversations, researcher reflections, and documentation during implementation activities, and provided a basis for subsequent group discussions.

Structured Focus Group Discussions

Following the presentations, participants engaged in four facilitated breakout discussions with 8–12 participants each on documentation practices, data collection challenges, ethical considerations, methods for organizing and analysing complex data, and strategies for integrating findings into implementation decision-making. Discussions were led by implementation science and behavioural experts (GMM, AS, TS, NN) using a standardized facilitator guide (Appendix 2).

Phase 2: Define

Group Discussion and Brainstorming

The Define phase identified themes for working with complex implementation data. Focus group facilitators shared key discussion points with the larger group, followed by a discussion on improving rigor and consistency when working with complex implementation data. All discussions were audio-recorded and transcribed verbatim using Rev.com services. Following the in-person session, all attendees were invited to contribute as authors and participate in the remaining study phases.

Qualitative Analysis and Development and Refinement of Data Themes

Two authors (GMM and AS) independently conducted inductive coding of data generated during the focus group discussions using MAXQDA software (20). Initial themes were identified through iterative analysis and synthesized into a preliminary summary report, which included illustrative participant quotes (Appendix 3). The report, together with an online feedback form, was distributed to participants who had expressed interest in ongoing involvement. Participants were invited to provide feedback on the accuracy, relevance and completeness of preliminary themes, and suggest additional considerations to inform the development of the recommendations. This feedback informed refinement of the coding framework and the development of revised themes.

Phase 3: Ideate, Prototype, Initial Testing

The Ideate and Prototype phases focused on generating solutions and developing practical recommendations for integrating complex implementation data into behavioural implementation research. Following incorporation of participant feedback from the previous phase, qualitative themes were synthesized into an initial set of recommendations. Project leaders (GMM + AS) shared the recommendations to all collaborators via a OneDrive document for initial feedback (i.e., testing), enabling iterative edits and feedback to refine the recommendations. Collaborators were also invited to contribute examples from their own research to illustrate how complex implementation data had been used in their practice. These examples were developed into brief case studies. Two video conference meetings were held: one involving colleagues from the United States and Europe, and another involving colleagues from the United States and Australasia. During these meetings, participants reviewed and refined the recommendations and discussed the most effective ways to present the case studies. Subsequent revisions and manuscript development were collaboratively completed via email and shared documents.

Data Analysis

Demographic data were analysed descriptively. Focus group data were analysed using inductive thematic analysis to generate themes and inform elements of resulting recommendations (21). To enhance methodological rigor throughout all phases, project leaders (GMM + AS) independently reviewed discussion notes, transcripts, and summary reports to identify patterns related to the collection, analysis, use, and dissemination of complex implementation data. Themes were compared, discussed, and refined through consensus with the broader authorship team (22, 23). Ongoing consultation and feedback from collaborators throughout the co-design process ensured the themes accurately represented participants' experiences and that resulting recommendations were grounded in the data, thereby strengthening their credibility (22).

Results

Participant Characteristics

Demographic information for all 41 session attendees is summarized in Table 1. Attendees identified mostly as white (n = 28, 68%), female (n = 31, 76%), English speaking (n = 25, 61%), and had a doctoral degree (n = 31, 76%).

Table 1
Demographic characteristics of attendants

Category	Frequency	Percentage
Race/Ethnicity		
African, or African American	2	4.9%
Asian	1	2.4%
Hispanic or Latino	6	14.6%
Middle Eastern or North African	1	2.4%
Prefer not to answer	3	7.3%
White	28	68.3%
Total	*41*	*100.0%*
Age		
21–29	3	7.3%
30–39	16	39.0%
40–49	12	29.3%
50–59	7	17.1%
No response	3	7.3%
Total	*41*	100.0%
Gender		
Female	31	75.6%
Male	8	19.5%
Prefer not to answer	2	4.9%
Total	*41*	*100.0%*
Language		
English	25	61.0%
Portuguese	5	12.2%
Spanish	4	9.8%
Dutch	3	7.3%
Other language (please describe)	2	4.9%

Category	Frequency	Percentage
Race/Ethnicity		
No response	2	4.9%
Total	*41*	*100.0%*
Education Level		
Bachelors degree	1	2.4%
Doctoral-level degree	31	75.6%
Masters degree	7	17.1%
No response	2	4.9%
Total	*41*	*100.0%*
Occupation		
Graduate (Masters or Doctoral) student	8	19.5%
Postdoctoral Researcher	3	7.3%
Junior faculty (Lecturer/Assistant Professor)	8	19.5%
Mid-career faculty (Associate Professor)	9	22.0%
Senior faculty (Professor)	7	17.1%
Researcher - another level	3	7.3%
Researcher/professional at nonprofit	1	2.4%
No response	2	4.9%
Total	*41*	*100.0%*

Following two rounds of analysis of the focus group session discussions, findings were organized into two overarching domains and eight subthemes related to the use of complex implementation data.

Challenges in Working with Complex Implementation Data

Participants consistently described complex implementation data as valuable for understanding implementation processes but challenging to collect, organize, analyse, and communicate. Four major challenge-related themes were identified.

Challenge 1: Limited Resources for Gathering Complex Data in Real-World Settings

Participants described numerous logistical barriers to collecting complex implementation data in real-world settings. Many implementation researchers and practitioners work in busy clinical, educational, and community environments where implementation activities compete with routine service delivery. As a result, documenting implementation processes was often perceived as burdensome, inconsistent, or a lower priority than core operational tasks. Researchers frequently relied on practitioners and staff to collect formal implementation data, however, competing demands, limited time, and workforce capacity constrained the extent to which these data could be collected systematically. Some participants suggested that rapid approaches to capturing implementation information may represent a more feasible alternative in resource-constrained settings. Nevertheless, participants also highlighted a lack of practical guidance on how to collect, manage, and use these forms of data in a systematic manner. While implementation partners were generally motivated to contribute to research activities, participants noted that data collection strategies requiring substantial additional effort were unlikely to be sustainable. These discussions highlighted a tension within pragmatic implementation research: the need to generate rich implementation knowledge while minimizing burden on those delivering services in real-world settings. For example, one participant shared,

We work with all these agencies and their partners to help test implementation strategies they're using to increase reach and enrolment. We've tried to build in really low burden, pragmatic, what we're calling 'process data'... and we have quarterly technical assistance meetings with them where we have someone take notes, then we code the notes, we use the RE-AIM [Reach, Effectiveness, Adoption, Implementation, Maintenance] framework, we code their quarterly reports they submit, and there are closeout meetings at the end of the grant. So, lots of different data sources, but it doesn't require any additional burden on their end.

Discussions underscored the need for pragmatic approaches that integrate with existing practices and workflows.

Challenge 2: Knowledge Gaps Regarding Effective Use of Complex Implementation Data

A second major challenge involved uncertainty regarding how complex implementation data should be utilized once collected. Participants described collecting large volumes of observations, field notes, conversations, and meeting documentation without having clear methods for translating these data into implementation insights. One participant noted,

I'm just thinking in terms of how we capture that data from the outset. Can it be asking how people would like to provide their data rather than assuming they're happy to share field notes or capture that information written or verbally, rather than us making that assumption? Practitioners work in so many different ways based on their experience, their discipline, and what they're familiar with, so could it be that there is no right or wrong way to collect this data... You could have 10 ways of doing it, which makes it probably messier or worse, but at least you're getting that information...Then the question becomes how do you analyse it? Because if you're collecting all this data, there needs to be at least some thoughts on the analysis process.

Several participants experienced that, unlike traditional quantitative measures, complex implementation data rarely yield straightforward or definitive answers. Researchers frequently described uncertainty about how best to use these data to explain implementation outcomes, inform adaptations, or support dissemination efforts. Participants noted that implementation studies vary considerably in their aims, settings, and contextual conditions, making it difficult to establish a single standardized approach to managing and analysing complex implementation data. Despite these challenges, participants consistently emphasized the value of complex implementation data for understanding how and why implementation succeeds or fails. Many argued that the richness and contextual depth of these data justified continued efforts to strengthen methodological approaches for their collection, analysis, and use. Discussions suggested that the field lacks practical guidance to support the transition from data collection to meaningful interpretation, decision-making, and action.

Challenge 3: Implementing Programs in Capacity-Constrained Settings

Participants frequently reflected on the challenges of conducting implementation research in under-resourced settings. Many implementation environments lacked dedicated personnel, protected time, infrastructure, or funding to support implementation monitoring and evaluation. Researchers described collaborating with community organizations, healthcare settings, and public health agencies whose primary focus was service delivery rather than the systematic documentation of implementation processes. As a result, participants emphasized that implementation data collection must be integrated into existing workflows and routine activities, rather than imposing additional demands on already stretched implementation partners. One participant described,

I'm evaluating data from the early childhood health program that's been scaled up, but those staff that are implementing the program are mainly healthcare professionals. So, their first priority hasn't been recollecting data to report back to us as researchers. They're already overworked and a lot of them are actually collecting data outside of their work hours as measure of as goodwill and because they fully believe in the program, but from a researcher's perspective, when we're looking at the evaluation data, there are a lot of gaps.

Participants noted that as interventions transition from efficacy testing to implementation in community settings, research teams often have fewer resources available for intensive process evaluation, despite an increasing need to understand contextual influences, implementation processes, and adaptations. Many participants observed that traditional approaches for collecting implementation data, such as surveys and interviews, can be difficult to sustain in resource-constrained settings because of time, workforce, and organizational limitations. This theme highlighted the need for practical guidance on leveraging complex implementation data as a feasible and informative alternative for understanding implementation in real-world contexts.

Challenge 4: Perceptions of Complex Data Within the Scientific Community

Participants consistently expressed concern that complex implementation data remain undervalued within scientific publishing and research culture. Although many attendees viewed these data as essential for understanding implementation processes, contextual influences, and adaptations, they perceived that academic journals, peer reviewers, and funding agencies prioritize data collected through formal and validated measures and statistically significant findings.

Several participants described feeling compelled to justify findings derived from complex implementation data by linking them to traditional implementation outcomes or quantitative health indicators. Others reported difficulties publishing studies focused primarily on implementation experiences, adaptations, or contextual factors despite the importance of these data for explaining how and why implementation processes evolve in real-world settings. Some participants suggested that this perceived lack of recognition contributes to the underuse and underreporting of complex implementation data within the literature. Some argued that researchers may be discouraged from investing the substantial time and effort required to systematically collect, analyse, and interpret these data when their scientific value is perceived to be secondary to more conventional forms of evidence. One participant commented:

We don't have guidelines or ways to sort of validate conversations with people, nor should we really, but sometimes that data that doesn't get prioritized when we come to publish and when we come to presenting conferences.

Approaches for Improving the Collection and Use of Complex Implementation Data

Alongside challenges, participants identified multiple approaches that have helped or would help them successfully integrate complex implementation data into research and practice. Four strategy-related subthemes were identified.

Approach 1: Establish Recommendations for Integrating and Utilizing Complex Implementation Data

Participants emphasized the importance of approaching complex implementation data with the same intentionality applied to other types of research data, recommending that it be identified in advance, and that adaptation or implementation frameworks guide data collection and interpretation. Many participants highlighted the value of documenting implementation changes continuously throughout a project, including who initiated adaptations, why changes occurred, and how these decisions were made.

Other participants emphasized the importance of developing organizational systems that enable researchers to systematically organize, categorize, and synthesize implementation data. One recommendation was to leverage existing implementation science frameworks, tools, and resources rather than creating entirely new approaches. Participants viewed these resources as providing a useful structure while still allowing flexibility for diverse implementation contexts. As one participant explained:

I think it would just really help if there would be some consensus about what we believe is valid enough to also make that argument in your papers, but also already at the beginning of your research...more of a 'messy data' checklist for researchers. For example, if you do interviews, 'There are these three types of data. If you're doing implementation in this setting, look for these things'.

These suggestions provide ways to better incorporate complex data into ongoing research practices.

Approach 2: Build Protocols Early and Navigate Ethical Considerations Proactively

Participants acknowledged that implementation-related learning often emerged through interactions that were not initially anticipated as data sources. Consequently, research protocols should provide guidance on what information may be recorded, how documentation should be undertaken, how confidentiality will be protected, and how these data will be analysed. For instance, one participant stated,

I must obtain IRB (Institutional Review Board) approval before collecting data. I have found that the more broadly I can scope an IRB protocol, while still remaining ethical, appropriate, and sufficiently focused, then the greater flexibility I have to collect data that may become valuable as the study evolves. For this reason, I often develop semi-structured interview guides that address broader domains or theoretical framework constructs while allowing the specific questions and lines of inquiry to remain flexible...This approach provides flexibility if, during data collection, certain participants emerge as particularly knowledgeable about a topic or domain that was not anticipated.

Participants also emphasized the role of researcher reflexivity. Field notes and observations were viewed not simply as objective records but as interpretations shaped by researchers' own experiences and perspectives. Awareness of this subjectivity was considered an important component of rigorous implementation research.

Approach 3: Align Complex Implementation Data Collection and Analysis with Existing Resources and Workflows

Participants described collecting process information from technical assistance meetings, partner workshops, routine reports, policy discussions, and implementation team meetings that were already occurring as part of implementation efforts. This approach was perceived as both pragmatic and sustainable. By embedding process data collection within existing workflows, researchers reduced the burden on implementation partners while simultaneously capturing rich contextual information that influenced projects in real time. Importantly, discussions suggested that implementation itself may, in part, occur through the relationships, discussions, and problem-solving processes they facilitate. Despite the value of these insights, complex and contextual implementation data were often excluded from formal data analysis and decision making because they had not been anticipated or systematically

planned for within study protocols. In retrospect, however, such information frequently provided important insights into implementation processes and outcomes. The example below illustrates how one participant was unable to fully utilize valuable complex implementation data because mechanisms for documenting, analysing, and integrating these data had not been established at the outset of the project.

All those complex conversations influence what you do. I've just come off three years of data collection. My project was really just about literally observing what do educators do, (measure) child outcomes, and looking at quantitative relationships between the two. But I spent so much time physically in early childhood centres, and I saw so much that is going to impact them and ultimately the strategy choice, but I didn't capture any of that because none of that was part of my research. In reflection, I should have kept a diary, some kind of ethnographic record of my conduct of the research because now I don't know how to take those things that I've seen and use them in a rigorous way to inform that next step.

Partner conversations, sense-making sessions, and collaborative discussions were often viewed not only as sources of data but also as implementation strategies that influenced adaptation and change.

Approach 4: Use Complex Implementation Data to Drive Adaptations and Strengthen Communication

Participants viewed complex implementation data as uniquely valuable for identifying necessary adaptations to implementation and service delivery and improving communication between researchers and implementation partners. Researchers described situations in which implementation observations contradicted conclusions that might have been drawn from “significant” quantitative outcomes alone. Complex data frequently provided insight into why implementation strategies were or were not likely to succeed in practice. Field observations, conversations, and stakeholder relationships allowed researchers to identify barriers that may never have appeared in surveys or formal interviews. Participants also emphasized that strong researcher-partner relationships foster honest conversations and actionable implementation insights. Complex implementation data were therefore viewed as both an information source and a mechanism for fostering collaborative decision-making throughout implementation. For example, one participant shared,

If I analyse my quantitative data, the implementation strategies which might point to that would be useful to get educators to use responsive feeding are actually not useful strategies in practice because I've seen all these things just from being there that would indicate, well, those strategies are not going to work. Unless you've got that really` strong relationship with the people that you're working with, they're unlikely to say, "Oh no, actually that's not going to work.

Collectively, the challenge and strategy domains revealed a need for practical guidance that supports researchers throughout the lifecycle of complex implementation data.

Complex Implementation Data Preparation, Collection, and Analysis Recommendations

Informed by the key challenges identified, together with the proposed strategies, the following recommendations were developed through four rounds of revision to provide practical guidance for the meaningful integration and use of complex implementation data. Activities have been organized in Table 2 according to three main research phases: 1) preparation and training, 2) data collection and analysis, and 3) dissemination and feedback.

[insert Table 2 here]

Complex Data Case Studies

To demonstrate the applicability of these recommendations for implementation research, we describe several examples from our work in using complex implementation data. These highlight the diverse and collective expertise of the research team. Table 3 provides an overview of each case including the program description, country of implementation, health topic, use of complex data, and linkage to specific items within the recommendations. Many of these case examples focused on behavioural health topics such as nutrition and physical activity, while others focused on mental health and maternal care. The main types of complex data gathered included observations and field notes, with specific actions linked to the Data Collection and Analysis section of the recommendations table.

[Insert Table 3 here]

Discussion

The purpose of this study was to understand challenges and approaches associated with working with complex implementation data among researchers from diverse disciplinary backgrounds and levels of implementation research expertise, and to co-develop recommendations informed by these experiences. Although implementation researchers routinely generate observational notes, reflections, stakeholder communications, and other forms of contextual information, there remains limited guidance on how these materials should be systematically documented, managed, analysed and integrated into implementation research. The co-developed recommendations presented in this study provide one of the first practical resources specifically focused on the collection and use of complex implementation data. Our findings align closely with broader implementation science scholarship emphasizing the importance of context (11, 24, 25). Existing frameworks highlight numerous factors capable of influencing implementation success (7, 8, 26, 27), yet researchers frequently struggle to operationalize and document these influences (14). Complex implementation data may provide a practical mechanism for capturing contextual dynamics that standardized measures fail to detect (25).

The findings also resonate with recent methodological innovations in qualitative analysis designed to generate actionable implementation insights in a timely and pragmatic manner (2, 6). Participants

frequently emphasized the need to capture and use implementation learning as it emerged rather than waiting until the conclusion of a project. Approaches such as Rapid Implementation Feedback reports and Lightning Reports demonstrate the value of timely synthesis and dissemination of implementation learning (2). Similarly, the Embedded Documentation of Implementation Tracking (EDIT)(28) approach was developed to provide a low-burden method for documenting implementation changes and contextual influences throughout ongoing studies. While these approaches focus primarily on facilitating timely implementation learning, our recommendations extend this work by outlining considerations for the systematic collection, management, ethical oversight, analysis, reflexivity, and dissemination of complex implementation data across the full implementation life cycle In doing so, they provide a practical framework for ensuring that valuable implementation insights generated through routine implementation activities are documented and used to inform both implementation practice and research.

Implications for Behavioral Research

For behavioural research, these findings have important implications across a range of implementation contexts. In school-based interventions, implementation occurs within complex systems that involve students, teachers, school leaders, food service staff, families, and community partners. Complex implementation data may help researchers understand how competing priorities, staffing changes, school culture, and policy environments influence implementation decisions and outcomes (29–32). The value of complex implementation data may be particularly pronounced in effectiveness-implementation hybrid trials, which are designed to simultaneously evaluate intervention effectiveness and implementation outcomes (33). Although hybrid trials commonly incorporate formal process evaluations, our findings suggest that some of the most influential implementation learning occurs during these observations, informal interactions, relationship-building activities, and ongoing sense-making processes that are rarely documented systematically or reported transparently. Deliberately planning for the collection and use of these data may strengthen understanding of the mechanisms linking context, implementation strategies, adaptations, and intervention outcomes while providing richer explanations for why implementation succeeds or fails in particular settings.

These recommendations are highly relevant to policy implementation research. Nutrition and physical activity policies are often adapted as they move from policy development to implementation, with decisions occurring across organizational, community, and policy levels (34–36). Complex implementation data may offer a unique opportunity to document how stakeholders interpret and enact policies, identify unintended consequences, and understand how contextual conditions shape policy implementation over time. Future behavioural studies may therefore benefit from treating complex implementation data as a planned and purposeful source of evidence, rather than as incidental observations collected alongside primary outcomes.

Limitations

Several limitations should be acknowledged. First, recommendations were generated through a self-selected conference-based brainstorming session and therefore may not reflect the perspectives of the broader implementation community. Attendees that did not consent may have left the session before our team noticed, despite reminders that consenting was optional, limiting our understanding of representation. Second, despite strong representation from many different countries, the lack of representation from Asian, African, and Middle Eastern countries is a weakness and represents potential "blind spots" in behavioural and implementation research. Third, despite many of the authors collaborating with community partners and learning from implementing stakeholders regularly in their work, the lack of non-academic representation in the authorship team and participant group is acknowledged. Finally, these recommendations should be considered an initial framework for the collection and integration of complex implementation data. Further validation across diverse implementation settings is needed to determine their feasibility, utility, and generalizability.

Strengths

Several strengths of this study should be considered. First, the recommendations were developed through an international co-development process that included researchers and practitioners representing 11 countries, multiple career stages, and diverse implementation settings. This broad range of perspectives increased the likelihood that the resulting recommendations reflect challenges and opportunities encountered across a variety of behavioural implementation contexts rather than a single research setting. Second, the project employed a design-thinking approach that moved beyond identification of methodological challenges to the development of practical solutions. Rather than being derived solely from the literature, these recommendations were grounded in the lived experiences of individuals actively conducting implementation research and navigating the complexities of collecting, integrating, and using complex implementation data. Third, the iterative nature of the development process, including focus group discussions, thematic analysis, member checking, feedback surveys, and multiple rounds of expert review, enhanced the credibility and relevance of the resulting recommendations. These procedures helped ensure that recommendations reflected both the challenges experienced by participants and the strategies perceived as most feasible and useful. Finally, by linking recommendation domains to real-world implementation examples, the framework offers practical guidance that can facilitate uptake by researchers working across diverse behavioural contexts.

Future Directions

The recommendations presented here represent an initial step towards more systematic use of complex implementation data in behavioural research. Several important opportunities exist for future work. First, prospective evaluation of the recommendations is needed across diverse implementation studies. Future research should examine whether adoption of the recommendations improves the quality, consistency, transparency, and usefulness of complex implementation data collection and reporting. Comparative studies could assess differences between projects that utilize structured approaches versus those relying on ad hoc data collection methods.

Second, future studies should examine the relationships between complex implementation data and implementation outcomes. A particularly important question is whether contextual factors, adaptations, and stakeholder interactions captured through complex data can explain variation in implementation outcomes such as acceptability and preserve the value of the data collected. Understanding these relationships would strengthen the empirical rationale for investing in the collection and integration of complex implementation data. Additional work is needed to ensure that recommendations are applicable across diverse cultural, geographic, and resource settings. Participants repeatedly emphasized the challenges of conducting implementation research in under-resourced environments, where time, staffing, and financial constraints may limit opportunities for extensive data collection. Future studies should therefore explore how approaches to collecting and integrating complex implementation can be adapted to low-resource contexts while minimizing burden on implementation partners.

Conclusions

Complex implementation data are frequently collected but insufficiently leveraged in behaviourally focused implementation research. We identified common challenges and opportunities associated with these data and translated them into a series of practical recommendations spanning preparation, collection, analysis, and dissemination. Increasing the rigor and consistency of complex implementation data practices may improve understanding of context, adaptation, and implementation processes across behavioural research.

Declarations

Ethics approval and consent to participate

This study was approved by the Temple University Institutional Review Board #33266. All research procedures were conducted in accordance with the Declaration of Helsinki. All participants provided written consent to participate in the study.

Consent for publication

Not applicable

Funding

This work was supported in part by the National Heart, Lung, and Blood Institute at the National Institutes of Health (K01HL166957 and R03HL178872; PI: McLoughlin).

Author Contribution

GMM conceptualized the study and obtained IRB approval. GMM, AS, and NN led methodology and data collection. TS assisted with data interpretation and framing of manuscript. GMM and AS led data analysis and writing of the manuscript. LB, MB, RB, KC, NC, DD, IK, LM, NN, JN, CP, CR, JVG, LVK, KLW, NN, and TS participated in meetings, assisted with data interpretation, and reviewed the manuscript several times. All authors edited and approved the final version of the manuscript.

Acknowledgement

The authors thank the attendees of the ISBNPA 2026 Dare to Share session for their contributions, expertise, and recommendations that informed development of the recommendations and methodological guidance presented in this paper.

Data Availability

Data can be shared by the lead author upon request

Tables

Tables 2 & 3 are available in the Supplementary Files section.

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Figures

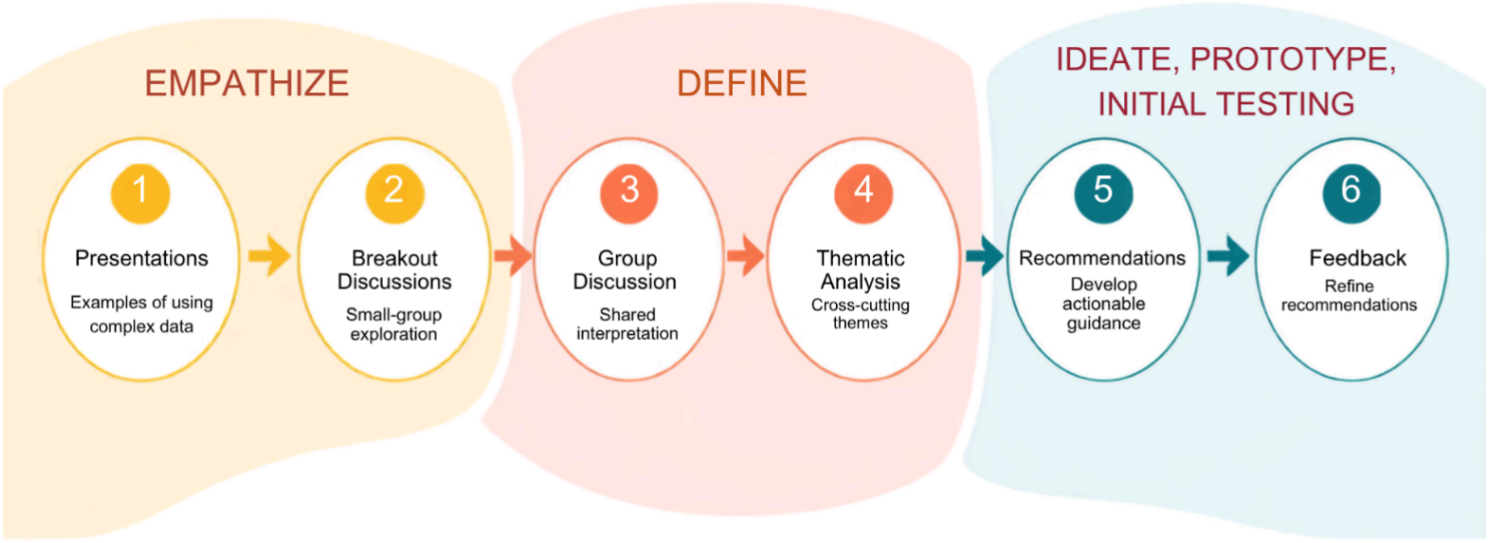


Figure 1

Overview of the co-development approach

Supplementary Files

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- Appendix2FocusGroupDiscussionQuestions.docx
- Appendix1SessionFlyer.pdf
- Appendix3InitialReport.pdf