

Using the Practical, Robust Implementation and Sustainability Model (PRISM) to qualitatively assess multilevel contextual factors to help plan, implement, evaluate, and disseminate health services programs

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Abstract

There is consensus in dissemination and implementation (D&I) science that addressing contextual factors is critically important for understanding translation of health care delivery interventions but little agreement on which contextual factors are key determinants of implementation outcomes. We describe the application of the Practical Robust Implementation and Sustainability Model (PRISM), which expands the Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM) framework to identify contextual factors across four diverse programs. Multiple qualitative methods were used to collect multilevel, multistakeholder perspectives from the adopting organizations and staff. We identified measures for evaluating context through the various domains of PRISM to guide health services research across the phases of program implementation. The PRISM domains of Recipients, Implementation and Sustainability Infrastructure, and External Environment identified important multilevel contextual factors, including variability in operational processes and available resources. These domains helped to facilitate planning and implementation phases of the four interventions and guide purposeful adaptations. We found assessments of PRISM domains useful to systematically assess multilevel contextual factors across various content areas as well as phases of program implementation. Additionally, these contextual factors were found to be relevant to RE-AIM outcomes. Lessons learned can be applied to future research as there is a need to investigate the measurement properties of PRISM and continue to test which contextual factors are most important to successful implementation and for which outcomes.

Keywords

Context, Contextual factors, Assessment, Implementation, PRISM

The construct of context is central to almost all dissemination and implementation science (D&I) models. While context has repeatedly been acknowledged as a critical area, this is often a catch-all term that can refer to myriad factors from individual to organizational and/or societal level influences [1,2]. Our paper uses the inclusive definition proposed by Øvretveit, which defines context as any factors (e.g.,

Implications

Practice: Understanding context helped tailor health services programs to specific settings to avoid program failure and increase program uptake.

Policy: Knowledge of influential contextual factors identified by PRISM can be used to estimate likely program impact, develop performance indices for different settings, and direct allocation of health care resources.

Research: PRISM is feasible to assess multilevel contextual factors; future research to explore contextual factors and their relation to implementation outcomes should include mixed-methods approach.

policies, organization climate, incentives, workflow, and targeted population) that are not part of the intervention [2].

There is relatively little guidance as to which aspects of context are important as well as how to overcome challenges associated with the systematic and pragmatic collection of contextual factors data [1]. Furthermore, context is often considered to be dynamic and iterative [2–5]. Therefore, it is important to identify and assess contextual factors at multiple levels of an organization and at various points throughout the life of a program. We used the Practical Robust Implementation and Sustainability Model (PRISM) as an overarching implementation model (Fig. 1) to help us conceptualize, specify, and assess key contextual factors [6]. In the classification proposed by Nilsen, PRISM fits well under both framework and process models [7]. Specifically, PRISM recommends documenting and defining key factors or “leverage points” at

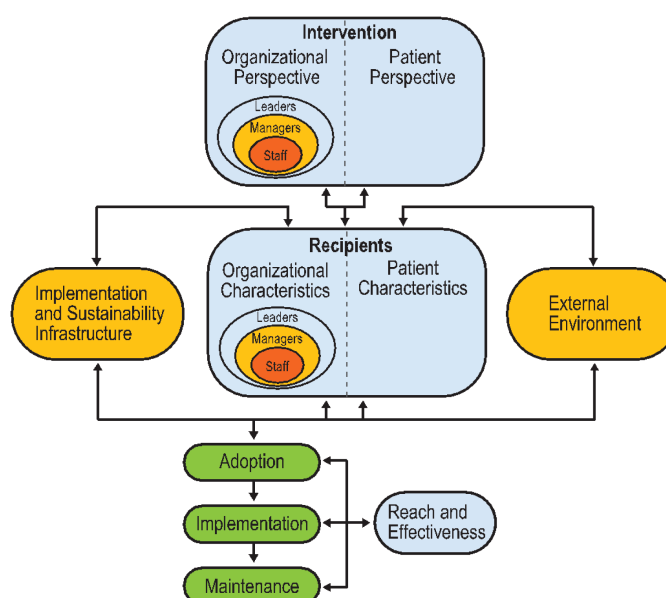


Fig 1 | The Practical Robust Implementation Sustainability Model (PRISM) used to guide planning, implementation, and evaluation of the research projects [6].

multiple levels of internal and external stakeholder influence. It considers how the external environment, intervention design, implementation and sustainability infrastructure, and the multilevel recipients of an intervention (i.e., adopting organization with emphasis on the health care teams and providers and patients) influence implementation outcomes [6].

PRISM was developed to provide a practical, actionable model that could be used by both practitioners and researchers to plan and guide interventions, implementation strategies, adaptations, and factors related to sustainability. As discussed by Feldstein et al., PRISM draws upon and integrates key concepts from Diffusion of Innovations, the Chronic Care Model, Institute for Healthcare Improvement (IHI) models, and the quality improvement literature [6,8–10]. PRISM is an extension of the more widely known Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM) planning and evaluation framework [11]. PRISM proposes that key contextual factors influence the RE-AIM outcomes. Important elements to improve program implementation based on PRISM include creating an environment (infrastructure) for encouraging spread, sharing best practices, observing results and adjusting processes accordingly, facilitating use of the intervention, as well as ensuring adaptability of protocols that fit the multilevel context [6]. PRISM focuses on these contextual factors and adds them to RE-AIM, as illustrated in Fig. 1. We selected PRISM because of its ability to identify contextual factors that are hypothesized to determine RE-AIM implementation outcomes. Moreover, PRISM's relative intuitiveness and emphasis on the alignment or fit among context, implementation strategy, and

outcomes are important to implementation and sustainability success [6,12].

The purpose of this paper is to provide guidance for and examples of how to apply the PRISM to assess multilevel contextual factors throughout the life of a program, that is, planning, implementation, evaluation, and dissemination. We will also discuss its application and lessons learned across four health services programs.

METHODS

We applied PRISM to identify and assess contextual factors during planning, implementation, evaluation, and dissemination program phases across four health services interventions in the Veterans Health Administration (VA), which is the largest integrated health care system in the United States, providing primary and specialty health care services to 9 million enrolled Veterans [13]. The VA Quality Enhancement Research Initiative (QUERI) has been a central component of the VA's commitment to improve health care for Veterans [8]. Our Triple Aim QUERI includes programs described here, intended to assess the feasibility and effectiveness of various interventions and implementation strategies unified by shared implementation models, measures, and approaches. This QUERI program is based upon the IHI Triple Aim model for improving value of health care by focusing on the three dimensions: (a) patient experience/satisfaction and quality of care, (b) health of populations, and (c) increasing the value of health care delivered [8,14]. The VA Triple Aim QUERI leverages automated health care data to identify actionable gaps in care and implements health care delivery interventions to improve

Table 1 | Description of the four quality improvement interventions

Intervention	Multimodal pain	Community transitions	Rural transitions	Patient-reported health status assessment
Problem addressed	Delivering multimodal pain care through telemonitoring	Transitional care from nonnetwork hospital to network primary care	Care coordination for rural Veterans during and postdischarge from a tertiary VA Medical Center back to their Patient-Aligned Care Team	Lack of standardized reporting of patient health status in setting of cardiovascular procedure
Setting	VA Medical Center, community-based outpatient clinics	VA Medical Center, community-based outpatient clinics, community hospitals	VA Medical Center, community-based outpatient clinics	VA Medical Center
Population	Veterans, providers, staff	Veterans, providers, staff	Veterans, providers, staff	Veterans, providers
Intervention	Leveraging data to identify gaps in the use of multimodal pain care and to train providers on best practices through telemonitoring	Integrated nonnetwork hospital discharge care coordination program, which includes nurse care coordination and health system changes including dedicated phone and fax lines for nonnetwork hospitals and Veteran care identification cards	A transitions nurse at VA Medical Center prepares patient for discharge, obtains a follow-up appointment; communicates with the Patient-Aligned Care Team site about the discharge care coordination; follows up with the patient within 48 hr after discharge; engages the rural primary care provider and registered nurse to ensure continuity of care and information exchange	To collect patient-reported health status information before and after percutaneous coronary intervention via an interactive voice response system and to integrate use of the health status data into routine clinical care
Implementation strategies	Audit and feedback; facilitation	Audit and feedback; facilitation	Audit and feedback; internal and external facilitation; modified rapid process improvement workshop; nurse training	Audit and feedback; facilitation
Implementation phase assessed	Planning	Implementation	Evaluation	Dissemination

the triple aims using audit and feedback implementation strategies [15,16].

Four health care system interventions

The four diverse interventions are described in Table 1. Each intervention addresses a different clinical problem and has a different clinical focus, target population, and intervention delivery system. Additionally, the interventions engage various local, regional, and national operational partners (e.g., VA Medical Center and regional administrative leadership, VA Office of Rural Health, National Pain Program) and stakeholders to identify outcomes of direct relevance to ensure the greatest impact on VA health practices. Assessing multilevel context is essential given that these complex interventions are each being implemented across multiple VA sites.

The first intervention, referred to as Multimodal Pain Management, identifies and addresses barriers and facilitators to multimodal pain care to design and implement an intervention to support primary care providers [17]. The second intervention, referred to as Community Transitions Program, focuses on care coordination of Veterans admitted to community hospitals for inpatient care and facilitates the transition to their Patient-Aligned Care Team (PACT), the VA medical home, in a safe, patient-centered manner [18]. The third intervention, Rural Transitions Program, funded by the VA Office of Rural Health in partnership with the Office of Nursing Services, aims to improve access for rural Veterans to follow-up with their PACT following hospitalization at an urban VA Medical Center (VAMC) [19]. The fourth intervention, patient-reported health status assessment, utilizes interactive voice response (IVR) technology to capture the preprocedural and postprocedural patient-reported health status for patients receiving elective cardiac catheterization laboratory procedures to inform clinical care [20].

We used PRISM to identify and assess multilevel contextual factors for this set of four programs because the domains and elements are very applicable to the VA setting and its multilevel focus including the organization, intervention agents, and patient recipients. We also wanted to test PRISM's generalizability across four different interventions and content areas. The four interventions are in various phases of program development, making it valuable to compare the use of PRISM across these interventions.

We employed multiple qualitative methods, applicable to each intervention design and program phase. We designed our interview guides based on the PRISM domains to assess contextual factors important to each intervention's aims, purpose, and a specific phase (Table 2). Additionally, we were open to explore contextual factors that would emerge as a result of the qualitative assessments. A team

of experienced qualitative analysts conducted the semistructured interviews, either in person or over the phone, facilitated focus groups with frontline staff, and conducted site visits using direct observations. We used purposive, convenience and snowball sampling techniques to identify participants. Interviews and focus groups were recorded and transcribed verbatim; qualitative content was managed and coded using Atlas.ti software package. We used an iterative, inductive approach drawing primarily on content analysis, which also included team-based coding consistency checks to ensure rigor [21]. At this stage, we only focused on short- to mid-term outcomes as they relate to PRISM and do not have final outcomes. Additional program-specific papers will report on detailed relationships between PRISM and later stage outcomes when the programs are completed and data analyzed. Below we described examples of how PRISM was applied during planning, implementation, evaluation, and dissemination phases.

Planning phase

The Multimodal Pain intervention illustrates the application of PRISM in the program *planning* phase. We conducted semistructured interviews with primary care providers and staff from VAMCs and community-based outpatient clinics (CBOCs). We designed our interview guides to specifically assess the Intervention (Organizational Perspectives) and Recipients (Organizational Characteristics) PRISM domains to identify the current barriers and facilitators to multimodal pain care in the VA. The sites were selected through a facility-level multimodal pain care index created in a previous aim of the project with a purpose to identify outliers in the utilization of 10 pain-related treatments to identify early and late adopting sites of multimodal pain care [22–24]. We are using the findings to plan the design and implementation of an intervention to improve multimodal pain care in the VA.

Implementation phase

As an example of PRISM application in the *implementation* phase, the Community Transitions Program used PRISM to assess the contextual factors that inform the implementation and adaptations of the Community Transitions intervention and implementation strategies. Once we engaged the stakeholders to obtain perspectives on the intervention design, we continued our qualitative assessment to capture contextual factors for predefined PRISM elements: Intervention (Organizational Perspective, Patient Perspective), Implementation and Sustainability Infrastructure, and Recipients (Organizational Characteristics). Coordinating team members provide ongoing feedback to implementing site teams about intervention progress and opportunities for improvement. This is done through audit and

Table 2 | PRISM domains assessed during the specific program phases: examples of the preidentified contextual factors in the four quality improvement programs

PRISM domains		Multimodal pain (planning)	Community transitions (implementation)	Rural transitions (evaluation)	Patient-reported health assessment (dissemination)
Intervention	Organizational perspective	What barriers to multimodal pain care exist at your facility?	Are there any specific personnel (roles) in the community hospitals that are needed to support the transition process of Veterans back to the VA primary care setting?	Please tell me about your experience with the intervention project?	How do you think intervention would fit best in your current workflow? What would be ideal?
	Patient perspective			What suggestions would you have to implementing a program to help Veterans with transitions home?	
Recipients	Organizational characteristics	Please tell me about current chronic pain management services in your clinic?	How much support does the current transition process have from key managers, operational leaders, and clinical partners?		How does PROST affect your job responsibilities and workload?
	Patient characteristics	Patient demographics*	Patient demographics*	Patient demographics*	Patient demographics*
Implementation and sustainability infrastructure		What resources (personnel, system-wide, or others) need to be in place for the transition?		Was there any information you wish you had had prior to getting TNP started at your facility?	What do you perceive your role to be in the PROST program?
External environment					

This table provides the actual questions from interview guides asked to assess preidentified contextual factors specific to each program and implementation phase. The questions were based on the investigator and program staff input and were mapped to the PRISM domains. PRISM Practical Robust Implementation and Sustainability Model. *Assessed from the existing data sources in the VA

feedback processes based on data received from an intervention database. This iterative component of the program is ongoing and involves two-way communication between the coordinating team and site champions.

Evaluation phase

The Rural Transitions Program provides an example of the use of PRISM to guide assessment of contextual factors in the *evaluation* phase. We used the PRISM elements of Intervention (Organizational Perspective, Patient Perspective) and Implementation and Sustainability Infrastructure to guide the assessment. Using various qualitative methods (direct observations and individual interviews), we assessed PRISM issues, such as intervention fidelity and adaptations to the program intervention and implementation strategies potentially related to the Effectiveness and Implementation dimensions of RE-AIM (quantitative RE-AIM outcomes are being collected but are not yet available) [19,25]. We conducted midpoint evaluations approximately 6 months after the intervention roll-out in each setting. We interviewed the local site teams and the clinical and administrative staff they interact with to solicit their feedback about the implementation of the program. We also surveyed enrolled Veterans about their experience with the program.

Dissemination phase

The patient-reported health status assessment is using PRISM in the *dissemination* phase. We collect perspectives of both current users and potential adoptees on key PRISM domains. Additionally, we provide guidance on ways to customize the intervention to “fit” different implementation settings, for example, different levels of organizational support, to maximize success on the RE-AIM outcome dimensions. The program team collects qualitative data through interviews and focus groups with various catheterization laboratory clinicians and staff to help refine the intervention and adapt it to fit the local culture and processes in potential replication settings. The interview guides were designed to assess the PRISM domains of the Intervention (Organizational Perspective, Patient Perspective), Recipients (Organizational Characteristics), and Implementation and Sustainability Infrastructure. These assessments take place as each new site is enrolled to receive the intervention.

RESULTS

Examples of the operationalized PRISM domains and contextual factors that were identified specific to each program’s phase are described in Table 3.

Planning phase

During the *planning* phase in the Multimodal Pain intervention, we conducted 49 interviews with

primary care providers, nurses, psychiatrists, psychologists, pharmacists, social workers, and pain program managers from 25 VAMCs and CBOCs. The interview participants described tremendous variation in types of chronic pain management services offered across the urban tertiary care centers and rural primary care clinics (Recipients [Organizational Characteristics]) and difficulties with staffing and lack of resources in rural areas (Implementation and Sustainability Infrastructure) [22]. Additionally, specific contextual factors that were not anticipated but were identified in our analyses included VA opioid prescribing regulations and congressional inquiry pressures (PRISM External Environment). We utilized these identified contextual factors to design a health services intervention to address the barriers in chronic pain management in diverse VA settings and to enhance likely reach and adoption of the intervention.

Implementation phase

During the *implementation* phase in the Community Transitions Program, we conducted 15 VA and community stakeholder engagement meetings to solicit feedback and fine-tune the program intervention. Our qualitative data confirmed the relevance of the preidentified Intervention (Organizational Perspectives) and Implementation and Sustainability Infrastructure domains and External Environment PRISM factors during these interactions. The analyses revealed contextual factors, such as the impact of restructuring the case management department at a community hospital (External Environment) on the intervention core components. This in turn resulted in the coordinating team reapproaching the case managers at that community hospital to obtain their buy-in. The qualitative data were continuously and iteratively used to modify and adapt the Community Transitions intervention (creation of the intervention core components) to identify additional system changes and implementation strategies needed to improve the implementation process (connection of the electronic fax line to receive medical records) and to continue to engage the VA and community providers and staff in the program.

Evaluation phase

During the *evaluation* phase in the Rural Transitions Program, the operational team consisting of a clinical coordinator and implementation specialist conducted six site visits during which they assessed the transitions nurses’ process of carrying out the intervention. Additionally, we conducted 15 interviews with the local site teams, clinical and administrative staff, and 23 interviews with Veterans to solicit feedback pertaining to their experience with the program. The PRISM domains of Intervention (Organizational Perspective, Patient Perspective) and Implementation and Sustainability

Table 3 | PRISM domains assessed during the specific program phases: examples of the identified contextual factors in the four quality improvement programs

PRISM domains	Multimodal pain (planning)				Community transitions (implementation)		Rural transitions (evaluation)		Patient-reported health assessment (dissemination)	
	Organizational perspective	Patient perspective	Organizational characteristics	Variation in chronic pain management care offered	Patient demographics*	Patient demographics*	Patient demographics*	Effective communications and care transitions as part of the program	Leadership support to adopt the intervention into routine practice	
Intervention								Veterans found the program valuable		
Recipients										
Implementation and infrastructure										
External environment										
PRISM Practical Robust Implementation and Sustainability Model										
*Assessed from the existing data sources in the VA.										

Infrastructure seemed especially relevant in this program phase. For example, identified contextual factors included the technical infrastructure and resources available to carry out program communications, such as electronic medical system alerts and interfacility electronic communications. These factors were used to inform adaptations to the program intervention and implementation strategies for the consequent national roll-out of the program.

Dissemination phase

During the *dissemination* phase in patient-reported health status assessment, we conducted 12 interviews and group discussions with catheterization laboratory clinicians and administrative staff. The assessment found PRISM domains of Intervention (Organizational Perspective, Patient Perspective), Recipients (Organizational Characteristics), and Implementation and Sustainability Infrastructure to be especially relevant. We learned that even though VA health care is an integrated system, individual facilities have developed their own processes (Implementation and Sustainability Infrastructure) that create variations in the reach, implementation, and effectiveness of the intervention. Additionally, we learned that the electronic medical system that supports and documents patient-provider interactions could not be modified in certain VA facilities to accommodate the intervention's core component for automated identification patients eligible for the health status assessment survey (Implementation and Sustainability Infrastructure). As a result, the implementation and site teams adapted the intervention to use other modes of identifying patients.

DISCUSSION

It was feasible to use PRISM to qualitatively identify and assess multilevel contextual factors across distinct phases of program development as well as across diverse interventions. PRISM was useful in this study to assess both preidentified and unanticipated contextual factors. We first applied the PRISM elements with a set of preidentified contextual factors that were felt to be important to implementing complex interventions during various phases of program development. These PRISM elements were then used to create our interview guides. Through our inquiry with stakeholders, we also discovered additional contextual factors for each intervention that were then mapped to the most appropriate PRISM domains, as described in [Tables 2 and 3](#). The identified contextual factors were addressed in subsequent implementation strategies and adaptations to fit the intervention to the local context. We found that contextual factors associated with PRISM domains of the External Environment, Intervention, Implementation and Sustainability Infrastructure, and the Recipients were most relevant to RE-AIM

dimensions of adoption, implementation, and maintenance [12]. While the programs are still ongoing, we will report on use of PRISM across programs and implementation phases. Our initial impressions are that Implementation and Sustainability Infrastructure appears to be of key importance when considering contextual factors to plan, evaluate, and disseminate programs.

We offer the following crosscutting lessons learned for researchers and program planners based on our experience with PRISM. These activities may contribute to improved program implementation success: (a) Engage stakeholders from multiple perspectives (recipients and organizational leaders) at multiple phases of program development. While the importance of soliciting perspectives of staff and implementers has been previously described, PRISM was especially helpful when eliciting the patient's perspectives relative to the fit of the intervention [6,26]. Additionally, engaging stakeholders facilitated creating an environment for encouraging spread and sharing best practices. As an example, engaging both VA and community multidisciplinary stakeholders provided feedback to improve the Community Transitions Program. Furthermore, their feedback resulted in creating a care transitions program focused on a longer term follow-up delivered by a social worker. (b) Observe results and adjust processes accordingly. We conducted PRISM assessments multiple times during all program phases but especially during the planning and implementation phases, as context changes and long-term implementation success and sustainability are dependent on adapting to the changing context [3,4,25,27]. (c) Adapt the intervention to one's local context to ensure fit of intervention components and implementation strategies. The concept of "fit" among Intervention and Recipient Characteristics, at multiple levels included in PRISM, was very important [28]. The specification of the Implementation and Sustainability Infrastructure is a unique aspect of PRISM that proved very useful and relevant across multiple program phases. The Implementation and Sustainability Infrastructure includes a set of diverse resources (e.g., information and technology support, policies, personnel, and skills) that contribute to the initial and ongoing use of a program in a given setting. Furthermore, PRISM allows for the assessment of multilevel constructs from multiple perspectives (i.e., organizational—leaders, manager, staff, and patient), which distinguishes it from most other frameworks in the field.

This application of PRISM had several strengths. We used multiple complementary assessment methods across multiple diverse interventions to provide examples of how PRISM can be used to identify and assess multilevel contextual factors. Second, our interview guides are available upon request and can be used as templates in future research, which

would contribute to replication. A third strength was that we were able to identify key contextual factors relevant to each of the four interventions using a small to moderate number of a priori specified PRISM domains and elements as well as discover additional contextual factors for each intervention that were successfully mapped to the most appropriate PRISM domains. Previous studies also found it to be important to consider multilevel context and contextual factors a priori as well as throughout the D&I process since context is dynamic [3,4,6].

There are also limitations to our application of PRISM. Our study was only conducted in the VA health care system and findings may not be generalizable. Nevertheless, we did apply PRISM to four different interventions during all phases of program development to illustrate the usefulness of PRISM in identifying and assessing context in various settings. Another limitation was that we did not use quantitative data to identify and assess multilevel contextual factors. Qualitative methods are very appropriate given the early phase of specifying and documenting key contextual factors; inclusion of quantitative data such as a survey could have provided a more comprehensive assessment to guide purposeful adaptations based on the emerging data [6,29]. Mixed methods can generate rich data from multiple sources to understand the complexities of context as well as provide support or discrepancies found in a single assessment approach. At present, there are no validated quantitative assessments for PRISM to our knowledge, with the important exception of the widely used RE-AIM outcome dimensions [6].

PRISM is one framework, but other models or frameworks to understand and explore contextual factors are also available [30–32]. Each framework has its strengths and weaknesses as well as several overlapping domains. PRISM was more intuitive and easier to understand and operationalize than other more comprehensive models, such as Consolidated Framework for Implementation Research (CFIR) and the Greenhalgh model [33,34]. PRISM contains fewer concepts than other models and focuses on factors most relevant to the outcomes from the RE-AIM framework. However, PRISM has not been as widely used as some alternative models, such as Diffusion of Innovations, Exploration Preparation, Implementation, Sustainment (EPIS) Model, Promoting Action on Research Implementation in Health Services (iPARIHS) model, or the Replicating Effective Programs Plus Framework [9,35,36]. These other models address several issues in addition to context and are less closely linked to RE-AIM outcomes.

Future research should (a) attempt to replicate these methods and findings with diverse types of interventions, programs, and policies, (b) include the combination of qualitative and quantitative measures, (c) compare PRISM to other contextual assessment frameworks, and (d) evaluate the incremental value of

using PRISM (and/or other context and implementation frameworks) compared to simple logic models for intervention planning, implementation, adaptation, evaluation, and guidance of dissemination. Although we have shown that PRISM can fit with intervention components, future research should evaluate the application of PRISM in relation to implementation strategies [37]. Context needs to be addressed when describing the implementation strategies, as better description of context will allow for better specification and evaluation of implementation strategies [37].

CONCLUSION

This work demonstrates the need to identify and systematically assess multilevel contextual factors through all phases of program development. We found that PRISM was useful across different interventions and applicable to identify contextual factors related to RE-AIM outcomes.

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Compliance with Ethical Standards

Conflicts of Interest: Marina McCreight, Borsika Rabin, Russell E. Glasgow, Roman Ayele, Chelsea Leonard, Lindsay B. Miller, Heather Gilmartin, Joseph Frank, Paul Hess, Robert E. Burke, and Catherine Battaglia declare that they have no conflicts of interest.

Authors' Contributions: M.S.M. collected and analyzed data, first author; R.A.A. and C.A.L. collected and analyzed data, contributing authors; B.A.R. and R.E.G. provided methodological support, contributing authors; H.M.G., J.W.F., P.L.H., R.E.B. are project leaders, directed data collection and analyses, contributing authors; C.T.B. is project lead, directed data collection and analysis, senior author.

Ethical Approval: This article does not contain any studies with human participants performed by any of the authors. This article does not contain any studies with animals performed by any of the authors. All four projects were deemed quality improvement; therefore, ethical reviews and approvals were not required in accordance with the local legislation and institutional guidelines.

Informed Consent: This study does not involve human participants and informed consent was, therefore, not required.

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