

An orientation for new researchers to key domains, processes, and resources in implementation science

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Abstract

The growth of dissemination and implementation (D&I) research over the last decade has produced a wealth of theories, frameworks, methods, strategies, and resources to inform the translation of evidence into wider practice. This article seeks to frame and orient researchers from the behavioral sciences to the rapidly growing interdisciplinary field of D&I science. We describe five domains across D&I research and practice: context assessment and intervention selection, dissemination, adaptation, implementation, and sustainability. We also discuss evaluation and communication as critical processes to drive ongoing learning and improvement across the five domains. In each section, we include widely cited literature and resources that readers may use to orient themselves to the field, and identify areas that they may want to explore further. This article organizes major areas of D&I science focusing on key definitions, approaches, and commonly used resources. It provides an introduction to researchers new to this area on how to conceptualize and navigate the field of D&I science, with the ultimate goal of increasing the reach and impact of evidence-based interventions.

Keywords

Dissemination, Implementation, Adaptation, Sustainability, Evaluation, Evidence-based intervention

BACKGROUND AND APPROACH

Dissemination and implementation (D&I) science is a rapidly growing field [1–3] with the potential to enhance the translation and impact of scientific findings [4]. D&I research broadly encompasses research focused on dissemination, the “active approach of spreading evidence-based interventions to the target audience via determined channels using planned strategies” [5], as well as implementation research, “the scientific study of methods to promote the integration of research findings and evidence-based interventions (EBIs) into healthcare practice and policy” [6]. In this article, we refer to evidence-based interventions (EBIs) as programs, policies, processes, practices, and guidelines with some level of “proven efficacy and effectiveness” [7]. The field of D&I research is interdisciplinary and transdisciplinary, with a core interest in translating evidence-based research and interventions into “real-world” practice and policy [2]. This is relevant to behavioral

Implications

Practice: Implementation science improves the translation of research for intervention dissemination, implementation, and sustainability; new researchers can draw on the resources of this growing field to extend the impact of their work in diverse real-world settings.

Policy: Policymakers can draw on implementation science to advance the dissemination and impact of policies based on rigorous study designs and evidence-based dissemination and implementation strategies.

Research: Future research is needed across all areas of implementation science, particularly to improve understanding of strategies to support the dissemination and translation of interventions and policies across a wide range of settings and populations.

scientists given that achieving the adoption and sustainment of behavior change and subsequent health improvements will require widespread D&I of evidence-based practices and interventions across a range of healthcare and community settings.

The last decade of D&I scholarship has produced a wealth of literature and resources; however, some of this literature remains less accessible to those without specific training in this field [8]. Useful resources include summaries and inventories of D&I terminology, theories and models [1, 5, 7, 9], targeted guides to facilitate assessment, reporting, and selection of D&I strategies [10, 11], as well as comprehensive texts focused on D&I [2, 12]. Nevertheless, navigating the field can be daunting because of the growth, complexity, and breadth of this rapidly evolving field, and the inherent challenge of determining which resources and publications are relevant.

This article provides an orientation to key concepts and processes in D&I, highlighting opportunities for behavioral scientists to inform and amplify the impact of EBIs to improve patient and population health.

Several D&I frameworks organize constructs into sequential and ordered stages or lifecycles within which program development, dissemination, and implementation activities take place (e.g., [13–15]). While useful for those familiar with D&I terminology and research, these frameworks may be less accessible to those new to the field. Informed by the literature and our prior experience as both faculty and students in the field of D&I, we discuss five domains that broadly capture core D&I domains: (i) context assessment and intervention selection; (ii) dissemination; (iii) adaptation; (iv) implementation; and (v) sustainability. We also discuss evaluation and communication as cross-cutting critical processes throughout these five domains. **Figure 1** displays these domains and processes, as well as key inputs driving D&I. While we describe these in a specific order, in practice, we recognize that work in these domains may occur more than once, in a different order, or not at all within the life span of a particular intervention, policy, or program.

Domain 1: context assessment & intervention selection

Careful consideration of context and the intervention selected are two critical components that often lay the foundation for later D&I domains. Not only must an intervention be “evidence-based” and effective in influencing health behaviors and other outcomes in the population of interest [16]; it must also be a viable choice for the organization or setting in which it is delivered. A thorough assessment of contextual factors and setting includes identifying and engaging with key stakeholders, assessing acceptability among providers/interventionists and the population, and understanding organizational

capacity, climate, and readiness to carry out the intervention [17–19]. Across the literature, activities in this domain are also sometimes referred to as “pre-implementation,” which often includes intervention selection, exploration of potential implementation strategies, and assessment of other factors identified by stakeholders as important in influencing on-the-ground implementation [20].

Selection of an intervention will have important implications for being able to implement the intervention and influencing successful program outcomes. Though often overlooked, it is critical to involve and consider key stakeholders’ opinions in selecting an EBI [21]. Considering an intervention’s evidence of effectiveness is heavily emphasized in the D&I literature, though there is little consensus on how much and what kind of evidence is needed to make an intervention “evidence-based” [22, 23]. While the randomized controlled trial (RCT) has been the gold standard for assessing effectiveness, it prioritizes internal validity over external validity. Yet in research and practice, understanding both internal and external validity is critical as it provides important information about not just whether the EBI is effective, but among which settings, populations, and conditions it works. Resources like Green and Glasgow (2006)’s quality rating criteria for external validity [22] may be useful when assessing the generalizability of existing studies about a EBI, to inform its implementation in other contexts. Where there are no known EBIs for the health behavior or outcome of interest or in some cases a new population or setting that has not been well-studied, a program planning model such as Intervention Mapping or PRECEDE-PROCEED can be useful

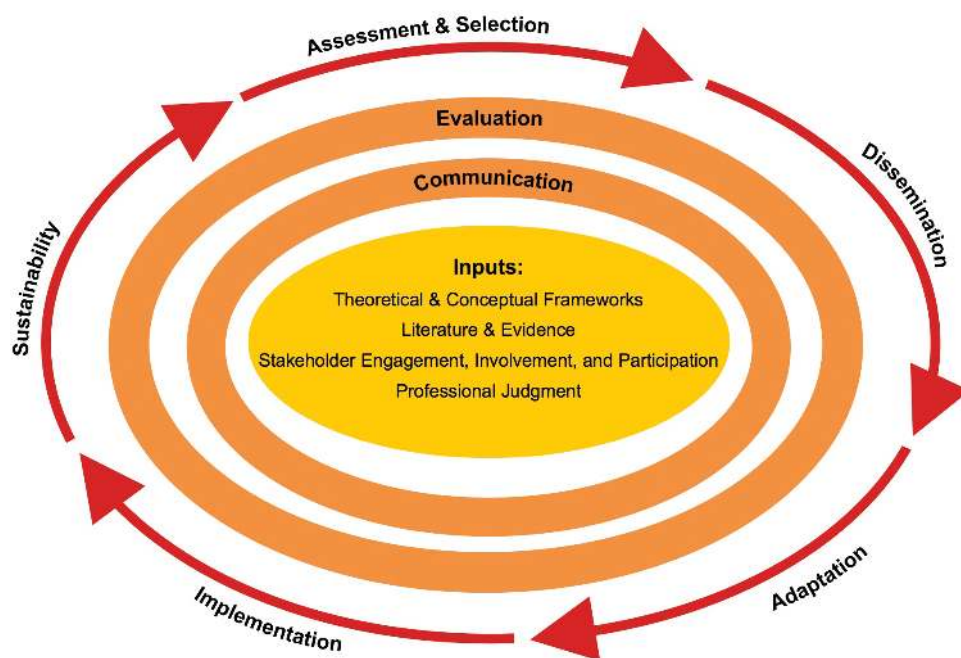


Fig 1 | Domains and processes in dissemination and implementation science.

in systematically informing the development of a new intervention [24, 25]. Identifying an EBI's core components—the “active ingredients” for achieving intended health behaviors and outcomes—is an important component of this domain; in some cases, core components may have already been identified by the program developers, while in other cases more work is needed to determine which are critical to have in place [12, 26]. This process involves specifying the functions and mechanism(s) behind how and why the intervention components are expected to work (ideally informed by theory)—and thus what should ideally be preserved in bringing it to a new setting or population.

Resources for selecting an EBI include the Guide to Community Preventive Services (“The Community Guide”), as well as widely used hubs of research-tested programs and policies including the Pew-MacArthur Results First Clearinghouse Database, National Cancer Institute Research-Tested Intervention Programs (RTIPs) database, the Substance Abuse and Mental Health Services Administration (SAMHSA) National Registry of Evidence-based Programs and Practices [27], and the Canadian Best Practices Portal (CBPP) [28]. Frameworks like the Hexagon Tool are useful for working with key stakeholders in guiding the assessment of context and selection of EBIs [29]. While not exhaustive, these and other resources (e.g., systematic reviews, Cochrane Reviews) capture the ever-growing landscape of tested interventions and policies that researchers may look to when identifying EBIs.

Domain 2: dissemination

Dissemination relates to identifying and communicating key information about the EBI to broadly promote its use by potential adopters and key decision-makers, who may, in some cases, be different than the implementers [2]. Disseminating EBIs requires considering contextual factors that may affect its adoption in a setting among the key stakeholders involved (e.g., organizational leaders, implementers, population impacted). The D&I literature may be useful to researchers as a source of conceptual frameworks and tools to maximize intervention reach and uptake among potential adopters.

Dissemination efforts and strategies to promote dissemination are often informed by Rogers’ “Diffusion of Innovations” theory, which refers to the ways by which an innovation (often a new intervention or policy) is “communicated over certain channels over time, among the members of a social system” [30]. Those planning for dissemination can examine how information about the intervention characteristics, such as relative advantage, compatibility, and trialability, could be communicated and tailored to best encourage uptake among potential adopters [31]. Additionally, Diffusion of Innovations defines the role of early adopters and opinion leaders

in the social system to determine who might be best to encourage adoption among first in order increase speed and impact of dissemination in the broader network [32, 33]. Considerations for planning dissemination strategies include understanding how the intervention is perceived by potential adopters, characteristics of target adopters, contextual factors that will affect adoption, and resources available to promote dissemination [14, 34]. Active and multi-pronged strategies involving personalized outreach and interactive activities are generally thought to be more effective in facilitating adoption than passive approaches like scientific publications and mass mailings; nevertheless, evidence is limited and more research is needed [35–37]. Overall, given the gaps in knowledge regarding dissemination, more research and practice-based knowledge is needed to advance understanding of the key determinants of and strategies for dissemination.

Domain 3: adaptation

Behavioral interventions are rarely one-size-fits-all due to the tremendous diversity of populations and real-world settings in which EBIs are ultimately implemented. In many cases, EBIs will not have been tested in the same setting or among the same population as the one being considered for implementation, and some adaptation may be necessary [22, 23]. One definition of adaptation in the D&I literature draws from cultural adaptation, “the systematic modification of an EBI to consider language, culture, and context in such a way that it is compatible with the client’s cultural patterns, meanings, and values,” including in the context of D&I research [38]. The scope of adaptations that can be made in practice is broad, related to new or different contexts and/or populations than were originally tested, and may include the addition, removal, or modification of intervention components and/or content, reframing of concepts and messages, language translation and image modification, among other changes [38, 39]. D&I researchers suggest proactive (vs. reactive) and purposeful adaptations that are documented and evaluated [2], to understand their impact. Additionally, if “core components” of the EBI have been identified (e.g., the key ingredients that make it effective), those should remain intact if feasible and appropriate.

Research suggests that it can be challenging to implement an EBI with high fidelity, particularly if the original intervention was developed in a setting or population that is not representative of real-world settings where the EBI is being disseminated [26]. Maintaining high fidelity to an evidence-based program model may help preserve the elements that originally demonstrated effectiveness, but with the risk of being a poor fit for the new population or setting. In such cases, planned adaptation using an adaptation model may be particularly useful. A recent scoping study identified 11 key adaptation

steps from 13 frameworks, some of which overlap with context assessment and intervention selection (Domain 1): assess community, understand the intervention, select intervention, consult with experts, consult with stakeholders, decide what needs adaptation, adapt the original program, train staff, test the adapted materials, implement, and evaluate [40]. The ADAPT-ITT model [41], the Map of Adaptation Process (MAP) [42], and Card et al. (2011)'s framework [43] are examples and guides for how to proactively adapt an intervention to maximize successful outcomes. Empirical evidence on the impact of adaptation is limited; however, recent work toward this goal within the field of D&I includes classification of types of adaptations [39] and a call for an “Adaptome” platform to capture knowledge from different intervention delivery settings and populations [44].

Domain 4: implementation

In delivering EBIs, attention should be paid not just to what intervention is selected and disseminated, but the extent to which the EBI is actually being delivered, as well as strategies and factors that support the integration and use of the EBI across a variety of real-world contexts. Understanding implementation, defined as the process of putting to use or integrating EBIs or policies within real-world settings [5], is a central focus of D&I research, with a voluminous literature [12, 45].

EBIs can be implemented in a variety of ways, making implementation strategies to facilitate implementation of the intervention an important area of inquiry for researchers in this field. An implementation strategy has been defined as a “systematic intervention process to adopt and integrate evidence-based health innovations into usual care” [46]. More than 70 discrete strategies have been identified in the D&I literature [47] including staff selection, technical assistance, and systems interventions [12]. In practice, implementation strategies can also be multifaceted or blended, depending on how they are combined or integrate two or more discrete strategies [46, 48]. Several concrete methods for selecting and tailoring strategies have been identified including: concept mapping, group model building, conjoint analysis, and intervention mapping [11], as well as the Behaviour Change Wheel for implementation planning [49]. While there is growth of research in this area [48], overall, limited evidence is available as to which implementation strategies are most effective due to variation in clarity of definitions and reporting, limited guidance on applying strategies to specific interventions, settings, and populations, and variable tracking of fidelity to implementation strategies.

A burgeoning area of D&I research has also focused on understanding factors that influence implementation at the policy, community, organizational, provider/implementer, and individual (e.g.,

patient, consumer) levels [45]. Conceptual frameworks within D&I science can be a useful starting point for exploring and identifying these factors. As one example, the Consolidated Framework for Implementation Research (CFIR), includes 37 systematically derived constructs across five categories (outer setting, inner setting, implementation processes, characteristics of implementers/population, and intervention characteristics), standardized in a cohesive framework [50]. Another D&I model, the Interactive Systems Framework (ISF), describes three interrelated systems (prevention synthesis and translation, support, and delivery) delineating structural factors and processes affecting implementation [51]. Frameworks like these and others [1] can help researchers anticipate and test key factors across multiple levels that may influence intervention delivery.

Domain 5: sustainability

Sustaining behavioral interventions is a distinct priority for researchers and practitioners since it involves factors that are important to consider and plan for beyond initial implementation. In D&I, sustainability has been defined as “after a defined period of time, the program, clinical intervention, and/or implementation strategies continue to be delivered and/or individual behavior change (i.e., clinician, patient) is maintained; the program and individual behavior change may evolve or adapt while continuing to produce benefits for individuals/systems” [52]. The concepts of scale-up and scale-out are relevant to sustainability since the continuation of an intervention over time can take place in additional new and similar settings. Scale-up describes implementation of the intervention for the same or similar populations and settings as that of initial implementation, while scale-out involves EBI delivery in new populations and/or delivery systems different from those in past evaluations [53].

In understanding and planning for the sustainability of EBIs, researchers should consider a range of multilevel sustainability determinants, as depicted in conceptual frameworks like the Integrated Sustainability Framework [54]. There is a growing literature and empirical evidence of factors across multiple levels that interact to influence the sustainability of EBIs across diverse settings, including factors related to intervention characteristics, population/interventionist characteristics, organizational context, processes, and policy context [54, 55]. In recent years, sustainability has been conceptualized as a dynamic process, rather than a static end goal [54]. Responsiveness and adaptation of EBIs to evolving circumstances—the population, setting, and implementing organization, as well as changing policies, resources, and evidence—is an important, but often overlooked, component of sustainability [54]. The Dynamic Sustainability Framework, a useful framework from D&I science, encourages ongoing

organizational learning systems and stakeholder involvement for sustaining and improving interventions over time [56]. Strategies to achieve sustainability have received less attention; however, several resources including the Program Sustainability Assessment Tool [57], RAND's Getting to Outcomes model [58], and the NHS Institute for Innovation and Improvement Sustainability Model [59] have been recommended for sustainability planning [54].

CRITICAL PROCESSES THROUGHOUT D&I: EVALUATION AND COMMUNICATION

In each of the five domains discussed, ongoing evaluation of well-defined processes and outcomes, and continuous communication with key stakeholders are important to facilitate learning and greater impact through D&I science.

Evaluation

Evaluating the impact of the D&I of EBIs can be a powerful tool at multiple levels: to understand whether a D&I strategy was executed as intended, to document the outcomes and cost/cost-effectiveness of those strategies (i.e., to what extent success can be attributed to D&I strategies rather than to effectiveness of the intervention itself), and to advance understanding of an EBI's external validity (in what ranges of settings, populations, conditions is this EBI effective) [60, 61]. Useful guides for measuring D&I outcomes have been proposed [3, 62]; for example, when evaluating implementation, outcomes to consider measuring include: acceptability, adoption, appropriateness, costs, feasibility, fidelity, penetration, and sustainability [62]. Ideally, this decision is made in collaboration with stakeholders, and measurement of multiple outcomes is collected at multiple levels that are relevant (e.g., organizational manager, interventionist/provider, patient). Frameworks and tools evaluating D&I processes and outcomes have been proposed. For example, the RE-AIM framework (adoption, reach, implementation, efficacy, and maintenance) is one of the most widely used models for guiding transparency and comprehensiveness in evaluation [63]. Also useful in offering constructs and organizing schema are the PRECEDE-PROCEED model [25, 60], PRISM model [60], and PRECIS along with PRECIS-2 [60, 64].

Conducting D&I research using traditional individual-level RCTs can sometimes be challenging due to logistical, ethical, and financial barriers [65]. In the implementation of interventions in the real-world, these issues may be heightened because of the tensions and trade-offs of generating findings that are locally applicable, while still being generalizable to multiple settings [61]. Evaluation study designs need to be determined based on feasibility, rigor, resources, and matched with the research questions [20]. Examples of viable evaluation designs [20], depending on these factors, include cluster

randomized trials like stepped wedge/dynamic wait list methods [65], observational studies [61], natural experiments [66], system dynamics modeling [67, 68], and variations in hybrid evaluations that test implementation effectiveness and intervention impact [9].

Evaluation approaches also vary depending on what is being evaluated. Examples include formative or evaluability assessment [60, 69] to inform planning, process evaluation to understand implementation strategy delivery, and outcome/summative evaluation to determine overall effectiveness or implementation outcomes (e.g., adoption, fidelity, cost, etc.) [62]. Integrating quantitative and qualitative tools with mixed methods designs is common [60]. Community-based participatory research (CBPR) approaches, which involve engaging stakeholders throughout the process in dialogue, decisions, and action, can also enhance multiple aspects of the D&I research process [21, 70]. CBPR toolkits and curricula are available from the Community Tool Box and the Community-Campus Partnerships for Health (CCPH) resource library [71, 72].

Communication

Strong communication throughout the iterative cycles of intervention planning and D&I domains is important for engaging key stakeholders, gathering feedback, and sharing key findings to advance understanding of best practices. Channeling both interim and conclusive findings to academic and clinical stakeholders not only fuels productive dialogue and knowledge exchange; it can catalyze increased opportunities to advance understanding of effective D&I strategies in a wider range of community, clinical, and other settings. Additionally, sharing results with community members, practitioners, providers, policymakers, and organizational leaders can promote greater integration into the field, generate new questions for practice-based research, and establish new partnerships and greater trust over time. Researchers have much to learn from communication scientists on how to best share research findings in ways that are meaningful, relevant, and impactful for various stakeholders [73–75], remembering that “one size doesn't fit all” in communicating findings. Communication strategies for disseminating findings beyond the research community may include engaging the press, public facing articles, op eds, policy briefs, and social media messaging. Communication in D&I is informed by resources such as the Center for Disease Control and Prevention's Clear Communication Index [76] and the AHRQ's Dissemination Planning Tool [77]. These tools may be useful starting points for communication throughout the D&I domains, but much more work in this area is needed.

CONCLUSION

D&I science is invested in bringing interventions from theory, to testing, to widespread

practice in evidence-driven ways. The D&I field's rapid growth offers a particular opportunity for researchers and practitioners from the behavioral sciences to draw from D&I frameworks, resources, and tools to increase the reach and impact of their work, and move away from relying on one-size-fits-all approaches to implementation that largely ignore the importance of context [78]. This article aimed to introduce researchers to key areas of work in D&I—context assessment and intervention selection, dissemination, adaptation, implementation, sustainability, evaluation, and communication. The domains discussed have not received equal attention in the theoretical and empirical D&I literature; notably, implementation has been the focus of far more work than dissemination and sustainability, signaling a need for further research in these areas. Researchers and evidence-oriented practitioners alike may use this primer to conceptualize, evaluate, and apply D&I knowledge to catalyze greater patient and population impact.

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Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflicts of interest.

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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.

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