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A Human-centered innovation process (HCIP) for evidence-based substance use prevention intervention implementation.

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Abstract

Despite efforts in Implementation Science, there remains a considerable gap between establishing intervention effectiveness and their widespread adoption in real-world settings. Shockingly, only about 14% of these interventions make it into practice. This study recognized the urgent need for a paradigm shift within the field and sought to develop a comprehensive understanding of the systemic barriers and facilitators affecting intervention implementation.

To achieve this goal, a qualitative methodology known as constructivist grounded theory was employed. This approach allowed for the exploration of rich, in-depth descriptions and theoretical insights derived from the experiences of 30 prevention professionals who have been involved in implementing evidence-based interventions for substance use prevention. Data collection involved various methods, including semi-structured interviews, elicited descriptions of lived experiences, participant documents, and analysis of existing literature.

Through systematic analysis, the study constructed a central process characterized as a human-centered innovating process. This process was found to be cyclical, nonsequential, and iterative, involving overlapping stages of engagement, collaboration, negotiation, iteration, and implementation. These findings shed light on the complexities inherent in implementing evidence-based interventions and provide valuable insights for researchers and practitioners alike.

Ultimately, this grounded theory offers a substantive approach to understanding evidence-based intervention implementation as an innovation process. By highlighting the importance of human-centered approaches and iterative strategies, it provides a roadmap for optimizing the translation of evidence-based interventions into real-world practice.

Keywords

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Recordings and transcripts were stored securely, and hard copies were kept in a locked cabinet. The IRB application addressed minimal risk, confidentiality protection, lack of direct benefits, and the importance of knowledge application to EBI development and implementation.

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A Human-centered innovation process (HCIP) for evidence-based substance use prevention intervention implementation.

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Abstract

Despite efforts in Implementation Science, there remains a considerable gap between establishing intervention effectiveness and their widespread adoption in real-world settings. Shockingly, only about 14% of these interventions make it into practice. This study recognized the urgent need for a paradigm shift within the field and sought to develop a comprehensive understanding of the systemic barriers and facilitators affecting intervention implementation. To achieve this goal, a qualitative methodology known as constructivist grounded theory was employed. This approach allowed for the exploration of rich, in-depth descriptions and theoretical insights derived from the experiences of 30 prevention professionals who have been involved in implementing evidence-based interventions for substance use prevention. Data collection involved various methods, including semi-structured interviews, elicited descriptions of lived experiences, participant documents, and analysis of existing literature. Through systematic analysis, the study constructed a central process characterized as a human-centered innovating process. This process was found to be cyclical, nonsequential, and iterative, involving overlapping stages of engagement, collaboration, negotiation, iteration, and implementation. These findings shed light on the complexities inherent in implementing evidence-based interventions and provide valuable insights for researchers and practitioners alike. Ultimately, this grounded theory offers a substantive approach to understanding evidence-based intervention implementation as an innovation process. By highlighting the importance of human-centered approaches and iterative strategies, it provides a roadmap for optimizing the translation of evidence-based interventions into real-world practice.

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Introduction

Substance use represents a significant and persistent public health challenge with far-reaching consequences. In 2023, an estimated 296 million individuals worldwide engaged in psychoactive substance use without prescription, while approximately 39.5 million suffered from substance use disorders, leading to around 500,000 deaths annually (United Nations: Office on Drugs and Crime, 2023). This alarming reality underscores the urgent need for effective

prevention strategies to address substance use.

Substance use prevention is a "wicked problem" (Rittel & Webber, 1973) characterized by complex, context-dependent challenges requiring a specialized, integrative theory (Trickett, 2019). It involves multifaceted risk factors across systems (UNODC, 2019; Williams et al., 2019), necessitating tailored interventions for various developmental stages and settings (EMCDDA, 2019). Effective prevention demands collaboration among diverse stakeholders (UNODC & WHO, 2018) and must adapt to dynamic social, economic, and cultural contexts (UNODC, 2019), while also strengthening protective factors (Wlodarczyk & Schwarze, 2017).

Despite the development of evidence-based interventions (EBIs) to address substance use, the translation of research into practice remains a formidable challenge. It can take up to 17 years for EBIs to become standard practice in the health field, particularly within the realm of substance use prevention and treatment (Balas & Boren, 2000; Morris et al., 2011; Prendergast, 2011). Moreover, only a small fraction of EBIs are successfully implemented in real-world settings, often requiring years of dedicated effort (Chaudoir et al., 2013; Norton et al., 2017). Even when implemented, these interventions are frequently done sparsely and poorly (Spoth et al., 2013), leading to reduced effectiveness, compromised quality, and increased costs (Kirchner et al., 2020).

Emergence of Implementation Science

In response to the research-to-practice gap, implementation science (IS) has emerged as a critical field aiming to facilitate the translation of research findings into routine practice (Gilmartin & Hessels, 2019). IS is an interdisciplinary field focused on bridging the research-to-practice gap by enhancing the adoption and implementation of EBIs in real-world settings (Bertram et al., 2021). It integrates insights from various disciplines to improve health services and address challenges such as diffusing literature and inconsistent terminology (Waltz et al., 2014). Despite advances in theory and frameworks, there is a need for more comprehensive and empirically grounded theories to better understand and address complexities in adoption, implementation, sustainability, scaling, and de-implementation of EBIs (Curran et al., 2012; Glasgow et al., 2020). To improve IS, researchers have called for a focus on integrating insights from complexity theory and human-centered design to enhance the implementation of EBIs (Braithwaite et al., 2018; Lyon et al., 2021). This is because IS researchers recognize that simple approaches are ineffective; instead, complex and integrative methods addressing various factors and intersecting systems are necessary (Fixsen et al., 2005). While simple models are ideal, IS may require complexity theory-informed approaches (Braithewaite et al., 2018).

IS aims to elucidate the role and impact of a range of factors on the implementation process, including the characteristics of EBIs, their adaptations, and the dynamic interaction within complex environments (Damschroder, 2020). However, despite the existence of multiple models and frameworks, there remains a need for further theory development and testing in IS, particularly in the context of substance use prevention (Pintello, 2019; Tsai et al., 2019).

Need for Enhanced Implementation Science Theories

Existing implementation theories often fall short of capturing the complexities of substance use prevention. They fail to

address the entire process of developing, selecting, and adapting EBIs in real-world settings, and overlook the decision-making processes of stakeholders (Esmail et al., 2020; Parker et al., 2021). This underscores the necessity for new theories specifically tailored to the challenges of substance use prevention.

Implementation Theories, Models, and Frameworks (TMFs)

While implementation theories, models, and frameworks (commonly referred to as TMFs in implementation science) are essential for enhancing EBI implementation success, they are underutilized in practice (Allen et al., 2019). TMFs provide a systematic way of reliably translating research knowledge into practice (Damschroder, 2020). Frameworks provide an outline, structure, system, or plan of phenomena by describing categories and the relations between them, but they do not explain the phenomena, whereas models are more descriptive than predictive and narrower than theories. Theories aim to explain and predict phenomena by defining a set of logical propositions (Carpiano and Daley, 2006).

Although there are between 61 to 100 unique TMFs available, most are frameworks and models, resulting in limited understanding of EBI implementation processes (Birken & Currie, 2021; Villalobos Dintrans et al., 2019). Furthermore, the proliferation of implementation TMFs has led to fragmentation and imprecision in implementation research (Nilsen, 2015). Despite the increased use of theoretical approaches in IS, the lack of clear justification and rationale for their application has undermined their utility (Smith et al., 2020).

This emphasizes the need for comprehensive theories that can provide a deeper understanding of the mechanisms driving successful implementation. Implementation theories have played a crucial role in advancing the understanding and explanation of various aspects of implementation (May, 2013). By refining existing theories such as Organizational Readiness or Absorptive Capacity, or expanding implementation models into theories like Normalization Process Theory, researchers have developed a set of conceptual tools (Nilsen, 2015). This development marks a significant milestone in implementation science. However, despite these advancements, the field still faces a shortage of comprehensive implementation theories (Esmail et al., 2020). The limited number of existing implementation theories underscores the ongoing need for further development in this area. Enhancing the process of EBI development, selection, adaptation, and alignment to TMFs during implementation remains a priority (Parker et al., 2022). The inadequacy of current theories to address these crucial aspects highlights the necessity for continued research and theory development to bridge the gap between theory and practice in implementation science.

The Research Gap

The growing body of literature within implementation science is diffuse, with no standard terminology (Waltz et al., 2019) or central reference for understanding the complex interplay between the development of an EBI and its implementation within real-world settings (Gilmartin & Hessels, 2019). The use of theories is critical to guiding implementation and achieving positive outcomes for EBIs (Kislov et al., 2019). However, there is a paucity of literature applying and testing theories (Damschroder, 2020), resulting in researchers calling for the development and testing of integrated multi-

level causal theories, which include implementation barriers, determinants, strategies, and standard measures (Curran, 2020). Some work on this has been done, but far more is needed (Kislov et al., 2019; Pintello, 2019). Further work is needed to address implementation theories and to improve our knowledge of what works, where, and why (Damschroder, 2020). By addressing the gaps in implementation science theory, advances in implementation science can be achieved that would improve the implementation of EBIs (Esmail et al., 2020).

This means that a comprehensive theory is needed that consolidates the existing body of knowledge (Glasgow et al., 2020), while also considering what is potentially not known, to assist in reducing the research-to-practice gap. Ideally, such a theory would be able to integrate theoretical insights from a variety of disciplines (Kislov et al., 2019), and account for the current lack of understanding of 1) the processes, 2) the context (Greenhalgh et al., 2004), 3) the variety of constructs (Damschroder et al., 2009), and 4) the variety of terminology (Gilmartin & Hessels, 2019) related to EBIs being implemented and sustained.

By doing this, theories become invaluable in explaining EBI outcomes, predicting how the implementation will unfold, and supporting the ability to generalize research findings across the complex variety of settings in which EBIs are implemented. Along with this, theories also provide a common language for implementation of research and practice. However, the implementation theory that is developed must be empirically grounded (Kislov et al., 2019).

Purpose of the Study

This study seeks to address research to service gaps by developing a comprehensive implementation science theory specifically focused on substance use prevention. By providing a theoretical framework that accounts for the complexities of substance use prevention interventions and the dynamic nature of implementation systems, this theory aims to enhance the adoption, implementation, and sustainability of EBIs in real-world settings. Through empirical grounded theory development, this study aims to explore prevention professionals' experiences in implementing EBIs in order to contribute to the advancement of implementation science and the global effort to address substance use as a critical public health priority.

Methods

Implementation science literature predominantly features quantitative research, often integrating qualitative methods in mixed-method designs. However, qualitative approaches in implementation science tend to be more positivist, deductive, and short-term, lacking reflexivity (QualRIS, 2019). Reflexivity, as defined by Charmaz (2014), involves examining how a researcher's background and perspectives influence the research process and outcomes, ensuring transparency and a nuanced understanding. Despite this, implementation science acknowledges intervention and context complexities (Damschroder et al., 2009).

Researchers advocate for more qualitative research in implementation science to understand EBI implementation nuances and stakeholder experiences (Albers et al., 2020; Hamilton & Finley, 2020). Qualitative methods offer rich contextual information, facilitating detailed exploration and addressing "how" and "why" questions effectively (Hamilton & Finley, 2020).

Incorporating diverse perspectives, like constructivist grounded theory, contributes to advancing the field (Hamilton & Finley, 2020). Positivism assumes an objective

reality, while constructivism views knowledge as holistic and intertwined with human factors (Parker et al., 2022). Constructivist grounded theory, a qualitative approach, constructs theories from participant data, emphasizing flexibility and researcher positionality (Charmaz, 2014).

For this study, Kathy Charmaz's constructivist approach (Charmaz, 2006, 2014; McCalman, 2013) was chosen due to its alignment with the researcher's constructive epistemological viewpoint (Charmaz, 2014). Unlike traditional grounded theory, Charmaz's approach acknowledges the researcher's subjectivity and values, emphasizing reflexivity and awareness of biases throughout the research process (Charmaz, 2014).

Constructivist Grounded Theory maintains the inductive, comparative, and emergent approach of traditional grounded theory while allowing for greater flexibility and reflexivity (Charmaz, 2014). The process involves rigorous comparative analysis, theoretical development, and methodological eclecticism to ensure study richness and trustworthiness (Charmaz, 2014).

This approach was chosen to capture prevention professionals' experiences and perceptions of EBI implementation, offering an interpretive portrayal of real-world processes (Charmaz, 2014). By centering on participants' perspectives, constructivist grounded theory provides insights not accessible through a purely positivist lens, enhancing research depth and richness (Charmaz, 2014).

Sample

The sample size of n=30 (Table 1) prevention professionals was determined based on emerging theory, specifically theoretical sampling and saturation. Where theoretical saturation is the point at which no new information or concepts emerged from the data (Corbin & Strauss, 2008) and existing literature (e.g., standard sample in grounded theory is between 20 - 30) (Creswell, 2007). Prevention professionals, as outlined by the OCDPB (Ohio Chemical Dependency Professionals Board, 2023), implement culturally relevant, evidence-based strategies aimed at reducing or delaying substance-related disorders. They lead community initiatives, provide education, and conduct screening programs. Whorley (1989), defines them as individuals responsible for planning and executing prevention efforts, collaborating to translate research into practice for the benefit of

Table 1: Participant Characteristics

Demographics	**N, (%)**
Sex	
-Female	23 (77%)
-Male	7 (23%)
Race[a]	
-White	26 (87%)
-African American	4 (13%)
Workplace	
-County Board	1 (3%)
-County Dept.	1 (3%)
-Government Agency	2 (7%)
-Higher Education	4 (13%)
-Prevention Organization	14 (47%)
-Treatment Organization	8 (27%)

[a] No participants identified as Hispanic; % = percent, N = number.

Table 2: Types of Data Collected

Data Type	N
Interviews	
-Initial	30
-Follow-up	5
Elicited Documents* (e.g., written responses to prompts and inquiries)	
-Lived Experience Description[a]	3
-Documents via email (e.g., responses to interview protocol, feedback, clarifications, responses to final core process summary, etc.)	6
Extant Documents**	
-Workplace websites (pdf)	98
-Handbooks or guidelines	19
-Pamphlets	4
-Books	7
-Reports	9
-Articles	1

[a]Lived Experience Description, as an elicited document, is an autobiographical narrative of the participants lived experience in delivering EBIs, which is developed in response to an open-ended prompt provided by the researcher (Hay & Cho, 2013; Van Manen, 2014). (See Appendix 1). N = number. *Elicited documents= documents created as a result of interaction with the participant. **Extant documents published documents.

various populations (Sloboda et al., 2023). The study focused on prevention practitioners, whose experiences are crucial for bridging the science-practice gap (Vroom et al., 2021). Developers were excluded because their focus is on EBI development, while practitioners are often blamed for implementation issues without understanding their perspectives (Green, 2009; Vroom et al., 2021).

Initially, purposeful sampling targeted prevention professionals registered with the OCDPB, who are 1) actively involved in prevention services aimed at addressing substance use disorders, 2) serve as decision-makers in various settings such as schools, workplaces, communities, families, or health services, where they implement EBIs, or 3) implementers in these same settings. Snowball sampling was then employed to expand the sample. Additionally, one participant was selected using theoretical sampling to explore the experiences of prevention professionals who had not implemented EBIs (Glaser & Strauss, 1967), aiming to enhance theory development and achieve theoretical saturation (Corbin & Strauss, 2008).

This comprehensive approach ensures a nuanced understanding of prevention professionals' perspectives and practices in addressing substance use disorders. Additionally, it is noteworthy that prevention training often occurs within practice settings rather than through formal education (Ostaszewski et al., 2018), and prevention professionals come from diverse educational backgrounds (Crozier & Gressard, 2005).

Data Collection

Data (Table 2) for this study were collected through interviews, lived experience descriptions, and elicited and extant documents (e.g., manuals, books, pamphlets etc.), ensuring a comprehensive understanding of EBI implementation (Flick, 2019). Triangulation of these diverse sources provided multiple perspectives and enriched the data analysis process (Patton, 1999). The interviews, conducted via Zoom, were semi-structured (see Appendix 1) and iterative,

Table 3: Data Analytic Steps

	Data Analytic Steps	Description
1	Collect and organize the data	Collect initial data including interview transcripts, lived experience descriptions, elicited, and extant documents (Charmaz, 2014).
2	Conduct initial coding	Engage with the data and generate codes, expressing what is seen in the data using gerunds (a verbal noun ending in -ing) to preserve the focus on action (Carmichael & Cunningham, 2017)
3	Continue coding until categories begin to form	Fracture the data to allow for comparison between codes and continue until categories begin to form (Charmaz, 2014).
4	Conduct focused coding	Look for the most frequent or important codes within the initial coding and test these to the original data to form categories and subcategories (Birks & Mills, 2012).
5	Refine coding using theoretical coding and theoretical sampling	Use codes to integrate the categories and refine the coding process once saturation of the categories has occurred and collect new data to refine the theoretical codes (Charmaz, 2014).
6	Support coding with constant comparative analysis and memo writing	Use constant comparative analysis, an iterative process that allows for the comparison of incidents, codes, and categories, within and across data sources to write the theory. This is done in combination with memo writing, which promotes data analysis and maintains research transparency (Birks & Mills, 2012; Charmaz, 2014; Glaser & Strauss, 1967).
7	Use memo writing to record and develop the emerging theory	Use memo writing to record ideas, analyze them, and generate notes and diagrams of the developing theory (Birks & Mills, 2012).

allowing for in-depth exploration of participants' experiences (Tolley et al., 2016). The initial interview question was,

> Having had experience(s) with EBIs within substance use, please could you tell me about your experiences with implementing them?

Follow-up questions delved into decision-making, planning, implementation, and contextual factors influencing EBI adoption. Transcriptions of the 35 interviews were member-checked and analyzed using constructivist grounded theory coding (Charmaz, 2014).

Additionally, participants were asked to provide autobiographical narratives of their lived experiences (lived experience descriptions/LEDs; see Appendix 1) with EBIs, yielding valuable insights (Hay & Cho, 2013; Van Manen, 2014). Lived experience, described by Van Manen (2016), captures how individuals directly experience and interpret their world, focusing on essence through detailed accounts like lived experience descriptions (LEDs) to understand real-world interactions comprehensively. Elicited and extant documents, including emails, reports, and academic literature, supplemented interview data, further enhancing understanding (Glaser & Strauss, 1967). Obtaining these documents involved email correspondence and ensured a nuanced grasp of participants' contexts and experiences (Charmaz, 2014) (see Appendix 1). Overall, this comprehensive data collection approach facilitated a thorough examination of prevention professionals' perspectives on EBI implementation, enriching the data and supporting the development of a solidly grounded theory (Charmaz, 2014).

Data Processing and Analyses

The data analysis for this study employed Constructive Grounded Theory, a method

that encompasses several simultaneous steps (refer to Table 3) and was done by the primary researcher under supervision of the remaining authors. Researchers utilize various methods within this framework, beginning with inductive logic and coding, and then proceeding to rigorous comparative analysis, theoretical development, and refinement (Charmaz, 2014). This systematic approach ensures the trustworthiness and credibility of research into EBI implementation for substance use prevention.

Interview transcripts and supporting documents underwent constructivist grounded theory analysis, a process where researchers attach meaning to data segments, raise analytic questions, and distill and compare data (Charmaz, 2014). Utilizing constant comparative methods, researchers continually compared data, codes, and categories to refine conceptual frameworks (Charmaz, 2014). Regardless of data type, the analysis involved consistent coding processes focusing on incidents, actions, characteristics, experiences, explanations, and images (Birks & Mills, 2012). The coding process involved three main stages: initial coding, focused coding, and theoretical coding (Charmaz, 2014). This coding approach was utilized, as Charmaz (2006) critiques axial coding for its rigidity and premature imposition of structure. She advocates for a flexible, iterative approach, where codes and categories emerge organically from line-by-line initial coding, promoting an open and evolving data analysis.

Memo writing played a crucial role throughout the data collection and analysis process, aiding in early analysis of data and codes and enhancing study credibility and trustworthiness (Charmaz, 2014). Additionally, maintaining a reflexive journal and an audit trail ensured research quality. Audit trails are systematic strategies for managing extensive data (including raw data, field notes, and analysis documents) to substantiate trustworthiness (Rodgers & Cowles, 1993). Recorded interviews were transcribed verbatim by the primary researcher, with transcriptions and other written data sources uploaded into NVivo for analysis (Rodgers & Cowles, 1993). NVivo facilitated data storage and analysis, ensuring an audit trail to support study quality. Table 3 outlines the data analytic steps, including data collection, coding, obtaining categories and subcategories of codes, and integrating and refining theory.

This process of studying the data, comparing them, writing memos, and journaling provided this researcher with the best process to define and interpret ideas from the data (Charmaz, 2014), resulting in rich information and a systematic, rigorous process culminating in a credible and trustworthy grounded theory of EBI implementation.

Memo writing

Memo writing was a vital aspect of both the data collection and analysis phases of the study. It involved recording and analyzing ideas throughout the research process, promoting early analysis of data and codes, and enhancing the credibility and trustworthiness of the study (Charmaz, 2014). Memos served multiple purposes, including mapping the research, extracting meaning from data, maintaining momentum, and facilitating open communication during the research process (Birks & Mills, 2012; Tolley et al., 2016). They provided a space to record the researcher's thoughts, changes in thinking, diagrams of developing theories, and analytic processes (Mruck & Mey, 2019).

Furthermore, memos enabled reflexivity and comparisons between data, categories, and concepts generated by the researcher,

Table 4: Research Quality

	Research Quality Methods	Details
1	Peer Debriefing	Peer debriefing involved regular meetings with a peer to ask hard questions about research aspects (Creswell & Creswell, 2017).
2	Quality Evaluations	Quality evaluations were done through monthly journaling to explore research quality questions posed by Charmaz (2014).
3	Methodological Journaling	Methodological journaling was done throughout the study and recorded dilemmas, directions, and decisions made during the research process (Charmaz, 2014).
4	Reflexive Journaling	The primary researcher scrutinized their research experience, ideas, and interpretations in the reflexive journal monthly (Charmaz, 2014).

supporting the constructive grounded theory approach (Charmaz, 2014). These memos were recorded digitally in qualitative software or in a research notebook, ensuring continuous access for analysis and idea generation (Charmaz, 2014). Maintaining an audit trail of memos and researcher work was essential for ensuring study quality and rigor (Rodgers & Cowles, 1993). Comparing memos involved asking key questions to guide the research forward and enhance data interpretation (e.g., How have I drawn links between intersecting systems and prevention professionals experiences?) (Charmaz, 2006).

Overall, memo writing served as a mechanism for analyzing data, generating new ideas, and maintaining transparency and rigor throughout the research process.

Quality Management

To ensure the quality of this constructivist grounded theory study, various qualitative methodologies were utilized (see Table 4), including maintaining an audit trail, conducting quality evaluations, engaging in peer debriefing sessions, and regular journaling. These methods aimed to uphold core quality criteria such as credibility, originality, resonance, and usefulness (Charmaz, 2014).

Quality evaluations involved monthly reflexive journaling sessions to explore key questions recommended by Charmaz (2014) (e.g., Is the data sufficient to merit my claims?) and assess adherence to quality criteria. Peer debriefing sessions, conducted weekly, provided an external check on the research process and fostered researcher honesty by being the devil's advocate and asking the tough questions (Creswell & Creswell, 2017; Lincoln & Guba, 1985). Journaling, including methodological and reflexivity journals, facilitated reflection, transparency, and idea generation throughout the research process (Birks et al., 2019; Charmaz, 2014).

Maintaining transparency and trustworthiness, the primary researcher accounted for their assumptions and perspectives upfront (e.g., constructivist worldview and beliefs about prevention practitioners' use of EBIs), recognizing the impossibility of complete separation from prior knowledge (Birks et al., 2019). Regularly reviewing research questions and aims helped ensure alignment with participant experiences and data (Charmaz, 2014).

Additionally, the researcher regularly consulted with their supervisory research committee to review and confirm analyses, promoting study quality, credibility, and trustworthiness (Birks et al., 2019). Data triangulation, through memo writing and comparison of elicited and extant literature and interviews, further bolstered trustworthiness and credibility (Charmaz, 2014).

To adhere to ethical guidelines, Institutional Review Board (IRB) approval was obtained from the primary researcher's university, ensuring participant confidentiality, and minimizing risk. Participants were provided with comprehensive information about the study and were offered counseling resources if needed. All data were securely stored in password-protected folders, both digitally and in hard copies, in compliance with IRB regulations.

Overall, adherence to quality criteria, ethical guidelines, and rigorous research practices ensured the trustworthiness, credibility, and ethical conduct of the study.

Figure 1: Diagram of the Developed Grounded Theory: Human-Centered Innovation Process (HCIP)

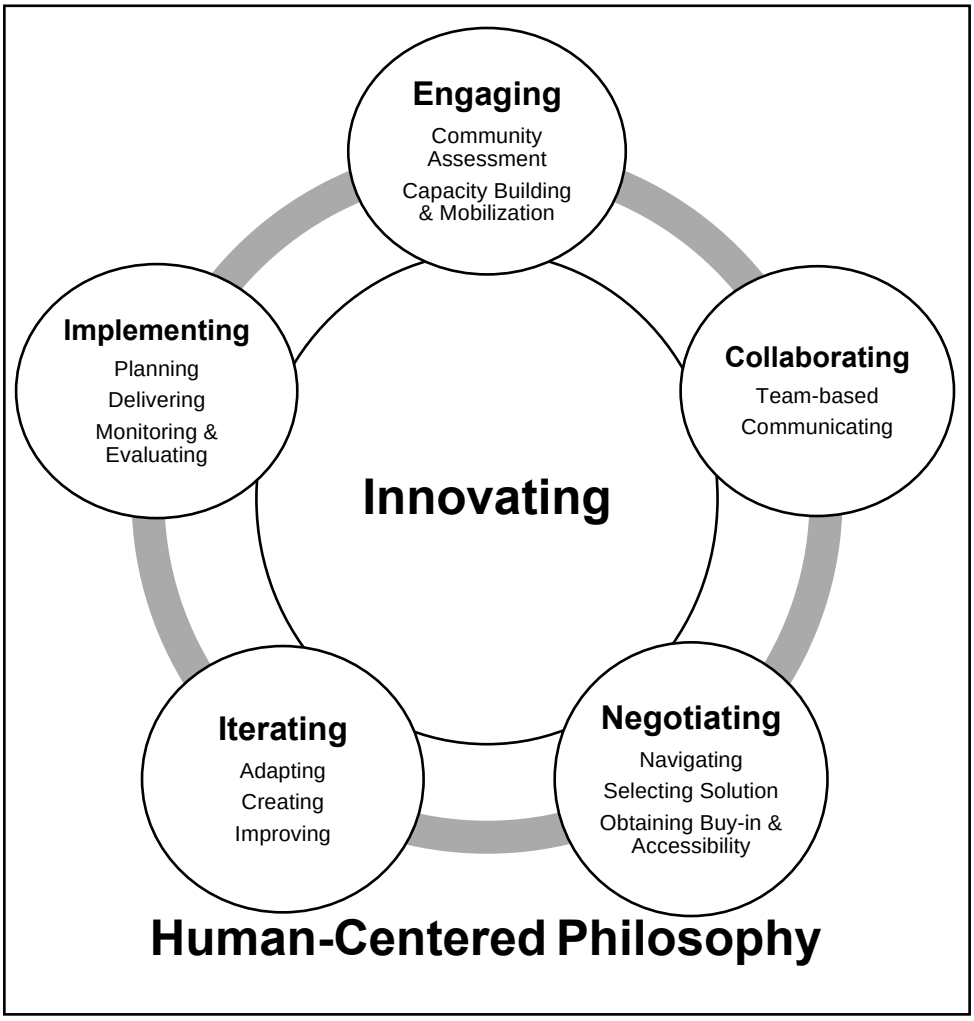

Table 5: Codes from the Data, their Definitions, and Composition.

Code	Coding Type	Definition and Composition
Innovating	Theoretical Code	An act of bringing life to ideas, by translating prevention science into practice within the real world.
	Focused Codes	Engaging, collaborating, negotiating, iterating, and implementing
Human-centered philosophy	Theoretical Code	A philosophical position that places the focus on human beings, through embracing a value system of being participatory, collaborative, and empowering to support sustainable change in improving the lives of individuals and communities. Requires understanding of those with whom they work, nurturing relationships, and meeting them where they are to address their needs.
	Focused Codes	Value system and nurturing relationships.
Engaging	Focused Code (category)	As a state, it is about drawing attention to themselves. As a process, it is about building connections with people to understand them, their situation, and their context. People are brought together for capacity building, empowerment, and mobilization.
	Subcategories	Community assessment, capacity building, and community mobilization.
Collaborating	Focused Code (category)	Working as a team with others and occurs because of engaging. Involves cooperating, coordinating, shared decision-making, and sharing in partnerships. Requires communication that is inclusive and open.
	Subcategories	Team-based and communicating.
Negotiating	Focused Code (category)	Working with others, while navigating the intersection of various systems, to find common ground, supporting all members to have a voice, while exploring the challenges they face and possible solutions to them.
	Subcategories	Navigating, obtaining buy-in and accessibility, and selecting a solution.
Iterating	Focused Code (category)	It is the iterative co-creation process of creating, adapting, and improving an agreed-upon solution.
	Subcategories	Adapting, creating, and improving.
Implementing	Focused Code (category)	Is the planning, delivering, monitoring, and evaluating of the solution.
	Subcategories	Planning, delivering, monitoring, and evaluating.

Results

The study involved 30 participants with diverse work backgrounds (Table 1) in the Midwest United States. Through constructivist grounded theory analysis, two core theoretical codes—innovating and human-centered philosophy—were identified from the empirical data. These codes, along with focused codes, were integrated to create the Human-Centered Innovation Process (HCIP) theory (Table 5 and Figure 1).

The HCIP theory, derived from the empirical data, suggests that prevention professionals engage in a cyclical innovating process characterized by engaging, collaborating, negotiating, iterating, and implementing. This process is guided by a human-centered philosophy, emphasizing the importance of nurturing relationships, and co-creating solutions to address identified problems (Appendix 2 Table 1). Below, each

aspect of HCIP is elaborated, featuring sample quotes from participants who were assigned pseudonyms.

Innovating

Implementing EBIs in real-world settings is an innovative process that bridges theory with practice. It involves bringing ideas to life and adapting scientific knowledge to suit specific contexts. This innovation process is iterative and multifaceted, encompassing activities such as engagement, collaboration, negotiation, and implementation. However, the ability to navigate these processes effectively may vary depending on factors like workplace support, funding availability, and stakeholder (e.g., schools, health facilities, health departments, faith organizations, etc.) buy-in.

Prevention professionals describe innovating as a dynamic process driven by a commitment to improving lives and fostering social change. They emphasize the importance of building relationships, collaborating with community partners, and negotiating diverse perspectives to develop solutions that are both relevant and timely.

Within this innovation process, engagement, collaboration, negotiation, iteration, and implementation are interconnected categories. Prevention professionals recognize the need to involve end-users in the development process to ensure the success and effectiveness of EBIs. By incorporating the perspectives of those whom EBIs are designed to serve, prevention professionals can create solutions that truly address the needs of their communities. “Sarah” adeptly outlined the EBI implementation process, emphasizing key elements like engagement, collaboration, negotiation, and iteration, which contribute to its time-consuming nature.

> I get frustrated because I feel like I'm always circling back and I'm always going over something [EBI implementation components] again because there's a new partner. So, it's the interaction between these things that you must do that forces it to be iterative. So, the need for engagement, collaboration, negotiation…It fits the part…So, even though it's better in the long run, it takes so much longer…That's why it takes so long to get prevention programs up and running. (Sarah, Interview 2).

Human-Centered Philosophy

At the heart of HCIP lies the human-centered philosophy, shaping the process of implementing EBIs. This philosophy prioritizes meeting the needs of individuals and communities, emphasizing the importance of nurturing relationships and building trust. Prevention professionals are guided by principles of empowerment, collaboration, justice, diversity, and compassion, which inform their actions and decisions. By becoming community role models and advocates, they aim to promote hope and engage in continuous iterative processes to bridge the gap between prevention science and practice. Liz embodies the human-centered philosophy as she considers her approach to interacting with community members and addressing their needs.

> When we would get together, it was always very comfortable, but very much focused on this very client-centered [relationship], wanting their needs to be met, and for them to feel comfortable (Liz, Interview 1).

Engaging

Engaging refers to the proactive interaction and connection-building efforts within the context of implementing EBIs. It involves multidimensional interactions aimed at drawing attention to oneself, others, or the issues at hand, even in challenging circumstances. Prevention professionals adopt approachable, empathetic, and

relatable approaches to understand and address the needs of individuals and communities. This includes activities such as community assessments, capacity building, and community mobilization, all geared towards empowering stakeholders and fostering collaborative partnerships for sustainable action. Martin underscores the importance of forging connections during EBI implementation, stressing that these partnerships are vital for the success and advancement of prevention professionals.

> I have worked with evidence-based interventions…because we've built up connections over the years. That has made the process easier for us. There are still some challenges trying to get into a new school district or a new school. We thrive off those connections with some of these partner schools…When we first get our steps in the door, we really don't try to push a full program. We try to see [what's happening], asking what's going on, or what are certain grade levels struggling with that you are finding…It really comes down to those conversations… It's definitely making those connections within the schools, with community partners. We always look at that as being a key aspect. (Martin, Interview 1).

Collaborating

Collaborating involves actively working with stakeholders to establish partnerships, which serve as the foundation for successful EBI implementation. It emphasizes effective communication and teamwork to achieve prevention goals. Collaboration extends beyond mere engagement to include joint decision-making, resource sharing, and champion development. Prevention professionals leverage shared resources, support stakeholder efforts, and nurture champions embedded within the community to drive community mobilization and achieve meaningful change. Paddy highlights the crucial role of collaborating with stakeholders to lay a solid foundation in communities. This collaborative approach is essential for engaging in key aspects of the innovation process, such as community assessment and capacity building.

> So, that [establishing collaboration] was kind of our first thing that we did is established that, and then they've [stakeholders] been instrumental in helping us lay the foundations and the groundwork, especially with more assessment and planning and capacity building (Paddy, Interview 1).

Negotiating

Participants described EBI implementation as navigating intersecting systems of science and practice and navigating teams with diverse beliefs, values, and perspectives. This process requires mutual compromise, accommodation, and reconciliation to find common ground in selecting the most appropriate solution for the community's needs. Negotiating requires prevention professionals to create supportive environments, actively listen, guide the team, and provide mentorship. They expect resistance and plan for it, paying attention to relationships to obtain buy-in and accessibility. Professional experience and knowledge help them facilitate these processes effectively. William highlights the significance of establishing mutual understanding while collaborating with faith organizations. He emphasizes that both prevention professionals and faith leaders share a common goal of caring for the youth, and this can be achieved through a holistic approach.

> Now that I'm here, we're almost everywhere when it comes to that we take information, sit down and talk. We have a lot of their kids in school. Their kids talk about us in school and at church. So, we have been able to get in there, at the same time understanding that we're not going to try to encroach on your domain. And this is our domain and the two can be integrated (William, Interview 1).

Iterating

Participants described EBI implementation as a complex and iterative process that co-creates novel solutions addressing stakeholders' needs, testing, and continually improving solutions, and ensuring fidelity to the design within context. This process involves collaboratively engaging with all stakeholders to adapt, create, or improve the solutions through iterative testing of them. The prevention professional oversees this data-driven process, considering personal preferences, past experiences (self and community) and community needs. The iterative process is considered necessary for quality maintenance and outcome achievement. Arlene highlighted the existing divide between developers and professionals and how this divide can lead to problematic characteristics in some developed interventions. Leading to the need to engage in iterating.

> I do a lot of... I'll take the curriculum that is evidence-based, and I use bits and parts of a particular lesson. But I also make it fit for the kids I have. I have 40 minutes with these kids and a lot of these programs are for an hour and 15 minutes and it doesn't make any sense to me. I don't understand… Do we know any kids that stay in class for an hour and 15 minutes? We don't…. There's a divide between the people that design it and the people that implement it. And that's a shame (Arlene, Interview 1).

Implementing

The implementing process was described by prevention professionals as a planned process involving planning, delivering, monitoring, and evaluation. Which incorporates testing and refinement through the overlapping iterative process. Many find implementation the easiest part of what they do. This process requires facilitation and communication skills. Success is achieved through flexibility, professionalism, credibility, cultural competence, humility, and collaboration. Staying within your professional scope of practice is essential for maintaining credibility and trust. Lara highlights the difficulties faced in implementing EBIs and emphasizes the need to view setbacks as learning opportunities for future success.

> When we're doing tobacco smoke-free days, before they were smoke-free... Some of the restaurants will give a good two hours of nobody can smoke and then they are like: *I'm tired of people complaining and saying they're not going to eat here.* And so now, everybody can smoke in here. We have all these smoke-free signs and we're so excited for your partnership, and you walk in and everybody's smoking at the table. Right? So, we've gotten good at saying: Okay. Well, this didn't work. Why didn't it work? And what do we have to do to make it more successful next time? Taking it as a learning opportunity and understanding that it's not necessarily a complete failure. (Lara, Interview 1).

Discussion

This study aimed to explore experiences of prevention professionals in implementing EBIs and to develop a grounded theory known as the Human-Centered Innovation Process (HCIP) based on their data, to narrow the research-to-practice gap (Glaser & Strauss, 1967).

HCIP as a Grounded Theory

HCIP serves as a grounded theory that provides insights into the multifaceted processes of EBI implementation, thereby facilitating bridging of the research-to-practice gap (Glaser & Strauss, 1967). Rooted in the lived experiences of prevention professionals, HCIP delineates a cyclical process of innovation, underscored by a human-centered philosophy, emphasizing

stakeholder involvement and co-creation of solutions.

Aligned with Strauss and Corbin's (1990) criteria for grounded theory, HCIP captures the nuanced and iterative nature of EBI implementation, drawing insights from diverse data sources within prevention science (Coetzer-Liversage, 2022). This theory outlines essential conditions for its successful application (Glaser & Strauss, 1967), and offers comprehensive and transferable insights applicable across substance use prevention contexts (Coetzer-Liversage, 2022).

HCIP offers a substantive theory for implementing EBIs. Per Glaser and Strauss (1967), such a theory emerges from specific empirical research, providing insights into the implementation of EBIs like Communities That Care (CTC). HCIP explains the processes for implementing CTC and other EBIs (e.g., Good Behavior Games, Screening Brief Interventions and Referral to Treatment, Team Awareness, LifeSkills Training) across various settings (e.g., communities, schools, health organizations, workplaces). Unlike linear models, HCIP shows how practitioners engage in overlapping, non-sequential steps tailored to specific needs (Parmar et al., 2022; Oeij et al., 2019). It highlights the multifaceted nature of real-world implementation, emphasizing the integration of diverse strategies and stakeholder involvement (Avelino et al., 2019; Middel et al., 2019; Waller et al., 2017).

By providing a practical theory grounded in real-world experiences, HCIP offers actionable insights to inform and guide evidence-based practice in prevention science. However, future research is warranted to assess adaptability and effectiveness of HCIP in varied settings and health domains.

Importance of Collaboration

The collaborative nature of HCIP aligns with the broader objectives of social innovation, highlighting the transformative potential of EBIs in tackling complex societal challenges (Mason et al., 2015; Metz et al., 2022). EBIs are recognized as disruptive forces that introduce uncertainty among stakeholders, emphasizing the necessity of collaborative strategies to manage this uncertainty and address stakeholder concerns (Fishman et al., 2021).

Prevention professionals and stakeholders serve as active innovators, and their values, needs, and perspectives are integral to the success of EBIs (Ng et al., 2018). The resulting EBI represents an innovation that encompasses outcomes, processes, and mindsets shaped incrementally by the prevention system (Kahn, 2018). This highlights the imperative for developers and academics to consider market demand, an aspect often overlooked, leading to increased efforts by prevention professionals to effectively market EBIs (Proctor et al., 2021). Moreover, culturally competent tailoring of EBIs further enhances their success (Guerrero et al., 2017).

The collaborative, relational, and socially positioned approach of HCIP resonates with Metz et al.'s (2022) emphasis on the importance of trusting relationships in successful implementation endeavors. By fostering engagement and trust among stakeholders, HCIP promotes inclusive decision-making and supports the development of tailored interventions that resonate with diverse cultural contexts.

HCIP's Team-Based Approach and Effectiveness

The team-based approach advocated by HCIP aligns with prior research that underscores effectiveness of such strategies

within prevention science (Dopp et al., 2020). By breaking down silos and optimizing implementation and dissemination of EBIs, HCIP makes significant contributions to strengthening the field of prevention science in real-world settings (Lyon et al., 2020; Proctor et al., 2021).

The team-based approach inherent in HCIP emphasizes collective problem-solving and inclusive decision-making, which fosters innovation and facilitates adoption of EBIs (Dopp et al., 2020). This collaborative ethos enhances coordination and communication among stakeholders, promoting a holistic and integrated approach to EBI implementation (Lyon et al., 2020). Consequently, HCIP plays a pivotal role in bridging the gap between research and practice, ensuring that interventions are effectively translated and utilized within diverse community contexts (Proctor et al., 2021).

Importance of Practice-Based Evidence

HCIP's emphasis on stakeholder engagement and empowerment resonates with the evolving focus on prioritizing "practice-based evidence" over exclusive reliance on "evidence-based practice" (Embry et al., 2021). By integrating real-world experiences into development of interventions, HCIP enhances our understanding of outcomes in diverse contexts (Green, 2009; Holmqvist et al., 2015).

This emphasis on practice-based evidence is instrumental in overcoming implementation barriers and fostering innovative solutions within prevention science (Embry et al., 2021; Lyon et al., 2020), and moving these practices towards evidence-based practice. The study highlights the importance of gathering evidence from real-world settings to comprehend interventions within their practical contexts (Green, 2009; Holmqvist et al., 2015). Such practice-based evidence offers invaluable insights into effectiveness and applicability of interventions across varied contexts, especially in the development of EBIs.

Paradigm Shift towards Non-linear Implementation Science

The innovation process unveiled in this study signifies a paradigm shift within IS, departing from conventional linear approaches (Parmar et al., 2022). It underscores the notion that EBI implementation can embrace various routes and methods, necessitating adaptable strategies tailored to diverse contexts and stakeholders (Oeij et al., 2019). This recognition emphasizes significance of the HCIP framework, which advocates for iterative and collaborative approaches to EBI implementation.

Moreover, this study aligns with prior research that highlights limitations of predominantly one-way conceptualizations of research translation, dissemination, and delivery to practitioners (Khoury et al., 2007; Nilsen, 2015). By acknowledging this limitation and emphasizing bidirectional interactions between researchers and practitioners, the study advocates for a more dynamic and collaborative approach to research implementation. This approach aims to bridge the research-to-practice gap and facilitate effective knowledge transfer (Dryden-Palmer et al., 2020).

Integration of Human-Centered Design (HCD)

Integration of HCD principles with IS, as exemplified by HCIP, holds promise for improving EBI implementation outcomes (Dopp et al., 2019). HCD's emphasis on rapid prototyping and iterative testing aligns with the need for agile and flexible approaches in

EBI development and implementation (Fischer et al., 2021). This agile approach is particularly relevant given the dynamic nature of prevention work and the evolving needs of communities.

Collaborative and Team-Based Approach of HCD

The collaborative and team-based approach promoted by HCIP has demonstrated superior outcomes in research (Dopp et al., 2020), breaking down silos that act as barriers within prevention science and maximizing EBI implementation (Proctor et al., 2021). Additionally, it enhances dissemination efforts (Lyon et al., 2021). This approach emphasizes collaboration and participation in problem-solving and solution development (Norman et al., 2021), aligning with HCD principles that promote stakeholder engagement and operationalize implementation strategies (Chen et al., 2021). Effective communication, rooted in conversations between collaborating teams, is pivotal to this approach and facilitates coordination (Krippendorff, 2000). This is consistent with the findings of this study, which also found communication to be an important feature of the innovating process.

Benefits of HCD

HCD's integration with IS brings creativity, egalitarianism, structure, efficiency, and visibility to the process, generating more innovative and impactful EBIs (Norman et al., 2021). This is established because more diverse opinions and unique possibilities are considered throughout the process (Fischer et al., 2021), which can address the many factors that currently undermine EBI implementation. Diversity of perspectives and input from stakeholders ensures that the EBI is more acceptable, appropriate, and feasible (Dopp et al., 2019). Integration of HCD with IS promotes a more human-centered philosophy to EBI implementation, facilitating successful implementation through a collaborative team-based approach.

HCD and IS

An important difference between HCD and IS is that HCD uses rapid prototyping, testing, and iterating compared to the more traditional (and slower) approaches of IS (Fischer et al., 2021). This aligns with the findings of this study, where prevention professionals express the need for novel approaches to IS that promote more agile and flexible approaches, as the period of EBI development is often too long, resulting in outdated and inappropriate interventions.

Research by Chen et al. (2021) and Fischer et al. (2021) has focused on aligning Human-Centered Design (HCD) processes with implementation science. Fischer et al. (2021) emphasize that the innovation process enhances understanding of development processes, which complements the findings of this study. Chen et al. (2021) position HCD at the beginning of the translational research pathway (i.e., discovery), with innovation science at the distal end. In contrast, HCIP views the integration of HCD and implementation science as a continuous, cyclical, and iterative process, differing from the sequential approach proposed by Chen et al. (2021).

Other researchers have advocated for embedding HCD within implementation science (Bowen et al., 2020; Lyon et al., 2021). The current study addresses this call to action by demonstrating that the integration of HCD with implementation science allows for the potential to improve EBI implementation (Dopp et al., 2019), through improved fit, relevance, appropriateness, and uptake of EBIs by prevention professionals.

The human-centered approach as found in this study aligns with HCD and its iterative, multistep, and empathy-driven principles. Findings support the call for the integration of IS with HCD (Fischer et al., 2021). This integration provides opportunities to address the research-to-practice gap by improving the development, adaptation, implementation, and sustainability of EBIs (Chen et al., 2021; Holeman et al., 2018; Lyon et al., 2020; Proctor et al., 2021).

Multiple researchers have advocated aligning HCD with IS (Bowen et al., 2020; Lyon et al., 2020, 2021). Chen et al. (2021) views such integration as sequential, emphasizing HCD at the beginning and IS at the end stages of innovation. In contrast, HCIP supports the integration of HCD and IS as a continuous, cyclical, and iterative process. The study confirms the potential of HCD to address complex problems of implementing EBIs (Holeman et al., 2018). Collaborative and team-based approaches are effective in prevention science (Dopp et al., 2020), breaking down silos and maximizing EBI implementation and dissemination (Lyon et al., 2020, 2021; Proctor et al., 2021). HCD promotes stakeholder engagement and operationalizes implementation strategies (Chen et al., 2021) through communication and coordination (Krippendorff, 2000), as confirmed in this study. HCD uses rapid prototyping, testing, and iterating, which aligns with prevention professionals' need for agile and flexible approaches. Studying and fostering this nimble approach using HCIP may make the development, adaptation, implementation, and sustainment of EBIs more efficient.

Comparison of HCIP with Other Implementation Theories

The human-centered innovation process that is central to the grounded theory involves engaging prevention professionals and stakeholders throughout the implementation process. This inclusive approach is critical, as implementation failures often stem from factors like inadequate knowledge or investment from stakeholders and prevention professionals (Lyon et al., 2020). While established IS theories such as Normalization Process Theory (NPT) emphasize coherence, cognitive participation, collective action, and reflexive monitoring as drivers of EBI normalization (May & Finch, 2009; May et al., 2009, 2022), HCIP diverges from traditional linear theories by underscoring iterative, co-creative, and collaborative processes in EBI implementation within complex systems.

Moreover, HCIP addresses a significant gap in the literature by confronting the scarcity of implementation theories (Esmail et al., 2020; Nilsen, 2015), providing a more comprehensive understanding of EBI implementation processes (May, 2013; Nilsen, 2015). This is particularly vital as many theoretical implementation frameworks (TMFs) predominantly consist of frameworks and models, offering limited insight into EBI implementation processes (Birken & Currie, 2021; Villalobos Dintrans et al., 2019). Importantly, HCIP also bridges the existing gap in TMFs by elucidating the entire process of EBI development, selection, and adaptation in real-world settings, shedding light on the decision-making processes of individuals within those contexts (Esmail et al., 2020; Parker et al., 2021).

The innovation process described in this study reflects a paradigm shift within IS. The widely used Diffusion of Innovation Theory delineates five main stages: adoption, diffusion, dissemination, implementation, and sustainability (Rapport et al., 2018; Rogers, 2003), representing a stage-based, somewhat linear theory of implementation. In contrast, this study portrays an iterative, non-linear cycle of activities, with data-

driven collaborative efforts at its core (Voorberg et al., 2015), which propel EBI implementation forward (Benitez et al., 2020). While other theories have been developed using logic based on well-informed observation (e.g., NPT), HCIP emerged from the exploration of lived experiences of prevention professionals and the data gleaned from discussions with them.

Implications for Health Behavior Research

This study contributes significantly to understanding the implementation of EBIs and offers insights for advancing health behavior research. Health behavior scientists can use the study findings to redefine, measure, and interrelate theoretical constructs related to EBI implementation, integrating HCIP constructs into existing frameworks or developing new ones to capture human-centered aspects effectively. Prevention professionals can leverage the study's recommendations to enhance their implementation capacity, potentially developing training programs centered on HCIP principles emphasizing engagement, collaboration, negotiation, iteration, and implementation. Adopting a more iterative and collaborative approach to EBI implementation, as proposed by HCIP, may lead to improved outcomes and better address implementation challenges. Policymakers can utilize insights from this study to shape policies and strategies promoting EBI adoption and implementation, such as incentivizing human-centered approaches or establishing guidelines for collaborative practices.

The key components of HCIP provide avenues for future research to explore the relationships between these elements, investigate their boundaries and contextual influences, and understand their optimal levels and consistency. Such investigations would contribute to refining and formalizing the theory (Glaser & Strauss, 1967), and enhance our understanding of EBI implementation. This is particularly crucial as HCIP is specific to the substantive area of substance use prevention, and formalizing the theory would facilitate its generalization and transferability across research fields (Glaser & Strauss, 1967).

Limitations

The predominance of white women in the sample may impact generalizability, yet it mirrors the field's demographic norm, potentially alleviating this concern. Another limitation lies in the small number of LEDs, constraining nuanced understanding and generalizability, though a larger number of participant documents partly mitigated this issue. Additionally, the focus on substance use prevention presents a limitation, but it also offers the chance to test the theory across different substantive areas. Further research is recommended to explore and test this preliminary HCIP theory from different perspectives, settings, and health foci. It may also be tested against the other relatively few IS theories (e.g., NPT). Future work may include perspectives of EBI research developers and end-user clients. HCIP may be expanded by specifically soliciting data on EBI failure. It may be informative to include treatment and prevention professionals from other regions and settings, who implement and sustain a wide range of EBIs (e.g., policy vs treatment) using a range of methods (e.g., online, in-person, etc.). This is because the study lacked perspectives from prevention professionals practicing in other U.S. regions or internationally. This limitation confines the grounded theory to EBI implementation for substance use prevention specifically within the Midwest U.S. Although these variations can test, stretch, and further develop HCIP, the rigor used in the current

study supports its relevance to improving IS theory.

Conclusion

This study emphasizes the importance of the Human-Centered Innovation Process (HCIP) as a theory derived from practice-based evidence, highlighting its collaborative and non-linear nature. By integrating literature and aligning with HCD principles, HCIP offers a unique approach to implementing EBIs. Understanding prevention professionals' perspectives is crucial for bridging the research-to-practice gap in EBI implementation. The study contributes to the initial development of HCIP, amplifying prevention professionals' voices and demonstrating the connection between HCD and implementation science (IS). HCIP has the potential to improve outcomes across diverse settings by bridging this gap effectively.

Discussion Questions

Implementation theory is instrumental in guiding the adoption and integration of evidence-based interventions (EBIs) into real-world settings. Given this importance, how can we intentionally integrate human factors into the design of substance use prevention programs to enhance uptake, implementation, and sustainability? Furthermore, how might the principles of the Human-Centered Innovation Process (HCIP) be effectively applied across diverse contexts to improve the adoption and sustainability of EBI implementation strategies? These questions prompt us to explore practical strategies and innovative approaches that prioritize human-centered design and collaboration in implementing EBIs.

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Appendix 1: Instruments

1. Interview Protocol

The interview followed a semi-structured process, to better obtain a richer explanation and exploration of the participant's lived experience with adopting and implementing evidence-based interventions for the prevention of substance use. The semi-structured interview involved the following questioning within the protocol below:

Participant Name: _____ Date: _____

Participant Allocated Code: _____

____ Gave Gift Card
____ Read/reviewed informed consent form. Obtain signature and give participant copy.
____ Read/reviewed audio consent form. Obtain signature and give participant copy.
____ Ask if there are questions before we begin.
____ Ask for permission to begin recording. If granted, begin the recorder, and inform the participant that the recorder is on.
____ Gave participant a copy of the lived experience, elicited document request
____ Asked for any references for published articles that influenced their implementation of EBIs

Interviewer:

I would like to thank you again for your participation. I appreciate your taking part in this research study into the implementation of evidence-based interventions to prevent substance use. Having had experience(s) with EBIs within substance use prevention, please could you tell me about your experiences with implementing them?

Interviewer (in response to interviewee's response):

Thank you for sharing that. I heard you talking about…..Please could you expand for me on:

Domain area: Decision (Adoption)

1. How did you find out about EBIs and the EBI(s) that you chose?
2. What made you choose an EBI?
    a. Prompts: Characteristics, motivation, needs
3. What made you choose …. as an EBI?
4. Who was involved in deciding on choosing the EBI?
5. What influenced the decision to choose the EBI?
    a. Prompts: Self, management, organization, EBI, and other role-players

Domain area: Preparation

1. After making the decision, what did you have to do to prepare for implementing the EBI?
2. What influenced your preparation and planning for the implementation of the EBI?
    a. Prompts: Self, management, organization, EBI, and other role-players

Domain area: Implementation

1. How did you go about implementing the EBI?
2. What was involved in implementing the EBI?
    a. Prompts: Self, management, organization, EBI, and other role-players
3. What influenced (promoted/impeded) the EBIS implementation?
    a. Prompts: Self, management, organization, EBI, and other role-players

Domain area: Context

1. Were there things that happened in your environment that impacted your adoption and/or implementation of the EBI(s)?
    a. Prompts: Personally, organizationally, community, state, country, internationally, or within the SU prevention field

How have you, the organization, and the individuals who received it benefitted from the EBI, and how?

Interview Prompts:

Types of prompts can include:

1. Could you tell me more about that? Can you give me some examples?
2. Anything else about …
3. Then what happened …
4. Could you explain that more …
5. Tell me more about the challenges
6. What resources …

2. Request for elicited and extant documents:

Elicited:
Would it be possible for you to provide me with any documents, reports, flyers, or emails that you have generated in the process of implementing the EBI that could help me understand your experiences better?

Extant:
Would it be possible for you to provide me with any references to publish articles, reports, and documents that influenced the process of implementing the EBI that could help me understand your experiences better?

The interviewer at end of the Interview:
Thank you again for your participation. I appreciate your participation in this study, and it has been very insightful. I will follow up via email in a few days with a copy of the transcript. You can review it and give me any feedback (corrections, misunderstandings, or areas you wish to expand on). I will also ask for a lived experience document, which is a written account of your experiences of adopting and implementing an EBI. You do not have to provide this, but it would be helpful for me to understand your experience more in-depth.

3. Lived Experience Description Document Prompt

To obtain the autobiographical lived experiences from participants, a lived experience document request was provided, which contained the following prompts:

Dear Participant,

To understand your experiences of implementing evidence-based interventions more fully, I am requesting a Lived Experience Description Document from you. This document is an autobiographical written account, that allows you to express your thoughts and memories more freely regarding the

1. Choice of an EBI,
2. Preparations for implementing the EBI
3. Experiences of implementing EBI
4. Continued use and implementation of the EBI

I would sincerely appreciate a written account of these in more detail. If there are things you would like to expand on, that have come to mind after the interview, please feel free to include them in this document. This includes any pertinent contextual influences from your surroundings (these could be related to you personally, organizationally, in community, state, country, internationally, or within the SU prevention field).

I would like to express my gratitude again for your participation. Your involvement will assist me in understanding EBI implementation.

Appendix 2

Table 1 Supporting Quotes for Codes from the Data.

Code	Category or Subcategory	Quote
Innovating	Translating	And that's the power of prevention, and that's why it works so well. It is a systems change process. It's not about delivering life skills [an EBI], a set of life skills curriculum to 5th graders. That's not what prevention is about. It's about changing systems (Nichola, Interview 1).
Human-centered philosophy	Value system	The core, in terms of why this [prevention science] is a value system to me and not a career... So, it's [prevention science] not a lens, it's an embodiment (Stafford, Interview 2).
	Nurturing relationships	That's going to be the foundation of really anything [within the process of implementing EBIs]: trust and relationship (Nichola, Interview 1).
Engaging	Community Assessment	I think it's very much what, what's going on? What are the issues in the community? Years ago, we did a survey, and we saw some shocking statistics on relationship violence and dating violence. I was just really surprised at the numbers that were saying that. So, we started doing some education around the issues of dating violence and I think we must really be aware of the specific needs in our community (Kerryn, Interview 1).
	Capacity Building and Community Mobilization	I mean, we've done some learning communities with them and with our folks that are implementing (Jenna, Interview 1).
Collaborating	Team-based	Then just making sure that we continue to communicate, and you continue to update the plan and continue, to navigate this by checking in with the target population that we're implementing it with, as well as those that are implementing it and the partnerships, and the stakeholders (Herculina, Interview 1).
	Communicating	So, communicate verbally as best you can, and communication is fricking tough. Most of us don't go to school for it, and it really, I think is it, it shows because if you can't communicate it well, people aren't going to get what you're saying. And there's no, there's no chance of a behavioral change if they don't understand or even listen to what you say (James, Interview 1).
Negotiating	Navigating	To hear other points of view and other reasons behind, why they feel things might not work, and why they feel or think things will work. Just based on their perception (Patrick, Interview 1).
	Obtaining buy-in and Accessibility	You could do the same program for five or ten years and it's because the community really loves it and then that strengthens, your ability to keep going back. Because they know that you're going to be doing something great every time (Lorraine, Interview 1).

	Selecting a Solution	The interesting thing that happened with that [finding an appropriate EBI] is that communities, and particularly boards, finally found something they could get their head around, in terms of the program. A program that was science-based, positive, and proactive, seemed to tick a lot of boxes for a lot of risk factors and protective factors, around self-regulation and it was kind of the perfect timing. So, local boards and local communities ended up far outspending the state dollars, because they finally knew what to do (Stafford, Interview 1).
Iterating	Adapting	So, we didn't see anything that mirrored what we needed. So, the homegrown approach to developing a curriculum was what I was taught. It went out and it was encouraged to be used. Now I didn't build it myself, but it was given to me to implement, and that was kind of the thing, these [homegrown] curriculums (Natalie, Interview 1).
	Creating	So, we didn't see anything that mirrored what we needed. So, the homegrown approach to developing a curriculum was what I was taught. It went out and it was encouraged to be used. Now I didn't build it myself, but it was given to me to implement, and that was kind of the thing, these [homegrown] curriculums (Natalie, Interview 1).
	Improving	I also want to say, but that's [updating EBIs] kind of out of the hands of the individual who's implementing. Simply because generally, it's up to the program itself to continue to update. But with things like evaluations, maybe those kinds of things can be brought to the table when discussing the program. That things are no longer as effective and everything else kind of remains the same (Patrick, Interview 1).
Implementing	Planning	I don't know if they consider prep for the class. That's not built-in, so you're often scrambling (Arlene, Interview 1).
	Delivering	I mean context is important. Content and context are important. Even when you teach it [an EBI], if you teach evidence-based programs, you must have fidelity, as fidelity is important. Are you sticking to the way the designer wants this course to be taught? Are you doing that? With a lot of the programs, it's difficult, most people who teach parents of color must alter what they teach (Lara, Interview 1).
	Monitoring and Evaluating	We've always had one of my jobs was the evaluator. So, we've had good resources as far as evaluations go. As far as what our data has, more of an outside, if you will, kind of lean on the data that it feels a little more objective. And so anyway, we work hard at giving schools and coalitions the report. The school is where it's taken. Therefore, they also have a piece of ownership in it (Lisa, Interview 1).