

Building on Strong Foundations: Deploying Enhanced Replicating Effective Programs for evidence-based prevention curriculum adaptation

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Abstract

Schools frequently adopt new interventions for each new public health issue, but this is both time- and resource-intensive. Adversity exposure is an example of a pervasive public health issue that emerged during Coronavirus Disease 2019 (COVID-19) with notable consequences, including an elevated risk of developing substance use disorders and mental illnesses. Adapting existing, universal, evidence-based interventions, such as the Michigan Model for Health™ (MMH), by incorporating trauma-sensitive content is a promising approach to meet this need. We examined critical steps in promoting MMH adaptability as part of the Enhanced REP (Replicating Effective Programs) implementation strategy during the COVID-19 pandemic. We share usability testing from the 2020 to 2021 school year and describe how we apply the results to inform the group randomized trial pilot study. We applied key steps from implementation adaptation frameworks to integrate trauma-sensitive content as COVID-19 unfolded, documenting the process through field notes. We conducted initial usability testing with two teachers via interviews and used a rapid qualitative analysis approach. We conducted member checking by sharing the information with two health coordinators to validate results and inform additional curriculum refinement. We developed an adapted MMH curriculum to include trauma-sensitive content, with adaptations primarily centered on adding content, tailoring content, substituting content, and repeating/reinforcing elements across units. We designed adaptations to retain the core functional elements of MMH. Building foundational relationships and infrastructure supports opportunities to user-test intervention materials for Enhanced REP that enhance utility and relevance for populations that would most benefit. Enhanced REP is a promising strategy to use an existing evidence-based intervention to meet better the needs of youth exposed to adversity. Building on the foundations of existing evidence-based interventions, is vital to implementation success and achieving desired public health outcomes.

Lay summary

Schools frequently adopt new interventions for each new public health issue that may or may not be evidence-based. Concentrating efforts on supporting the effective implementation of existing, widely adopted evidence-based interventions (EBIs) in schools is an efficient and effective way to achieve their public health impact and reduce implementer overload. We systematically adapted an EBI, the Michigan Model for Health™, to incorporate trauma-sensitive content and pilot-tested the materials with two health teachers using pre-/post-interviews to gather feedback for refinement. The implementation support professionals—regional school health coordinators—provided further insight and validation of teacher feedback on adaptations. The adaptations developed focused on maintaining the core functions that make the curriculum effective. We learned that the foundational relationships and implementation infrastructure were central to testing intervention materials in a way that would enhance utility and relevance for the student population that would most benefit. Leveraging available infrastructure and existing collaborations are vital to implementation success and achieving desired public health outcomes.

Keywords: implementation science; adolescent health; smart materials; primary prevention

Implications

Practice: Adopting new interventions for each new public health problem is time-consuming and expensive. Leveraging existing partnerships across sectors is a promising way to efficiently adapt existing interventions to meet population needs.

Policy: Translational research can advance policies that support ongoing funding for implementing, adapting, and sustaining interventions to meet population needs and achieve public health objectives.

Research: Future research is needed to inform systematic approaches for building implementation infrastructure, a central component to making needed adaptations and responding effectively when community needs arise.

Introduction

Exposure to adversity among youth is pervasive, and schools are a central setting for interventions to reduce the impact of risk exposure on youth well-being [1–3]. Universal prevention, or Tier 1 interventions, is designed for *all* youth regardless of identified risk status. Universal prevention can have a lasting impact by reducing or preventing multiple interrelated outcomes (e.g. drug use and poor mental health) that share common risk factors [4, 5]; it is a foundational component of comprehensive substance misuse prevention and mental health promotion [6]. Consistent with the multi-tiered systems of support framework, universal prevention interventions adopt a broad approach to reducing the risk of adverse outcomes, intended to meet the needs of 75%–80% of the population vs. more narrowly selected (10%–15%; students who have demonstrated risk) and intensive (5%–10%; students who are at highest risk) interventions [7]. We focus on drug use outcomes as robust longitudinal research indicates that universal prevention focused on increasing protective factors and decreasing risk factors is a promising and low-cost approach to reducing the onset and escalation of substance use [8–10]. One example of universal prevention is the Michigan Model for Health™ (MMH). MMH is a comprehensive health curriculum recognized by the CASEL, the Collaborative for Academic, Social, and Emotional Learning [11], that has demonstrated efficacy in reducing substance use and improving mental health outcomes [12]. MMH is consistent with other evidence-based interventions (EBIs) and aligned with national health education standards; it serves as a model for evidence-based health curricula [13]. MMH also aligns with the Center for Disease Control and Prevention's (CDC's) characteristics of effective health education, include being research-based and theory-driven, building competence by addressing skills, providing opportunities to reinforce skills and positive health behaviors, and managing social influences [14]. The MMH includes several core units, including foundational skills, social and emotional learning, and drug use prevention.

Universal prevention also represents an excellent societal return on investment. Effective prevention could save \$18 for every \$1 invested, and nationwide implementation of effective school-based EBIs with fidelity could save \$1.3 billion annually [15]. Despite this potential, few prevention EBIs are well implemented, if implemented at all [3, 16]. Researchers acknowledge that *how* interventions are implemented is as important as *what* interventions are implemented to achieve desired public health outcomes [17]. Researchers have found a robust relationship between fidelity, that is, the extent to which core functions of an intervention are delivered as intended, and positive student outcomes [18, 19]. Barriers to effective delivery have resulted in failure to realize the public

health benefits of universal prevention EBIs and millions of research dollars wasted on intervention development and poor implementation [20].

Even before the COVID-19 pandemic, educators reported that intervention-context fit, specifically meeting the needs of youth exposed to marginalization, trauma, and socioeconomic disadvantage, was a critical barrier to implementing universal prevention in schools [21, 22]. Exposure to adversity is especially concerning among low-resource communities, placing youth at significant risk for poor long-term consequences, including poor mental health, substance misuse, and school failure [23–25]. Teachers have reported that universal prevention EBIs are often not sufficiently contextually relevant for students in low-resource environments [26, 27]. Researchers have found that exposure to adversity only intensified during COVID-19, especially among low-resource communities [28, 29], making incorporating trauma-sensitive approaches even more critical to the contextual relevance of the MMH and other health education curricula. Contextual relevance and student engagement are central to delivering EBIs with fidelity and realizing their public health benefits [22, 30, 31]. Researchers have found that teachers are less likely to implement and sustain EBIs with fidelity if they do not sufficiently meet the needs of their students [21, 22].

To better meet student needs, educators are faced with either adopting a new intervention developed for the specific need or adapting an existing intervention to make it more contextually relevant. Schools often engage in the former, which involves adopting a new intervention for each emerging health issue as schools are pressured to respond to health threats quickly [17]. Full adoption of new interventions, however, can take 2–4 years [32], and many schools abandon the newly adopted intervention in favor of another for a different health issue *without* achieving its public health benefits.

Implementation strategies, and methods to enhance the effective adaptation, adoption, and implementation of EBIs, are promising ways to support adaptations that will improve intervention-context fit and provide needed support to achieve public health objectives [33, 34]. Promote adaptability, according to the SISTER (School Implementation Strategies Translating ERIC Resources) taxonomy, refers to identifying new ways an intervention can be adapted to best fit local needs and clarifying which core functions must be maintained to preserve fidelity [33]. Promote adaptability includes modifications to an EBI's content or delivery in response to participant needs or the school setting. Promoting adaptability can provide scaffolding to support flexibility while preserving the core intervention components and underlying mechanisms of behavioral change [35]. For example, incorporating trauma-sensitive activities into an existing, widely-adopted EBI while retaining the core functions

(e.g. skill building) has notable potential to enhance intervention-context fit [35]. While various types of adaptation exist (e.g. planned and unplanned), we focus on intentional or planned adaptation in which an EBI is changed or modified to suit the population's needs or to improve the fit with the context [36]. Implementation strategy bundles, such as Enhanced Replicating Effective Programs (REP), include adaptation as one of the central strategies [37]. Enhanced REP in the pre-implementation phase includes EBI adaptation, resulting in an intervention package incorporating options for different settings. This adaptation is one of the first steps of REP [38].

The current paper presents the first step in designing and deploying the Enhanced REP implementation strategy bundle, promoting curriculum adaptability. We also describe how proactively building implementation partnerships and infrastructure supported this process despite significant contextual challenges (i.e. the COVID-19 pandemic). We used implementation science frameworks to guide the systematic adaptation of existing, widely adopted EBIs, such as MMH, incorporating a collaborative, participatory approach. These frameworks share common steps as informed by Escoffrey *et al.* [39]: (i) assess the community, (ii) review the selected intervention, (iii) consult with experts and community partners, (iv) decide what needs adaptation, (v) adapt the original program, (vi) train staff, (vii) test adapted materials, (viii) implement, and (ix) evaluate. We include a summary of the steps in Table 1. The current study focuses on steps one through seven, the initial adaptation (steps one through five), and usability testing portions (steps six and seven).

While we initially intended to design and deploy all components of Enhanced REP for rollout in fall 2020, we pivoted the implementation strategy design process to focus on the EBI adaptation component and conducting usability testing due to constraints related to the COVID-19 pandemic.

Step 7, the user testing portion, is aligned with the USE-EBPI (Usability Evaluation for Evidence-Based Psychosocial Interventions) methodology [40]. We focus on usability testing in step 7 as participant responsiveness to the adapted intervention (i.e. its usability) can be a robust determinant of the extent to which EBI users (e.g. teachers) adopt and sustain interventions [40, 41].

The purposes of this paper are to (i) describe key steps in promoting adaptability of the MMH curriculum for students exposed to trauma and the forms of modifications that occurred as the first step in the implementation strategy design process, (ii) share the central role of building implementation infrastructure in the process, (iii) present results from teacher usability testing of the adapted curriculum during the COVID-19 pandemic, and (iv) discuss how we applied the results from the usability testing to further refine MMH curriculum adaptations and other Enhanced REP components (i.e. training and facilitation) with a focus on meeting student needs and minimizing teacher burden.

Methods

We worked collaboratively to build foundational relationships with the Michigan State Health Coordinators' Association (MiSHCA) and the Michigan Department of Health and Human Services (MDHHS) and strengthen implementation infrastructure that enabled us to systematically promote the MMH curriculum adaptability to meet population needs. In the state in 2021–2022, among 9th graders, 51% were considered economically disadvantaged, 64% were white, 18% African American, 9% Hispanic/Latino, and 9% mixed race or other [42]. Health coordinators “serve as a statewide liaison between the state and local school districts” [43] to promote health education, including using MMH. We focused on retaining core functional elements

Table 1 Steps in the systematic adaptation of MMH, based on Escoffrey *et al.* [39]

Step	Description	Enhanced REP curriculum adaptation activities
1	Assess needs	Review data from Health Education Experts Study Meet with MiSHCA and MDHHS
2	Review the selected intervention	Review the existing MMH curriculum Identify core functions of MMH and areas for adaptation
3	Consult with Experts: community, practice, academic	Communication with MDE SEL ^a and University partners Advisory Board meetings MiSHCA, MDHHS meetings
4	Decide what needs adaptation	Identify fidelity-consistent adaptations based on advisory board input Retain core functions
5	Adapt the Original Program	Compile advisory board input Create a website for the adapted MMH curriculum Incorporate changes to the MMH curriculum
6	Train Staff	Design facilitation training for coordinators (winter 2021) Design teacher trauma-sensitive training (deployed fall 2021)
7	Test Adapted Materials	Usability testing Fall 2020
8	Implement	Pilot study: deploy Enhanced REP ^b , 2021–2022 school year
9	Evaluate	Evaluate data, from the pilot study, additional refinement of Enhanced REP

MDHHS, Michigan Department of Health and Human Services; MiSHCA, Michigan School Health Coordinators' Association; MMH, Michigan Model for Health™ curriculum.

^aSocial Emotional Learning.

^bReplicating Effective Programs; the current study focuses on steps 1–7.

(see Table 2) to inform the tailored packaging (i.e. the MMH curriculum) component of Enhanced REP during the pre-implementation phase. Also consistent with the pack-

aging component, we conducted user-testing and feedback before the cluster randomized pilot trial in Michigan high schools' 2020–2021 school year.

Table 2 Core functions and forms of the Michigan Model for Health™ (MMH) Universal Prevention Curriculum

MMH core functions (fixed)	MMH forms (adaptable elements)
Skill building (NHES) ^a 1. Accessing information 2. Analyzing influences 3. Goal setting 4. Decision making 5. Interpersonal communications 6. Self-management 7. Practice health-enhancing behaviors 8. Advocacy Opportunities to reinforce skills and positive health behaviors Opportunities to make positive connections with influential others Teacher information plans and professional development to enhance instruction effectiveness and student learning	<ul style="list-style-type: none"> Activity topical content to develop health skills (e.g. activity accessing info for opioids vs. vaping devices) Teacher resource information sheets addressing specific topics including drugs Student worksheet topical content Resources for reliable current information (e.g. CDC adolescent health website, NIDA Teens website) Activity options to reinforce skills Activity options that support making positive connections Topical content of information plans and professional development

^aNational Health Education Standards as defined by the CDC and American Public Health Assoc.

Adaptation of the MMH curriculum

A summary of the adaptation steps is provided in Table 1 and depicted in Figure 1.

Step 1: Assess needs and build on the existing implementation infrastructure

We conducted qualitative, quantitative, and mixed methods studies of implementers (i.e. health educators) regarding the strengths and weaknesses of the current MMH curriculum. We focused on building partnership/collaboration capacities to improve the implementation of MMH. Over time, the research team collaborated with health coordinator partners and MDHHS to conduct the initial project, interpret the results, and apply them to identifying priority determinants (e.g. meeting population needs), outcomes (e.g. improved fidelity of MMH), and candidate implementation strategies to achieve these objectives [21, 26, 44–46]. Through building this capacity, we were able to collaborate on research and practice efforts that were coordinated with student and state agency needs and designed to address implementation gaps. One critical gap (i.e. determinant) we identified was the need for data-driven adaptations, including tailoring to meet students' needs and a desire for content that reflected a trauma-sensitive approach and creating a trauma-sensitive classroom.

Step 2: Review the selected intervention

MMH is grounded in Social Cognitive Theory [47] and the Health Belief Model [48] and has demonstrated efficacy in

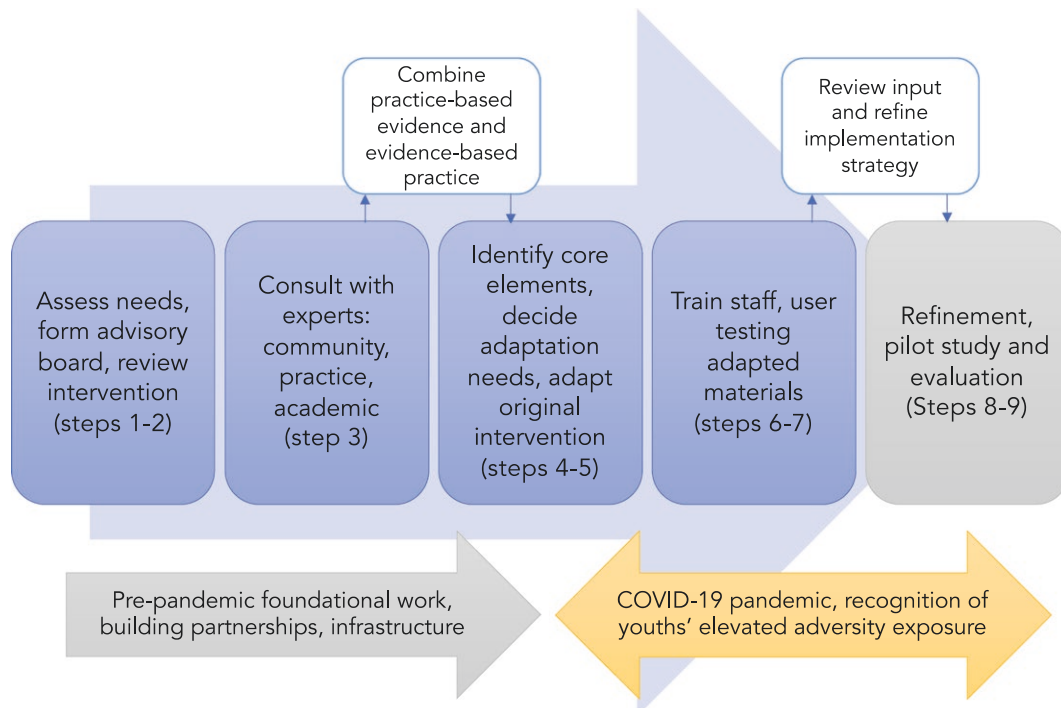


Figure 1 Schematic of the curriculum adaptation (steps 1–7 included in the current study) and timeline relative to the pandemic onset. Based on steps described in Escoffrey et al. [39].

reducing adolescent substance abuse and improving mental health [12, 49]. MMH is widely adopted as it is implemented in over 39 states across the USA [50]. Given its theoretical foundations and alignment with state and national health education standards, we identified the core functional and adaptable form elements (see Table 2). Identifying the core functions and forms enabled systematic adaptation that retained those components of the MMH intervention that make it effective [51]. In collaboration with our MDHHS and health coordinator partners, we determined that MMH is the best curriculum for this process rather than adopting a new intervention to meet student needs due to the prolonged period between adopting a new program and full implementation [17].

Step 3: Consult with experts: community, practice, and academic

We contacted an academic expert in trauma-sensitive approaches and a state Department of Education advisor for social and emotional learning to obtain initial information and resources regarding creating a trauma-sensitive student environment as part of designing Enhanced REP. This included publicly available information through sites such as the National Child Traumatic Stress Network, funded by the Center for Mental Health Services (CMHS), Substance Abuse and Mental Health Services Administration (SAMHSA), U.S. Department of Health and Human Services and jointly coordinated by UCLA, and Duke University. These experts also shared information on statewide and regional resources (e.g. trauma-sensitive training content for educators) that we could leverage for Enhanced REP components. We consulted with these experts throughout year 1 of the pilot project, meeting at least six times throughout the year with each.

We also assembled an advisory board with two regional school health coordinators with background and training in ACEs (Adverse Childhood Experiences), three health teachers, and a school administrator with a mental health practice background. The advisory board reviewed content that the experts shared, aided in determining what content was suitable to meet the needs of the current project, and proposed alternatives to some curriculum content and training based on their practice-based expertise for what worked in the classroom and was suitable for the MMH curriculum. The advisory board met three times during the 2019–2020 school year, with these meetings overlapping with the experts' input. In between the meetings, the research team shared information with the advisory board on updates for review and input. Two research team members took field notes during each meeting, and the advisory board members shared their notes from the hard copy of the curriculum. The research team also consulted with staff from MDHHS who manage and support MMH content and dissemination, the MMH steering committee, and a Michigan Department of Education mental health consultant.

Step 4: Decide what needs adaptation

In collaboration with our advisory board and state agency partners, the current project focused on the following MMH units: Skills: A Strong Foundation, Social and Emotional Health, and Alcohol, Tobacco, and Other Drug (ATOD) Prevention. These units address high-priority health issues and contain interrelated and overlapping content. The research

team and health coordinator partners also reviewed the curriculum to identify the core functions and forms based on the National Health Education Standards, the CDC's characteristics of effective health education, and the theoretical foundations of MMH. See Table 2 for a summary. Identifying core functions and forms supports making fidelity-consistent adaptations that improve fit with the context without compromising elements responsible for an EBI's effectiveness [35].

Step 5: Adapt the original program

Adaptations to the original intervention began when the advisory board went through the units of the curriculum and commented on areas for potential adaptations. The FRAME guided our characterization of the adaptations: Framework for Reporting Adaptations and Modifications-Enhanced [35]. Adaptions included adding elements such as alternative activities, tailoring language to be more trauma-sensitive, and substituting activities/assignments (see Table 2). These adaptations were informed by evidence-based practice and practice-based evidence as they occurred during the onset and escalation of the COVID-19 pandemic (see Figure 1). The advisory board and practice-focused team members shared concerns and issues related to teachers, classrooms, and students in real time as the pandemic unfolded. This practice-based evidence-informed pragmatic changes to the curriculum, such as offering multiple options for activities, including curriculum materials in different formats (e.g. digital, word documents, PDFs) that would be amenable to use in different settings and schools' LMS (learning management systems).

Step 6: Train staff

Curriculum training is available to every teacher who uses MMH through the Michigan network of School Health Coordinators. Foundational training is essential to utilizing MMH to help educators grasp the unique structure of a skill-based curriculum, often different from traditional health education curriculums. During the user testing, we gathered feedback to inform more specialized training on the updated materials and trauma-sensitive practices. This included adding a unit on secondary trauma for teachers.

Step 7: Test adapted materials

The University Institutional Review Board approved all study procedures. We conducted usability testing via semi-structured interviews to obtain feedback from two teachers recruited through our partner health coordinators from a high school in Southeast Michigan. While we planned to receive feedback from a larger sample, recruitment was limited, given this was during the height of the COVID-19 pandemic (2020–2021 school year). The teachers had a range of experience levels: one teacher had several years of experience with the MMH curriculum and recent MMH training, while the other had not taught health for several years and reported that the last MMH training was 10 years ago. The teachers prepared a combination of face-to-face, hybrid, and fully remote during the usability testing period. Teachers had access to the digital format of the standard MMH curriculum and the three adapted units to ensure consistency of platforms that were part of the curriculum modifications.

To understand the curriculum usability following the adaptation process, we interviewed the teacher's pre- and post-MMH curriculum implementation and recorded and transcribed them. In the pre-implementation interview, we asked the teachers about their experiences with MMH, its strengths and weaknesses, and significant health topics for their students. In the post-implementation interview, we asked about the teachers' experiences with the modified curriculum. We asked teachers to complete lesson-tracking surveys guided by the FRAME: Framework for Reporting Adaptations and Modifications-Enhanced [35] to monitor additional modifications made to the lessons. We also shared the summary of findings with the two study school health coordinators to contextualize the findings and enhance their applicability to curriculum refinement.

Data analysis

We used rapid qualitative data analysis, including structured template data summaries and data matrix displays, to compile the interview and field notes data [52]. Researchers have found this method to generate reliable, timely information similar to other qualitative approaches such as thematic analysis [53]. We summarized teacher interviews using a multistep procedure. First, team members read through each interview transcript and all field notes from advisory board sessions, noting particularly rich responses, defined as responses that were contextually meaningful and detailed. Second, we developed and tested a structured template to standardize the capture of qualitative content. Specifically, we developed key topics or themes from the advisory board meetings and teacher interviews as broad categories for the summaries. Three team members tested the summary template with a single document, compared summaries, and resolved discrepancies to standardize the summary procedure. Third, after summarizing all interviews and field notes using the summary template, we aggregated the data to create a comprehensive data matrix. This data matrix summary facilitated a complete picture of the systematic adaptation process and its initial user testing with two teachers. We identified the critical idea patterns within each topic and across topics and their implications on program fidelity and effectiveness. We focused on enhancing the credibility of our findings and their application via multiple data sources; this approach facilitated rich descriptions of the adaptation and initial user testing process from multiple implementation partners' perspectives [54].

Methodological integrity

To ensure we captured the information accurately, we conducted a member check by presenting a summary of the feedback to critical interested parties, including participating health coordinators [55]. This also aided in ensuring alignment in the pilot study approach, priorities, and concerns, mainly as this occurred during the height of the pandemic. As the health coordinators communicate regularly with health education teachers across the state, they can identify everyday experiences across counties/districts. These ongoing relationships were central to identifying potential teachers for user testing and enrolling teachers in the pilot study.

Positionality statement

We acknowledge that our backgrounds and previous research may influence how we approach data collection and analysis.

Our diverse backgrounds support diverse interpretations and applications of the data to conduct rigorous and unbiased research, recognizing the importance of addressing our subjectivity, and its potential impact on the findings.

Our team is comprised of individuals with backgrounds in public health, social work, anthropology, medicine, and education, with varying experience in qualitative methods. Our team has conducted numerous qualitative projects, and we have engaged in ongoing training and discussions to ensure our research practices align with the highest standards of rigor. We utilized member checking to validate our interpretations, mitigate potential biases, and broaden our perspectives; both researchers and community practitioners collectively contributed to this manuscript. Our collective goal is to enhance the richness and depth of our research by leveraging our diverse qualitative research experiences and maintaining transparency about our positionality throughout the research process. Nevertheless, we acknowledge the likelihood that our disciplinary training and personal experiences may influence our collection and analysis of qualitative data.

Results

Planned adaptations made to the MMH curriculum

Table 3 provides an overview of key changes to each unit based on feedback from the advisory board and the core functional elements in Table 2 and guided by the FRAME. The curriculum adaptations were co-developed with community partners (state agency staff, health coordinators, and school personnel) via an iterative process before and during the ongoing COVID-19 pandemic. The project efforts continued due to existing well-developed community-research partnerships and a mutual commitment to serving teachers and youth in Michigan. Mutual collaboration and co-development across implementation partners were essential to our objective of enhancing MMH relevance and ultimately "closing the gap between discovery and delivery [56]." Our changes included several types of content modifications, including adding elements, substituting, tailoring, and repeating/reinforcing elements across the units [35].

Adding elements

Teachers and health coordinators on the advisory board shared that the curriculum would benefit from additional content on managing stress. Thus, we added content related to stress management and self-care activities in the Social Emotional Learning unit of the curriculum. We added a "stress packet" developed by one of the regional school service agencies for use with the MMH curriculum. The additional content included an activity to help students assess their ability to manage stress, a self-care assessment tool, and a stressor identification activity. Students are asked to mark physical, emotional, and behavioral signs of stress they have experienced, including fatigue, irritability, and withdrawal from others. These activities help students identify when they are stressed and provide tools to support stress management.

Substitution

To integrate student activities more fully with the trauma-sensitive approach, we substituted an example related

Table 3 Key changes to the MMH curriculum: overall and unit-specific

Key content adaptations: pre-implementation, planned ^a	
Overall	<ul style="list-style-type: none"> • Adding elements <ul style="list-style-type: none"> ◦ Include alternate activity options to improve fit between the curriculum and populations served ◦ Scaffolding for students to engage in lessons and activities ◦ Included social-emotional learning components throughout the 3 units (e.g. self-care and relationship skills) Tailoring ◦ Revised language throughout to make it more trauma-sensitive, with a focus on reducing the risk of retraumatization (e.g. person-first language: a person with an opioid addiction rather than an addict) • Loosening structure <ul style="list-style-type: none"> ◦ Removed some of the scripted elements • Substitution <ul style="list-style-type: none"> ◦ Substituted activities or homework assignments to increase opportunity for learning and practicing emotion regulation
Unit 1	<ul style="list-style-type: none"> • Shortening/condensing elements <ul style="list-style-type: none"> ◦ 20 lessons to 13 • Enhancing integration <ul style="list-style-type: none"> ◦ SEL concepts from Unit 2 integrated into the skills unit • Adding elements <ul style="list-style-type: none"> ◦ Activities related to active listening and responding to emotions • Substitution <ul style="list-style-type: none"> ◦ Replaced in-class activities and examples (e.g. car buying for decision-making) with SEL and health-focused examples (e.g. sleep) ◦ Goal-setting activity around health behaviors replaced with a more explicit focus on stress management, coping, avoiding drug use
Unit 2	<ul style="list-style-type: none"> • Adding elements <ul style="list-style-type: none"> ◦ Additional options for activities related to the impact of emotions on ourselves and others ◦ Included expanded list of SEL-focused resources <ul style="list-style-type: none"> ▪ Stress “packet” with an emphasis on stress management and self-care ▪ Activities for managing stress <i>during</i> conflict ▪ Self-care strategies ◦ Healthy vs. unhealthy relationships, consent, and dating abuse • Substitution <ul style="list-style-type: none"> ◦ Current celebrity and influencer testimonials relevant to youth ◦ Content emphasizing empathy and the dangers of victim blaming
Unit 5	<ul style="list-style-type: none"> • Tailoring <ul style="list-style-type: none"> ◦ Made differentiation between “drug-use,” “drug-abuse,” and “drug misuse,” with attention toward avoiding stigma-reinforcing language ◦ Explanation of opioid and other prescription drug misuse and types, including diversion, non-medical use, and medical misuse ◦ Added scaffolding for drug use prevention advocacy projects to provide students with additional support and guidance ◦ Included emphasis on the role trauma plays in ATOD use • Loosening structure <ul style="list-style-type: none"> ◦ Students were given the opportunity to propose their own ideas for the drug use prevention advocacy project • Removing Elements <ul style="list-style-type: none"> ◦ Parent homework • Repeating elements <ul style="list-style-type: none"> ◦ Problem-solving: students were asked to find solutions for drug use among youth, with a focus on drug use for coping • Adding elements <ul style="list-style-type: none"> ◦ Include prompts for discussions of drug use prevention and reasons for drug use, including as a coping mechanism ◦ Information on vaping and the dangers of vaping

^aPlanned adaptations were fidelity consistent; using the FRAME [35] process components, the adaptation level of delivery included the target intervention group and individual practitioner (i.e. teacher).

to goal-setting skills. In the lesson, students receive a worksheet about setting SMART goals: Specific, Measurable, Achievable, Relevant, and Time-Bound. The worksheet provides some examples of SMART goals and some that do not meet the SMART criteria and then walks students through steps in achieving the SMART goals. The example provided

in the original worksheet centers on buying a car. The advisory board discussed options to substitute a health-focused example. The goal-setting activity focuses on engaging in self-care, like journaling or listening to music, and walks students through steps for reaching the goal, monitoring progress, and evaluating to what extent they met the goal.

Tailoring/tweaking/refining

We found several curriculum areas that would benefit from additional tailoring to enhance the concordance between the curriculum and the context and population needs. In our study, tailoring included minor changes to language and terminology in the curriculum to reflect a trauma-sensitive approach [51]. For example, we revised language throughout to reflect current terminology that centers on addiction as a disease rather than a personal failure (e.g. person-first language: a person with an opioid addiction rather than an addict). We also added scaffolding to support students in completing some curriculum projects and better meet them “where they are.” Scaffolding is an instructional method that breaks lessons into smaller, more manageable segments and teachers support students’ mastery of each segment [57]. For example, our advisory board reported students were frequently overwhelmed by the drug use prevention advocacy project in the curriculum and could not successfully complete it. Consequently, we broke down the advocacy project into several smaller steps with additional guidance and resources for each step to enhance the likelihood of student success.

Repeating elements across units

We focused on repeating and reinforcing parts of the MMH intervention related to foundational units: skills, social-emotional learning, and drug use prevention. This occurred primarily through the other adaptations (adding, substituting, and tailoring), and was intentionally designed to enhance synergy across the units. Through this integration, we provided expanded opportunities to simultaneously reinforce foundational skills related to the curriculum (e.g. critical thinking) and important topical content (e.g. awareness of using substances as a coping strategy).

Curriculum usability testing feedback

The two teachers mentioned that they appreciated the user-friendly layout of the adapted curriculum. One of the teachers stated, “*It was super easy...to follow... and I didn't have to go from the binder to the jump drive, it was just all there. And so it was just being able to click on things I wanted to download and save and documents that I could change if it wasn't working for my class...(I appreciated) the accessibility of it.*”

We found that foundational MMH training, including updates, is vital to effectively delivering the curriculum. For the teacher who had training relatively recently: “*I was very effective because I was able to see what was even in the units, because our previous curriculum had nothing like the skills-based unit at the very start.*” The other teacher who had not had formal training reported a finding using the adapted curriculum challenging. For this reason, the teacher without MMH training “*relied on (the trained teacher) a lot for... implementing.*”

The teachers reported an increased need for flexibility in curriculum material formats, given the frequent transitions between remote and in-person, but also to enhance compatibility with their school’s learning management system (LMS; e.g. Google Classroom, Canvas, etc.). “*The (documents) that were (in a more flexible format such as) Google docs (or Word) was incredibly helpful, especially because we ended up having to go remote...word documents were insanely more helpful than the PDF... we could change some of the wording (if needed).*”

We also found that very few (only about 1 of 30 or 3%) of the lesson-tracking surveys were completed over the semester. Given the low response rate, we revised the forms to make them visible and abbreviated the survey to enhance completion following each lesson.

The research team shared the preliminary findings with health coordinator collaborators to aid in expanding our understanding of the teachers’ experiences, incorporate practice-based evidence, and guide needed refinement to support pragmatic considerations, the implementation strategy component implementability, and meet the urgent needs of students and educators.

Discussion

Systematically adapting EBIs is a promising approach to meeting the needs of youth. We systematically adapted an existing, widely adopted EBI, the Michigan Model for Health™, to students exposed to adverse childhood experiences based on needs reported in prior research investigating implementation determinants [21, 26]. This is consistent with national reports that indicate adversity exposure among youth in the USA has reached unprecedented levels, with an estimated 30.5% of youth ages 12–17 exposed to multiple (2 or more) ACEs [58]; this estimate indicates that exposure to broader forms of adversity is likely even higher [59]. COVID-19 has exacerbated exposure to adversity and has revealed the disparities in its consequences [60, 61]. Importantly, exposure to adversity is a potent risk factor for drug misuse and the development of substance use disorders [28, 29, 60]. Universal prevention, such as MMH, as part of the Whole School, Whole Child, Whole Community (WSCC) is a critical piece to creating a school environment that is supportive and safe and complements selected and indicated approaches. The systematic adaptation of the MMH curriculum to focus on reaching *all* students in a timely, relevant way that is sensitive to the needs of students may provide schools and teachers with the comprehensive approaches necessary to improve youth academic and health outcomes.

Our planned adaptations for the program packaging centered on retaining the core functional elements that make MMH effective, grounded in theory and the robust empirical base focused on cross-cutting risk and protective factors [11–13], but also tailoring the form elements (e.g. examples, activities) to suit population needs. As teachers frequently cite student engagement and needs as priorities for health curriculum implementation [22, 30], this project focused on providing scaffolding to meet those needs in a fidelity-consistent way. The subsequent user testing in advance of the pilot study permitted us to refine the program packaging component of Enhanced REP and better meet the needs of the priority population as these needs intensified due to the COVID-19 pandemic. We focused on improved intervention-setting fit to support student engagement and outcomes; the adaptations centered on improving the fit with students experiencing marginalization, trauma, and socioeconomic disadvantage, at high risk of adversity and its consequences, particularly during the pandemic [21, 35, 62]

Consistent with foundational research on intervention implementability [40], we found that curriculum usability was as important as curriculum content. While the usability challenges were heightened during the pandemic for multiple

reasons, including ongoing shifts in in-person and remote learning, these challenges accelerated the fidelity-consistent flexibility incorporated into the curriculum (e.g. offering numerous activity options, and formats for documents/materials). Both teachers reported difficulty with the formatting of the activities and worksheets. They requested the materials to be flexible to work with a variety of learning management systems (LMS), including formats that could be edited as needed to fit their context (i.e. a Microsoft Word version rather than a PDF of a worksheet). Flexible and user-friendly formats are essential, especially given the challenges of COVID-19.

Lessons learned and additional adaptations

The central role of partnerships: going slow to go fast

Dissemination and implementation research is fundamentally action-oriented, and community-engaged approaches are central to achieving our desired objective of bridging the research-to-practice gap [63]. Our approach to community engagement as a prominent feature of successful implementation and sustainment is consistent with that of other implementation scientists [64, 65]. The systematic adaptation process for the MMH curriculum as part of Enhanced REP occurred as an unintentional experiment for “going slow to go fast.” This refers to the process of “developing trust and working across different partners” that takes time and effort, “but once these relationships are established, research can proceed more quickly [66].” Through the collaborative foundational research process, the team was able to work across sectors and develop shared goals, objectives, and priorities. This became especially important as the pandemic escalated; student and staff needs, including concerns about overall well-being, were rapidly intensifying. Though the typical responses in schools to such emergencies are reactive and frequently not grounded in theory or evidence, we were able to advance systematic adaptations of an existing evidence-based universal prevention curriculum (MMH) with the best available evidence and engage school partners *while the pandemic was escalating*. Thus, we were able to support educators in meeting the needs of students and themselves under notable contextual challenges and constraints.

Enhanced REP refinement

We reviewed input to refine the existing Enhanced REP implementation strategy (see [Figure 1](#)).

Training

Our initial research suggested that supplemental, ongoing training would support the systematic tailoring component of MMH. While user testing affirmed the role of tailored training, it also indicated that foundational curriculum training is vital to successfully delivering the curriculum before additional tailoring or adaptations. Training sets a strong foundation for teacher confidence and competence in health curriculum use [67]. The teacher who had not received foundational MMH training required notable support from the trained, more experienced teacher to deliver the intervention. However, access to another teacher with experience in the school building is not always feasible. Thus, ensuring foundational training, as currently offered through the existing

MMH curriculum infrastructure via the school health coordinators, is vital to ensure implementation success.

Curriculum

We found that in several areas, additional flexibility was needed to meet the needs of school settings. One such change was related to contextual modifications: the format of curriculum materials. We provided a more comprehensive array of options for student-related materials that incorporated more editable documents (from PDF to Word or Google Docs). We also included more options related to completing the core functions of the curriculum. For example, with the advocacy project, we provided several other possible options that would achieve the activity objectives (e.g. analyze influences, and advocate for healthy behaviors), including analyzing a media piece related to drug use and developing a short social-media like video in addition to the standard advocacy project.

Limitations

The small usability sample size and singular location, as well as the limited quantitative data collected, given the COVID-19 pandemic challenges and limitations, limited the generalizability of study findings. As a part of usability testing, the two teachers were asked to complete lesson surveys using FRAME to track modifications and adaptations to the curriculum. The lesson-tracking surveys were used to capture modifications, including added content, removed content, changed content, substituted activities, changed format, changed student evaluation materials, and others. The difficulty the teachers faced with the usability of the curriculum may have been a barrier to completing these surveys. Only two surveys were completed during the usability testing out of 30 lesson surveys for each teacher, and we could not draw conclusions about modifications to the curriculum materials using this framework. The qualitative data collected from the pre- and post-implementation interviews provided rich information about the teachers' experiences but did not capture information about specific lessons and adaptations. Further research is needed to understand how the updated curriculum, along with tailored training and support impacts the usability and implementation of the EBI.

Conclusions

The systematic adaptation of the MMH curriculum and the usability testing provided helpful information with which to inform the pilot study and further refinement to Enhanced REP components. Establishing partnerships and capacity for such adaptations *ahead* of when they are needed, i.e. building implementation infrastructure, is central to responding effectively when needs arise. The usability testing informed specific approaches to deploying the implementation strategy for the pilot study (e.g. foundational MMH training was essential before moving into tailored training). Additionally, we refined and reformatted the curriculum materials to make them more flexible and fidelity-consistent for teachers. Lastly, we changed the fidelity and adaptation monitoring process to promote survey completion and ultimately achieve implementation objectives. Promoting intervention adaptability as part of a comprehensive implementation strategy while building meaningful partnerships to build implementation capacity

will advance meeting population needs and enhancing the impact of universal prevention.

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Conflict of interest statement. All authors declare that they have no conflicts of interest.

Human Rights

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Welfare of Animals

This article does not contain any studies with animals performed by any of the authors.

Transparency Statements

Study Registration: This study was reviewed by the Wayne State University Institutional Review Board. (IRB-20-08-2653). This study was not formally registered. *Analytic plan pre-registration:* The analysis plan was not formally pre-registered. *Analytic code availability:* There is no analytic code associated with this study. *Materials Availability:* Materials used to conduct this study are not publicly available at this time.

Data Availability

The qualitative datasets generated and analyzed during the current study are not publicly available given the need for specific content to grasp their usefulness. However, code reports from the qualitative interviews and deidentified data are available from the corresponding author on reasonable request.

References

1. Dray J, Bowman J, Campbell E *et al.* Systematic review of universal resilience-focused interventions targeting child and adolescent mental health in the school setting. *J Am Acad Child Adolesc Psychiatry* 2017;56:813–24. <https://doi.org/10.1016/j.jaac.2017.07.780>
2. Fenwick-Smith A, Dahlberg EE, Thompson SC. Systematic review of resilience-enhancing, universal, primary school-based mental health promotion programs. *BMC Psychol* 2018;6:30. <https://doi.org/10.1186/s40359-018-0242-3>
3. U.S. Department of Education. Prevalence and Implementation Fidelity of Research-Based Prevention Programs in public schools: final report. Report No.: ED-00-CO-0119. Washington, DC: U.S. Department of Education, Office of Planning, Evaluation and Policy Development, Policy and Programs Study Service, 2011.
4. Greenberg M. School-based prevention: current status and future challenges. *Eff Educ* 2010;2:27–52.
5. Hale D, Fitzgerald-Yau N, Viner R. A systematic review of effective interventions for reducing multiple health risk behaviors in adolescence. *Am J Public Health* 2014;104:e19–41.
6. SAMHSA. Selecting best-fit programs and practices: guidance for substance misuse prevention practitioners [Internet]. Rockville, MD, September 2018:40. https://www.samhsa.gov/sites/default/files/ebp_prevention_guidance_document_241.pdf (1 February 2023, date last accessed).
7. Epperson A. What is MTSS? [Internet]. PBIS Rewards. 2019 [cited 6 July 2023]. <https://www.pbisrewards.com/blog/what-is-mtss/> (6 July 2023, date last accessed).
8. Catalano R, Berglund M, Ryan J *et al.* Positive youth development in the United States: research findings on evaluations of positive youth development programs. *Ann Am Acad Pol Soc Sci* 2004;591:98–124.
9. Hill KG, Bailey JA, Steeger CM *et al.* Outcomes of childhood preventive intervention across 2 generations: a nonrandomized controlled trial. *JAMA Pediatr* 2020;174:764–71. <https://doi.org/10.1001/jamapediatrics.2020.1310>
10. Compton WM, Jones CM, Baldwin GT *et al.* Targeting youth to prevent later substance use disorder: an underutilized response to the U.S. opioid crisis. *Am J Public Health* 2019;109:S185–9. <https://doi.org/10.2105/AJPH.2019.305020>
11. CASEL. Elementary SElect: Michigan Model for Health [Internet]. CASEL: Collaborative for Academic Social and Emotional Learning. 2018 [cited 23 February 2018]. <https://casel.org/guideprogramsmichigan-model-for-health/> (8 February 2022, date last accessed).
12. O'Neill J, Clark J, Jones J. Promoting mental health and preventing substance abuse and violence in elementary students: a randomized control study of the Michigan model for health. *J Sch Health* 2011;81:320–30.
13. CDC. National Health Education Standards [Internet]. CDC Healthy Schools, 2019 [cited 21 December 2021]. <https://www.cdc.gov/healthyschools/sher/standards/index.htm> (15 June 2023, date last accessed).
14. CDC. Characteristics of an Effective Health Curriculum [Internet]. CDC Healthy Schools, 2018 [cited 6 June 2019]. <https://www.cdc.gov/healthyschools/sher/characteristics/index.htm> (15 June 2023, date last accessed).
15. Miller T, Hendrie D. Substance abuse prevention dollars and cents: a cost-benefit analysis. DHHS Pub. No. (SMA) 07-4298, Rockville MD: Center for Substance Abuse Prevention, Substance Abuse and Mental Health Administration, 2008. <https://www.samhsa.gov/sites/default/files/cost-benefits-prevention.pdf> (4 January 2022, date last accessed).
16. Wolfenden L, Nathan N, Sutherland R *et al.* Strategies for enhancing the implementation of school-based policies or practices targeting risk factors for chronic disease. *Cochrane Database Syst Rev* 2017;11:CD011677.
17. Moir T. Why is implementation science important for intervention design and evaluation within educational settings? *Front Educ* 2018;3:61.
18. Dusenbury L, Brannigan R, Falco M *et al.* A review of research on fidelity of implementation: implications for drug abuse prevention in school settings. *Health Educ Res* 2013;18:237–56.
19. Ringwalt CL, Pankratz MM, Jackson-Newsom J *et al.* Three-year trajectory of teachers' fidelity to a drug prevention curriculum. *Prev Sci* 2010;11:67–76. <https://doi.org/10.1007/s11121-009-0150-0>
20. Wolfenden L, Ziersch A, Robinson P *et al.* Reducing research waste and improving research impact. *Aust N Z J Public Health* 2015;39:303–4. <https://doi.org/10.1111/1753-6405.12467>

21. Eisman AB, Palinkas LA, Brown S *et al.* A mixed methods investigation of implementation determinants for a school-based universal prevention intervention. *Implement Res Pract* 2022;3:263348952211249–13. <https://doi.org/10.1177/26334895221124962>
22. Herlitz L, MacIntyre H, Osborn T *et al.* The sustainability of public health interventions in schools: a systematic review. *Implement Sci* 2020;15:4. <https://doi.org/10.1186/s13012-019-0961-8>
23. Felitti VJ, Anda RF, Nordenberg D *et al.* REPRINT OF: Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: the Adverse Childhood Experiences (ACE) Study. *Am J Prev Med* 2019;56:774–86. <https://doi.org/10.1016/j.amepre.2019.04.001>
24. Hughes K, Bellis MA, Hardcastle KA *et al.* The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. *Lancet Public Health* 2017;2:e356–66. [https://doi.org/10.1016/S2468-2667\(17\)30118-4](https://doi.org/10.1016/S2468-2667(17)30118-4)
25. Merrick M, Ford D, Ports K *et al.* Vital signs: estimated proportion of adult health problems attributable to adverse childhood experiences and implications for prevention—25 states, 2015–2017 [Internet]. (Morbidity and Mortality Weekly Report). Report No.: 68(44). Washington D.C.: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, November 2019:999–1005. <https://www.cdc.gov/mmwr/volumes/68/wr/pdfs/mm6844e1-H.pdf> (9 December 2023, date last accessed).
26. Eisman AB, Kiperman S, Rupp LA *et al.* Understanding key implementation determinants for a school-based universal prevention intervention: a qualitative study. *Transl Behav Med* 2022;12:411–22. <https://doi.org/10.1093/tbm/ibab162>
27. Rauscher KJ, Casteel C, Bush D *et al.* Factors affecting high school teacher adoption, sustainability, and fidelity to the “Youth@Work: Talking Safety” curriculum. *Am J Ind Med* 2015;58:1288–99. <https://doi.org/10.1002/ajim.22497>
28. Spinelli M, Lionetti F, Setti A *et al.* Parenting stress during the COVID-19 outbreak: socioeconomic and environmental risk factors and implications for children emotion regulation. *Fam Process* 2021;60:639–53. <https://doi.org/10.1111/famp.12601>
29. Sahle BW, Ofori-Asenso R, Renzaho AMN. Adverse childhood experiences should be priority in global response to Covid-19. *J Paediatr Child Health* 2020;56:1656–7. <https://doi.org/10.1111/jpc.15132>
30. Shoemith A, Hall A, Wolfenden L *et al.* Barriers and facilitators influencing the sustainment of health behaviour interventions in schools and childcare services: a systematic review. *Implement Sci* 2021;16:62. <https://doi.org/10.1186/s13012-021-01134-y>
31. Cassar S, Salmon J, Timperio A *et al.* Adoption, implementation and sustainability of school-based physical activity and sedentary behaviour interventions in real-world settings: a systematic review. *Int J Behav Nutr Phys Act* 2019;16:120. <https://doi.org/10.1186/s12966-019-0876-4>
32. Fixsen D, Blase K, Naoom S *et al.* Core implementation components. *Res Soc Work Pract* 2009;19:531–40.
33. Cook CR, Lyon AR, Locke J *et al.* Adapting a compilation of implementation strategies to advance school-based implementation research and practice. *Prev Sci* 2019;20:914–35. <http://link.springer.com/10.1007/s11121-019-01017-1>
34. Powell B, Waltz T, Chinman M *et al.* A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. *Implement Sci* 2015;10:21.
35. Wiltsey Stirman S, Baumann AA, Miller CJ. The FRAME: an expanded framework for reporting adaptations and modifications to evidence-based interventions. *Implement Sci* 2019;14:58. <https://doi.org/10.1186/s13012-019-0898-y>
36. Rogers EM. *Diffusion of Innovations*. 5th ed. New York: Free Press, 2003.
37. Kilbourne A, Abraham KM, Goodrich DE *et al.* Cluster randomized adaptive implementation trial comparing a standard versus enhanced implementation intervention to improve uptake of an effective re-engagement program for patients with serious mental illness. *Implement Sci* 2013;8:136.
38. Kilbourne A, Neumann MS, Pincus HA *et al.* Implementing evidence-based interventions in health care: application of the replicating effective programs framework. *Implement Sci* 2007;2:1–10.
39. Escoffery C, Lebow-Skelley E, Udelson H *et al.* A scoping study of frameworks for adapting public health evidence-based interventions. *Trans Behav Med* 2019;9:1–10. <https://doi.org/10.1093/tbm/ibx067>
40. Lyon A, Koerner K, Chung J. Usability Evaluation for Evidence-Based Psychosocial Interventions (USE-EBPI): a methodology for assessing complex intervention implementability. *Implement Res Pract* 2020;1:2633489520932924.
41. Lyon A, Bruns E. From evidence to impact: joining our best school mental health practices with our best implementation strategies. *School Ment Health* 2019;11:106–14.
42. Center for Educational Performance and Information (CEPI). Student Enrollment Counts Report [Internet]. MI School Data. 2023 [cited 13 October 2023]. <https://www.mischooldata.org/student-enrollment-counts-report/> (27 October 2023, date last accessed).
43. MiSHCA. MiSHCA [Internet]. 2023 [cited 17 August 2023]. <https://mishca.org/> (25 February 2021, date last accessed).
44. Eisman AB, Kilbourne AM, Greene D Jr *et al.* The user–program interaction: how teacher experience shapes the relationship between intervention packaging and fidelity to a state-adopted health curriculum. *Prev Sci* 2020;21:820–9. <https://doi.org/10.1007/s11121-020-01120-8>
45. Eisman AB, Kilbourne AM, Ngo Q *et al.* Implementing a state-adopted high school health curriculum: a case study. *J Sch Health* 2020;90:447–56.
46. Eisman AB, Palinkas LA, Koffkey C *et al.* Michigan Model for Health/ATM Learning to Enhance and Adapt for Prevention (Mi-LEAP): protocol of a pilot randomized trial comparing Enhanced Replicating Effective Programs versus standard implementation to deliver an evidence-based drug use prevention curriculum. *Pilot Feasibility Stud* 2022;8:1–14.
47. Bandura A. Human agency in social cognitive theory. *Am Psychol* 1989;44:1175–84. <https://doi.org/10.1037/0003-066x.44.9.1175>
48. Janz NK, Becker MH. The Health Belief Model: a decade later. *Health Educ Q* 1984;11:1–47. <https://doi.org/10.1177/109019818401100101>
49. Shope J, Copeland L, Maharg R *et al.* Effectiveness of a high school alcohol misuse prevention program. *Alcohol Clin Exp Res* 1996;20:791–8.
50. State of Michigan. (c) 2011–2024. *Michigan Model for Health: Skills for Health and Life*. Mt. Pleasant, MI: Educational Materials Center, 2013. <https://www.michiganmodelforhealth.org/>
51. Baumann A, Cabassa L, Stirman S. Adaptation in dissemination and implementation science. In: Brownson R, Colditz G, Proctor E (eds.), *Dissemination and Implementation Research in Health: Translating Science to Practice*. 2nd edn. New York, NY: Oxford University Press, 2018, 285–300.
52. Hamilton A. Qualitative methods in rapid turn-around health services research. VA Health Systems Research Seminar. 2013. https://www.hsr.d.research.va.gov/for_researchers/cyber_seminars/archives/video_archive.cfm?SessionID=780
53. Taylor B, Henshall C, Kenyon S *et al.* Can rapid approaches to qualitative analysis deliver timely, valid findings to clinical leaders? A mixed methods study comparing rapid and thematic analysis. *BMJ Open* 2018;8:e019993. <https://doi.org/10.1136/bmjopen-2017-019993>
54. Tracy SJ. Qualitative quality: eight “Big-Tent” criteria for excellent qualitative research. *Qual Inc* 2010;16:837–51. <https://doi.org/10.1177/1077800410383121>
55. Lietz C, Langer C, Furman R. Establishing trustworthiness in qualitative research in social work: implications from a study regarding spirituality. *Qual Soc Work* 2006;5:441–58.

56. Green L, Glasgow R. Evaluating the relevance, generalization, and applicability of research: issues in external validation and translation methodology. *Eval Health Prof* 2006;29:126–53.
57. Belland BR. Scaffolding: definition, current debates, and future directions. In: Spector JM, Merrill MD, Elen J, Bishop MJ (eds.), *Handbook of Research on Educational Communications and Technology*. New York, NY: Springer, 2014, 505–18. https://doi.org/10.1007/978-1-4614-3185-5_39
58. Office of the Surgeon General O. Protecting youth mental health: The U.S. Surgeon General's Advisory [Internet]. 2021, 1–53 [cited 4 May 2022]. <https://www.hhs.gov/sites/default/files/surgeon-general-youth-mental-health-advisory.pdf> (10 October 2022, date last accessed).
59. Panchal N, Kamal R, Garfield R *et al.* Mental health and substance use considerations among children during the COVID-19 pandemic [Internet]. 2021. <https://www.kff.org/coronavirus-covid-19/issue-brief/mental-health-and-substance-use-considerations-among-children-during-the-covid-19-pandemic/> (12 December 2021, date last accessed).
60. Calvano C, Engelke L, Di Bella J *et al.* Families in the COVID-19 pandemic: parental stress, parent mental health and the occurrence of adverse childhood experiences—results of a representative survey in Germany. *Eur Child Adolesc Psychiatry* 2021;31:2013–6. <https://doi.org/10.1007/s00787-021-01739-0>.
61. Hawke LD, Szatmari P, Cleverley K *et al.* Youth in a pandemic: a longitudinal examination of youth mental health and substance use concerns during COVID-19. *BMJ Open* 2021;11:e049209. <https://doi.org/10.1136/bmjopen-2021-049209>
62. Steinka-Fry KT, Tanner-Smith EE, Dakof GA, *et al.* Culturally sensitive substance use treatment for racial/ethnic minority youth: a meta-analytic review. *J Subst Abuse Treat* 2017;75:22–37. <https://doi.org/10.1016/j.jsat.2017.01.006>
63. Minkler M, Salvatore A, Chang C. Participatory approaches for study design and analysis in dissemination and implementation research. In: Brownson RC, Colditz G, Proctor E (eds.), *Dissemination and Implementation Research in Health: Translating Research to Practice*. 2nd edn. New York, NY: Oxford University Press, 2018.
64. Ramanadhan S, Donaldson ST, Siqueira CE *et al.* Connecting implementation science, community-engaged research, and health promotion to address cancer inequities in Massachusetts: The UMB/DF-HCC U54 Outreach Core. *Am J Health Promot* 2022;36:597–601. <https://doi.org/10.1177/08901171211062800>
65. Shelton R, Chambers D, Glasgow R. An extension of RE-AIM to enhance sustainability: addressing dynamic context and promoting health equity over time. *Front Public Health* 2020;8:134.
66. Eisman AB, Kim B, Salloum RG *et al.* Advancing rapid adaptation for urgent public health crises: using implementation science to facilitate effective and efficient responses. *Front Public Health* 2022;10:1–9.
67. Hahn EJ, Noland MP, Rayens MK *et al.* Efficacy of training and fidelity of implementation of the life skills training program. *J Sch Health* 2002;72:282–7. <https://doi.org/10.1111/j.1746-1561.2002.tb01333.x>