RESEARCH ARTICLE

Implementing a State-Adopted High School Health Curriculum: A Case Study

Andria B. Eisman, PhD, MPH[a] (ID) Amy M. Kilbourne, PhD, MPH[b] Quyen Ngo, PhD[c] Judy Fridline, BS[d] Marc A. Zimmerman, PhD[e] Dana Greene, Jr MPH[f] Rebecca M. Cunningham, MD[g]

── **ABSTRACT** ──

BACKGROUND The Michigan Model for Health™ (MMH) is the official health curriculum for the State of Michigan and prevailing policy and practice has encouraged its adoption. Delivering evidence-based programs such as MMH with fidelity is essential to program effectiveness. Yet, most schools do meet state-designated fidelity requirements for implementation (delivering 80% or more of the curriculum).

METHODS We collected online survey (N = 20) and in-person interview (N = 5) data investigating fidelity and factors related to implementation of the MMH curriculum from high school health teachers across high schools in one socioeconomically challenged Michigan county and key stakeholders.

RESULTS We found that 68% of teachers did not meet state-identified standards of fidelity for curriculum delivery. Our results indicate that factors related to the context and implementation processes (eg, trainings) may be associated with fidelity. Teachers reported barriers to program delivery, including challenges with adapting the curriculum to suit their context, competing priorities, and meeting students' needs on key issues such as substance use and mental health issues.

CONCLUSIONS Multiple factors influence the fidelity of health curriculum delivery in schools serving low-income students. Investigating these factors guided by implementation science frameworks can inform use of implementation strategies to support and enhance curriculum delivery.

Keywords: program evaluation; implementation science; primary prevention; high school teachers; evidence-based practice; health disparities.

Schools are a primary setting for prevention and health promotion efforts. Health education is integral part of achieving academic success, the primary objective of schools.[1,2] Universal, evidence-based health education curricula, such as the Michigan Model for Health™ (MMH), are an essential component of overall school health education efforts that have tremendous potential to improve students' health and well-being, and reduce the likelihood of poor health outcomes.[2-4] In addition, school health education curricula can provide a critical opportunity to reach youth underserved by other settings and aid in

[a]Research Assistant Professor, (aeisman@umich.edu), Department of Health Behavior and Health Education, University of Michigan School of Public Health, 1415 Washington Heights, Ann Arbor, MI 48109.

[b]Professor, (amykilbo@med.umich.edu), Department of Psychiatry, University of Michigan Medical School, Ann Arbor, MI 48109.

[c]Research Assistant Professor, (qen@med.umich.edu), Department of Emergency Medicine, University of Michigan Medical School, 1500 East Medical Center Drive, Ann Arbor, MI 48105.

[d]Regional School Health Coordinator, (jfridlin@geneseeisd.org), Genesee Intermediate School District, Center for Countywide Programs, 5075 Pilgrim Road, Flint, MI 48507.

[e]Professor, (marcz@umich.edu), Department of Health Behavior and Health Education, University of Michigan School of Public Health, 1415 Washington Heights, Ann Arbor, MI 48109.

[f]Project Manager, (greenejr@umich.edu), Department of Health Behavior and Health Education, University of Michigan School of Public Health, 1415 Washington Heights, Ann Arbor, MI 48109.

[g]Professor, (stroh@med.umich.edu), Department of Emergency Medicine, University of Michigan Medical School, 1500 East Medical Center Drive, Ann Arbor, MI 48105.

Address correspondence to: Andria B. Eisman, (aeisman@umich.edu), Department of Health Behavior and Health Education, University of Michigan School of Public Health, 1415 Washington Heights, Ann Arbor, MI 48109.
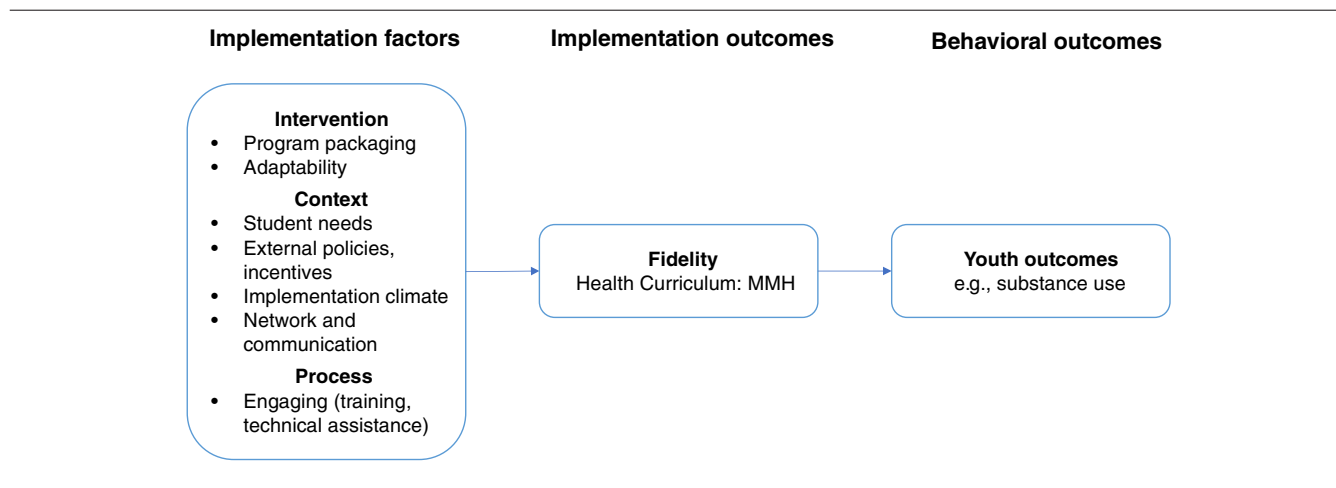
Figure 1. **Overarching Conceptual Model**

| **Implementation factors** | **Implementation outcomes** | **Behavioral outcomes** |

Intervention
- Program packaging
- Adaptability

Context
- Student needs
- External policies, incentives
- Implementation climate
- Network and communication

Process
- Engaging (training, technical assistance)

→ **Fidelity**
Health Curriculum: MMH

→ **Youth outcomes**
e.g., substance use

---

narrowing health disparities.[5] Yet, health curricula and similar school-based programs rarely achieve positive outcomes as seen in research trials because they are generally not delivered as intended.[5] Although program fidelity is critical to effectiveness, research investigating the fidelity of evidence-based health education curricula and factors that influence fidelity is limited.[5,6]

The Michigan Model for Health™

MMH is the comprehensive, evidence-based K-12 health curriculum for the State of Michigan that has demonstrated effectiveness in reducing risk of negative outcomes such as alcohol, tobacco and other drugs (ATOD) use and conduct problems and increasing the likelihood of positive social behavior.[7,8] The MMH curriculum is recognized by Collaborative for Academic, Social and Emotional Learning (CASEL)[9] and the National Registry of Evidence-Based Programs and Practices.[10] In addition, MMH is aligned to both State of Michigan and National Health Education standards. Prevailing policy and practice has encouraged its adoption within many Michigan school districts. The program is grounded in Social Learning Theory and the Health Belief Model, and it addresses several developmentally appropriate cognitive, social-emotional, attitudinal, and contextual factors related to health behaviors.[7,8] The high school MMH curriculum includes core content areas focused on social and emotional health; nutrition and physical activity; safety; ATOD; and personal health and wellness. MMH has been widely adopted throughout the State of Michigan: 72% of public schools report delivering 4-5 MMH core content areas in ninth grade. Yet, less than half (42%) meet state-designated fidelity requirements, delivering 80% or more of the curriculum, for curriculum implementation.[11]

Researchers have found strong correlations between quality implementation of evidence-based programs (EBPs) and favorable behavioral outcomes including reduced substance use, including among students in schools.[12] Hence, adequate implementation of evidence-based health curricula is essential to ensure that the effectiveness of these programs is realized.

Communities with economic and social challenges face additional barriers to implementing EBPs with fidelity due to competing demands and carefully allocated resources among schools.[5] To better understand factors that influence program delivery in real-world contexts, specifically schools, the purpose of this study is to apply theoretically based implementation science frameworks to study factors associated with implementation of an evidence-based health curricula in low resource communities.[5]

Conceptual Frameworks to Guide EBP Implementation

The Consolidated Framework for Implementation Research (CFIR) and Implementation Outcomes Framework (IOF) are useful complimentary frameworks for examining factors related to implementation and implementation outcomes such as fidelity; these frameworks aid in informing implementation strategies to improve quality of EBP delivery in schools.[13,14] Implementation strategies are theory-based methods designed to ameliorate barriers and enhance uptake and fidelity of EBPs.[15] Figure 1 depicts constructs associated with these frameworks which includes multilevel domains including the program, context and processes, that can aid in investigating factors that facilitate and impede delivering MMH with high fidelity.[13] Guided by this model, we expect that factors related to implementation will influence program fidelity and that program fidelity, in turn, will influence youth outcomes. These frameworks have been widely applied

in clinical implementation research but have been less often applied to school contexts. Applying well-developed implementation science frameworks used in clinical settings is a promising approach to understanding and enhancing EBPs such as MMH in schools serving disproportionately students from low-income families.

Current Study

As a first step in applying these implementation science frameworks to understanding and improving delivery of a comprehensive, evidence-based health curriculum, we use a mixed methods approach to focus on the following objectives: (1) assess the current level of implementation of MMH across several districts in one Michigan county with disproportionately high rates of poverty and unemployment; (2) assess program, context, and process factors guided by CFIR that may facilitate or impede delivery of a health education program (MMH); (3) deepen our understanding of how and why these factors influence curriculum implementation; and (4) develop initial recommendations to address these factors and enhance health curriculum fidelity. We focus specifically on health curriculum delivery during the high school year as (1) high school health class is mandated in the State of Michigan and (2) adolescence is a developmental stage characterized by increasing rates of risk behaviors such as ATOD use and violence, and mental health issues.[16,17] This research is expected to provide critical information regarding barriers and facilitators to school EBP implementation and foundational knowledge to use evidence-based implementation strategies to enhance delivery.

METHODS

Survey

Participants and setting. The study focused on high schools in Genesee County, Michigan. The Genesee Intermediate School District (GISD) is a regional educational service agency providing technical assistance and support to 45 high schools (public, private, and charter) in Genesee county serving 24,499 students. Like other communities facing declining populations and economic challenges, the county has higher unemployment levels and children living in poverty compared to state and national averages for over a decade,[18] and youth report higher rates of problem behaviors such as ATOD use compared to state averages (Table 1).[19] Eligible participants for the survey were teachers from schools in the Genesee Intermediate School District service area, who worked with high school students/in a high school building and taught high school level health classes.

Table 1. Demographics and Youth Risk Behavior

	Michigan	Genesee Co.	Flint
Median household income	49,087	41,879	24,679
Per capita income	26,143	22,536	14,527
% living in poverty—children under 18	23.7	32.1	62.4
% racial/ethnic minority	20	25	40
Adolescent Substance use (past 30 days)	Proportion		
Alcohol (any)	25.9	27.5	n/a[a]
Alcohol (binge)	12.5	16.1	n/a[a]
Cigarettes	10	10.4	n/a[a]
Marijuana	19.3	25.6	n/a[a]

11th grade students: MI Youth Risk Behavior Surveillance (YRBS) 2015. [a]MI YRBS does not provide city-level data.

Procedure. We recruited all eligible teachers for the survey in collaboration with the GISD. We sent a recruitment email to prospective participants informing them about the study. The email included a link (URL) for online survey using UM Qualtrics, a secure online survey system. Eligible participants first completed a screening survey to verify eligibility and informed consent document before linking to the online survey. Participants received $10 remuneration for completing the survey.

Instrumentation. We used the CFIR and IOF to guide measurement development and scale selection for the factors in Figure 1 and the IOF for our fidelity outcome of interest: dose delivered.[13,14] CFIR factors included in this study are informed by previous school-based research and input from the study team and other community partners at the GISD; this included constructs related to the program such as packaging, adaptability, context such as implementation climate, and implementation process such as training and facilitation. Our implementation outcome, fidelity (dose delivered), was based on the IOF.[14]

Program (packaging). Among program components, we asked health teachers their perceptions of the MMH program (curriculum) packaging. We included two program packaging items, evaluated independently. We asked to what extent participants agreed 1 = strongly disagree to 5 = strongly agree, that the curriculum was easy to use/deliver in their classrooms, and that the checklists and rubrics included as part of the curriculum were helpful.

Context. We assessed context using items adapted from the implementation climate scale.[20] We included the following subscales: (1) focus on EBP, (2) selection/hiring for EBP, and (3) selection for openness. Participants were asked to indicate their agreement for each statement using a 5-poing Likert scale.[20] Focus on EBP measures the degree to which the school/district focuses on using EBPs. We measured focus on EBP using three items: (1) one

of my district's main goals is to use evidence-based curricula effectively, (2) people in my district think implementation of MMH is important, and (3) using MMH is a top priority in my district. Selection for EBP assesses the degree to what extent to which the school/district hires based on EBP experience and emphasis. We measured selection for EBP using two items asking about schools/districts selecting staff who (1) have previously used evidence-based curricula, and (2) value evidence-based curricula. Selection for openness assesses the degree to which the school/district hires staff based on their willingness to adopt new practices if necessary. We measured selection for openness using four items regarding schools/districts selecting staff who are adaptable, flexible, open to new types of evidence-based curricula, and open to new approaches to curriculum delivery. We used the mean of each respective set of subscale items (focus on EBP, selection for EBP, selection for openness) to create the three implementation climate construct measures.

Process. We asked participants processes related to health curriculum delivery, including training and technical assistance. We asked about the number of health curriculum trainings attended: 0 = none, 1 = 1-4 trainings 2 = 4, or more. We also asked (yes/no) if teachers knew who to contact for technical assistance and if they sought assistance with delivering the curriculum.

Fidelity dose delivered. We assessed fidelity using dose delivered by asking about the proportion of the MMH curriculum teachers delivered to students using a scale from 0 (none) to 4 (75% or more).

Data analysis. We assessed quantitative data through descriptive analyses using Stata 14 (Statacorp), including univariate and bivariate statistics, to investigate possible variation in factors related to implementation guided by CFIR and their association with fidelity (Figure 1). The type of correlation is determined by the scale of the variables: polyserial correlation if one is ordered and the other continuous, spearman rank correlation if both are ordered and Somers' D if one is ordered and one is binary.[21-23]

Interviews

Participants. Eligible participants for the interviews included the health teachers as described previously and state agency staff (ie, key stakeholders) directly involved in curriculum development.

Procedure. Teachers were recruited through the online survey; following completion of the survey, teachers were asked about semi-structured interview participation. Those willing to participate in the interviews were contacted by project staff via email and postal mail. Interview participants completed a consent form and were interviewed in-person and $20

remuneration for their participation. Interviews were audio recorded. We contacted state agency staff directly to ask about interview participation. Those indicating ''yes'' were consented prior to the interview.

Instrumentation. Interview guide: The semi-structured interview guide was based on the CFIR interview guide.[24] We sought to examine the experiences and perspectives of teachers to better understand barriers and facilitators to implementation across CFIR domains and suggestions for improvements. As part of the guide, we included questions across the domains addressed in the survey, to aid in investigating convergence between qualitative and quantitative findings, which is seeing if the results reach the same conclusions and complementarity, which is using qualitative data to aid in understanding quantitative findings.[25] The interview included prompts addressing multiple CFIR domains including intervention program factors, implementation processes, and contextual factors. We elicited information regarding about experiences with the curriculum and its delivery to understand the challenges to implementing the curriculum with high fidelity. The interviews also focused on ways to address these challenges and other feedback to facilitate effective program delivery.

Data analysis. All interviews were transcribed verbatim from the recordings. We used CFIR to guide analysis of our data using a modified grounded theory approach.[26] Specifically, we used CFIR as a framework to guide the semi-structured interviews, but interviewees were free to incorporate unique information and feedback based on their own experiences, allowing for freely emergent themes. This incorporates an etic approach to qualitative data analysis, that is a standard, objective framework of analysis while allowing space for the emergence of themes from an emic perspective, that is internally constructed and fluid themes based on specific cultural or contextual views. These singularly emic or etic approaches have been criticized previously, thus by combining both approaches, we capitalize on the strengths of both.[26] Qualitative analyses such as these permit more detailed exploration of factors across CFIR domains and how these may serve as barriers and facilitators to curriculum delivery, and be associated with program fidelity. The interview data were independently coded by project investigators to condense the data into analyzable units. Segments of data were assigned codes based on a priori (eg, CFIR constructs) or emergent themes (also known as open coding[27]). We resolved disagreements through discussion between investigators and enhanced definition of codes. We used the computer program QSR NVivo[28] to generate a series of categories connecting text segments grouped into separate *nodes*. We will use these nodes to organize and evaluate *a priori* and emergent categories.

Integrating survey and interview findings

Results from qualitative data are examined in conjunction with quantitative data to explore convergence and complementarity.[25] Specifically, we investigate results for each implementation factor, compare the conclusions drawn from each analysis, and seek to investigate why discrepancies in conclusions may exist. We also seek to use qualitative results to deepen our understanding of quantitative results such as why teachers may or may not attend trainings, and specific barriers and facilitators to program implementation.

RESULTS

Survey

We had valid contact information for 42 health teachers in the county and 20 health teachers responded to the survey, resulting in a response rate of 48%. Health teacher respondents were 65% women, with 15% 35 years or younger, 40% between 36 and 45 years, and 45% 46 or older. Overall, 45% of respondents taught more than 15 years. Overall, 35% reported teaching health for more than 15 years, 50% 5-15 years, and 15% less than 5 years. Teachers reported having students across multiple grades in high school: 93% of teachers report teaching 9th grade, 80% teach 10th grade, and 75% teach 11th grade students.

Table 2 provides a descriptive results summary for CFIR constructs and fidelity. Overall, 75% of teachers agreed or strongly agreed that MMH lessons were easy to teach and the curriculum rubrics and checklists were helpful. Generally, staff felt that openness to adopting new practices was valued by their organizations (mean = 3.94, SD = 0.93). Whereas most (80%) reported that they knew who to contact for assistance with MMH, less than half (40%) reported seeking assistance for curriculum delivery. Overall, 21% of respondents did not attend an MMH training and 37% attended more than four trainings. Many (69%-75%) teachers felt MMH lessons are engaging for students and that MMH is effective in reducing substance use.

Fidelity to the MMH Curriculum: Dose Delivered

One-fourth of participants reported that they did not use MMH to teach health, 42% report using one-fourth to three-fourths of the curriculum, and 32% report teaching three-fourths or more of the curriculum. Of note, the fidelity requirement for the MMH designated by the State of Michigan is at least 80% of the core curriculum.

In our bivariate analyses (Table 3), we found correlations between factors across CFIR domains and dose delivered. Among contextual factors, we found a correlation between focus on EBP and dose delivered.

Table 2. Summary of Univariate Descriptive Results for CFIR Constructs (N = 20)*

Program

Curriculum materials	SD-D	N	A-SA		
Easy to use	12.5	12.5	75		
Helpful rubrics/checklists	19	6	75		
Context	Mean	SD			
Selection for openness	3.94	.96			
Selection for EBP experience	3.23	.93			
Focus on EBP	3.34	1.27			
Process					
Technical assistance	Yes	No			
Know who to contact for assistance	80	20			
Sought implementation assistance	40	60			
Training	None	1-4	> 4		
Number of trainings attended	21	42	37		
Fidelity					
Curriculum dose delivered	None	> 25%	25-50%	50-75%	< 75%
	26	21	21	0	32

*All values provided are percent in each category unless otherwise noted.
SD-D, strongly disagree — somewhat disagree; N, neutral; A-SA, somewhat agree-strongly agree; EBP, evidence-based program.

Table 3. Summary of Bivariate Descriptive Statistics Results

CFIR domain	Curriculum fidelity: dose delivered	
Program	Spearman's rho	p value[†]
Ease of use	0.15	.58
Helpful rubrics	0.21	.44
Context	Polyserial rho	p value[‡]
Openness	−0.11	.66
Use of EBP	0.1	.69
Focus on EBP	0.81*	.00
Process	Somers' D	p value
Know who to contact for assistance	0.44*	.03
Have sought assistance with delivery	0.42*	002
	Spearman's rho	p value[†]
Number of trainings attended	0.59*	.01

*p < .05.
[†]Two-tailed t test.
[‡]Likelihood ratio test of no correlation.

We also found correlations between multiple process factors and dose delivered, including knowing who to contact for assistance, seeking assistance with curriculum delivery, and the number of trainings attended.

Interviews

Five participants (three teachers and two state agency staff) participated in the semi-structured interviews.

Program characteristics: Program packaging, adaptability. An overly structured curriculum emerged as a top concern for teachers regarding MMH. ''(MMH has) got to fit you a little bit and I think some of (the MMH curriculum) is a little cookie-cutter.'' Yet, stakeholders felt that the high level of structure incorporated into the MMH curriculum can provide useful guidance for teachers who may be unfamiliar with the curriculum and/or specific health subject areas. Teachers also reported that they faced challenges to updating the curriculum to suit the ever-changing needs of students, especially with substance use. ''(K)ids really care about current. If the video (and) the idea behind it isn't relevant, then they're going to shut it off.'' Teachers reported that online resources for both educators and students with up-to-date information would be helpful in delivering the curriculum. ''I would love to see . . . a curriculum where kids can (have easy) access to the information (using a tablet).''

Contextual factors. Student needs: Teachers reported that skills students learn in health are vital to their learning *and* health and well-being. ''It's an important class the kids like that they are going to learn skills and it's going to be life-long it's a real-world stuff.'' This may be especially relevant for youth attending schools serving a large number of youth facing individual and contextual risk such as low family income, food insecurity, and adverse childhood events. ''We have a host issues you know, truancy, socioeconomic (disadvantage), kids coming in (from) broken homes, and hungry . . . these are real world issues (the youth) dealing with.'' In terms of meeting students' needs, participants also reported that access to current information on key issues youth experience, such as substance use, mental health issues, and sex, is critical. One teacher remarked, ''I know they are very curious when it comes to the ATOD (use). So, you kind of see the excitement with them just wanting to eat up the information.''

External policies and incentives: Participants report that prevailing policy and practice puts primary emphasis on test scores, school designations and that, generally, health is not considered a curricular priority. ''The (academic) cores are hands down the priority of the district because that's, you know, our test scores. Test scores are always in the limelight in the spotlight,'' ''I don't necessarily (think) if you asked about the top 3 priorities (in education), health education would be in the fore front.'' Yet, participants recognized how important health education is for student achievement: ''We've been reforming our educational process for years and not making any progress . . . (there's a) realization that you can't teach a child that's not in school, that's not coming to school prepared to learn (who) experiences trauma in their life or is using drugs . . .'' Teachers and other stakeholders are working

on integrating health into common core, and other requirements to help prioritize it and create policies supportive of health education in school. ''We aren't going to make improvements with our academic scores and our academic achievement if we don't improve the health of the child.''

Network and communication: Regional School Health Coordinators, according to interview participants, are a vital to the success of evidence-based health curriculum delivery in Michigan schools. ''(The) infrastructure of (Regional School) Health Coordinators is key to the success of the overall program it's very unique (to have this resource in the state).'' This infrastructure provides an opportunity to strengthen the network of professionals delivering evidence-based health curricula and use this infrastructure to provide support with and solutions to addressing challenges to curriculum implementation.

Stakeholders mention that communication with administrators and legislators is key to the success of EBPs such as MMH. For example, meeting with legislators about the role of health curriculum in educational success and student well-being is essential for funding to support continued development and delivery of these programs. Administrator support is critical to program success and sustainability. ''(If) you don't convince school administrators and educators about the importance of health to a child's success (in school) you won't even make it to the table (for school priorities).'' Thus, communication with various stakeholder groups, including legislators and administration, is key to support for MMH implementation and long-term sustainability.

Implementation processes. Prescriptive trainings emerged as a concern among implementation processes. Teachers described the training as prescriptive and did not feel it incorporated sufficiently teachers' experiences and perspectives. ''(A)s an educator, you (already) have some type of knowledge and understanding. (I don't need someone to read) word for word off a PowerPoint . . . you know, I can do that.'' Given notable logistical and resource challenges to attending trainings including finding substitute teachers, health teachers felt the trainings needed to be ''high value.'' One teacher suggested that a work day following the training was especially helpful, ''where we worked with other districts (to discuss) what works, (and) what doesn't. I really liked that part of it.''

DISCUSSION

Researchers suggest that effective evidence-based health curriculum delivery is key to academic success; yet, schools face challenges to delivering curricula with fidelity.[1,4] This study is an vital first step in applying implementation science frameworks, using a mixed method approach, to investigate health

curriculum delivery in high schools disproportionately serving students from low-income families.[1,5] Our findings indicate that an evidence-based curriculum, the Michigan Model for Health is widely adopted by high school health teachers in Genesee County, MI, but that fidelity of implementation may be lower than statewide averages. This suggests that most high school health teachers use the evidence-based curriculum, but that effective implementation may be especially challenging in schools serving lower income students and with limited school and community resources. Our results also suggest that multiple factors influence implementation in these settings, including factors related to the program, the context, and implementation processes.

Program

Although we did not find an association between program factors and dose delivered, our interview results provide useful insight about possible issues that may adversely affect implementation of the curriculum materials. Some teachers, for example, noted that the curriculum is too scripted, especially for experienced teachers, and consequently difficult to adapt to personal teaching styles and classroom environments. Teachers also reported that some units, including the ATOD core unit, would benefit from frequent updates. Teachers mentioned that access to current statistics related to health, preferably online, and a mechanism for youth accessing up-to-date information, such as through an online text or resource site. Collectively, these results suggest that health curriculum packaging may benefit from a flexible format such as an outline format and/or online resources, through which current information can be easily accessed and disseminated and additional structure can be added or removed. As we did not address these issues in the original questionnaire, these results are useful in identifying critical areas to assess for future questionnaire development.[25]

Context

Implementation climate. We found an association between focus on EBP and fidelity. A growing body of research recognizes the critical role implementation climate plays in the successful implementation of programs, including programs in schools.[29,30] These results suggest that this type of institutional support for evidence-based curricula may be especially important for delivering EBPs with high fidelity. Furthermore, our results are consistent with a recent study by Lyon and colleagues, who found that a general focus on EBPs may be an important support for effective delivery.[30] Although general support of EBPs seems to be associated with fidelity, our interview results point to less specific support for health education. Interview participants indicate that prevailing policy and practice emphasize academic performance over health education. This may be especially true in schools serving youth at high risk for negative outcomes including poor academic performance. These schools may be less likely to possess resources to support the socioeconomic challenges, which impact student health and academic performance. Schools and educators experience tremendous pressure to meet academic standards established by state and federal agencies.[31,32] Yet, our participants felt that comprehensive approaches to education, such as the Whole School, Whole Child, Whole Community (WSCC) approach that emphasizes academic performance and health, are critical to youths' well-being and academic success. WSCC proposes that schools prioritize developing a healthy environment as "student cannot learn if they are not healthy and safe (and thus) engaged, supported and challenged."[33(p761)] They felt adopting the WSCC approach would change the current culture to support greater emphasis on health education and that this, in turn, would aid in enhancing academic success.[1] Consequently, a context that provides both general support for EBP and specific support for evidence-based health education curricula may further enhance fidelity in program delivery and, consequently, academic success.

Student needs. Participants viewed health education curriculum delivery as a key way to address prominent concerns among youth, including ATOD use and mental health issues. Yet, to meet these needs, students need real-time, up-to-date curriculum resources. Teachers also emphasized how important health class is to learn critical life skills that are transferable to many domains in their lives. This may be especially vital for youth who face disproportionate individual and contextual risk factors, such as those living in socioeconomically challenged communities; learning these skills can provide opportunities to build important assets such as competence that enhance resilience to overcome risk and promote healthy development.[34,35] Collectively, these results suggest that the emphasis on skill development and effectively addressing specific current issues to adolescent health may help better meet the needs of the students. These results are useful in informing additional issues around student needs in future questionnaire development.

Process

In the survey results, we found relationships between implementation processes, including training and technical assistance and fidelity. Our results suggest number of trainings was positively associated with fidelity. This supports the notion that provider training is an effective implementation strategy to improve fidelity and, ultimately, effectiveness of EBPs.[36] Our interview results provided suggestions

for improving the trainings to enhance their utility for teachers. Participants mentioned incorporating explicitly teacher perspectives and classroom problem solving strategies. We also found a relationship between technical assistance (eg, knowing who to contact for assistance and reaching out for help) and fidelity. Although this has less often been investigated in education, our results are consistent with clinical studies suggesting that receiving technical assistance can help enhance program fidelity.[37] Technical assistance may be especially important for teachers working in lower resource settings as this specialized assistance can aid in reducing barriers related to program delivery.[38] Yet our interview results suggest challenges to effective technical assistance, such as difficulty reaching ISD staff or varied relationships with those staff. Participants suggested another option would be establishing ongoing work/collaborative groups to develop supportive networks, discuss challenges with delivering the health curriculum and ways to address these challenges.

Limitations

Limitations of the current study need to be noted. First, although our survey sample included nearly half of the high school health teachers in Genesee County, our sample may not be representative of other teachers in the county and throughout the state. Yet, these findings are an important first step in understanding implementation of health curriculum delivery and barriers and facilitators to program delivery in schools serving students from low-income families. Future research investigating these factors among a larger sample of teachers will aid in integrating diverse perspectives to better inform program approaches, for example, implementation strategies that will improve fidelity and, ultimately, student outcomes. A larger study will also provide added power to investigate empirically using multivariate modeling the relationship between implementation factors and outcomes and identifying those factors that may be most relevant. Second, our qualitative data collection also had few participants, and the data may not be representative of teachers throughout the county or state. Our results, however, are consistent with feedback from work by the Michigan Department of Health and Human Services (MDHHS) about health curricula including the desire for an online version of the curriculum, updating the ATOD unit, reducing density of class slides (S. Sutka, personal communication, July 18, 2017). Future research should expand the interview component to obtain more diverse perspectives and include an observation component to view the curriculum ''in action'' and help further contextualize the results and develop feasible implementation strategies. Yet, these interviews were an important

first step in deepening our understanding of health curriculum implementation and generating acceptable and appropriate solutions.

Finally, our study would benefit from including additional survey constructs including provider factors such as self-efficacy, knowledge and beliefs about the program, processes such as satisfaction with curriculum trainings, context such as evaluating student needs as well as information on overall and specific curriculum content delivery based on the results of qualitative interviews and stakeholder input not included in the original survey.

Conclusions

Evidence-based health curricula are a promising approach to improving academic success and the overall health and well-being of youth and can aid in narrowing disparities among youth facing disproportionately risk of poor academic and health outcomes.[5] Although some evidence-based curricula such as the Michigan Model for Health™ are used widely, most teachers are not implementing the program with fidelity, which may reduce its effectiveness as demonstrated in controlled efficacy trials. Multiple factors influence fidelity of health curriculum delivery in schools. Investigating these factors in schools serving a large proportion of students from low-income families guided by implementation science frameworks can inform use of implementation strategies to support and enhance curriculum delivery in these settings. The current study provides an important first step in investigating fidelity of a widely adopted, evidence-based health curriculum for high school students and factors associated with fidelity guided by implementation science frameworks.

IMPLICATIONS FOR SCHOOL HEALTH

Challenges to delivering programs with fidelity are not unique to MMH or school-based evidence-based interventions more generally.[39] Yet, programs are unlikely to achieve their objectives if not delivered with fidelity.[40] The current study has several implications for the effective implementation of evidence-based health curricula in schools:

- Balancing flexibility and fidelity is critical for successful implementation of school-based programs. Incorporating implementation strategies that apply principles of user-centered design may support adapting program materials to support intervention-environment fit; flexibility to adapt curriculum materials and tailor elements to school context, student needs, and teaching style, while maintaining fidelity to core components may help improve fidelity.[39,41] This can include creating an online version of the curriculum that integrates this flexibility

with options for lessons' level of structure such as a scripted versus outline format, options for program activities such as small group activities versus a large group activity, and resources for up-to-date health information, while keeping core components intact. Providing such flexibility may improve intervention effectiveness and help the EBP fit the local context.[42]

- Implementation strategies that integrate teacher perspectives into EBP trainings and create supportive work groups may also enhance fidelity. Integrating teacher input for addressing practical challenges to MMH delivery during program trainings can help reduce barriers to implementation. This can be accomplished through advisory boards that include health teachers to inform the training approaches or trainings that include experienced teachers who can provide practical problem-solving approaches to program deliver. Ongoing collaborative work groups, such as learning collaboratives, may also provide opportunities to problem solve challenges to MMH delivery and support quality implementation.[15]

- Creating an environment that supports a whole-child approach to education, such as the WSCC is vital to long-term success of school health programs.[33] Although the larger social, political, and economic context is critical to implementation, it is also challenging to change.[39] School districts may benefit from prioritizing initiatives that focus on the whole child, including an emphasis on social-emotional learning (SEL) as a key component to youths' educational experience, to enhance academic success and student well-being. This could include including health-related goals into school improvement plans.[33] This would require ongoing collaboration between various stakeholder groups, including legislators, state health departments, school administration, state departments of education, and health teachers.

Human Subjects Approval Statement

The University of Michigan's Health Sciences and Behavioral Sciences Institutional Review Board approved this study protocol (HUM00123505).

Conflict of Interest

The authors have no conflict of interest to declare.

REFERENCES

1. ASCD. *Making the Case for Educating the Whole Child*. ASCD: Alexandria, VA; 2012. Available at:. http://www.wholechildeducation.org/assets/content/mx-resources/WholeChild-MakingTheCase.pdf.
2. US Centers for Disease Control and Prevention (CDC). *Health Education Curriculum Analysis Tool*. Atlanta, GA: CDC; 2012. Available at:. https://www.cdc.gov/healthyyouth/hecat/index.htm.
3. Collins J, Robin L, Wooley S, et al. Programs-that-work: CDC's guide to effective programs that reduce health-risk behavior of youth. *J Sch Health*. 2002;72(3):93-99.
4. 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(5):19-41.
5. Lee R, Gortmaker S. Health dissemination and implementation within schools. In: Brownson R, Colditz G, Proctor E, eds. *Dissemination and Implementation Research in Health: Translating Science to Practice*. 2nd ed. New York, NY: Oxford University Press; 2018:401-416.
6. Mihalic S, Fagan A, Argamaso S. Implementing the LifeSkills training drug prevention program: factors related to implementation fidelity. *Implement Sci*. 2008;3:5.
7. Shope J, Copeland L, Maharg R, Dielman T. Effectiveness of a high school alcohol misuse prevention program. *Alcohol Clin Exp Res*. 1996;20(5):791-798.
8. 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(6):320-330.
9. CASEL. Collaborative for Academic Social and Emotional Learning. Elementary Select: Michigan Model for Health. Available at: https://casel.org/guideprogramsmichigan-model-for-health/. Accessed May 4, 2019.
10. Substance Abuse, Mental Health Services Administration. *National Registry of Evidence-Based Programs and Practices*. MD: Rockville; 2018. Available at:. https://www.samhsa.gov/nrepp.
11. Rockhill S. *Use of the Michigan Model for Health Curriculum among Michigan Public Schools*. Lansing, MI: Michigan Department of Health and Human Services; 2017.
12. Bumbarger B. Readiness assessment to improve program implementation: shifting the lens to optimizing intervention design. *Prev Sci*. 2015;16(8):1118-1122.
13. Damschroder L, Aron D, Keith R, Kirsh S, Alexander J, Lowery J. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci*. 2009;4:50.
14. Proctor E, Silmere H, Raghavan R, et al. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Adm Policy Ment Health Ment Health Serv Res*. 2011;38(2):65-76.
15. 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.
16. Kann L, Kinchen S, Shanklin SL, et al. Youth risk behavior surveillance—United States, 2013. *MMWR CDC Surveill Summ*. 2014;63(4):1-170.
17. Cobb N. *Adolescence: Continuity, Change, and Diversity*. 6th ed. New York, NY: McGraw-Hill; 2007.
18. Bureau of Labor Statistics. *Unemployment Rates in the United States*. Washington, D.C.: Department of Labor; 2019 Available at: https://www.bls.gov/lau/data.htm. Accessed May 13, 2019.
19. US Centers for Disease Control and Prevention (CDC). *Youth Risk Behavior Survey Questionnaire*. Atlanta, GA: CDC; 2015 Available at: www.cdc.gov/yrbs. Accessed May 7, 2019.
20. Ehrhart M, Aarons G, Farahnak L. Assessing the organizational context for EBP implementation: the development and validity testing of the implementation climate scale (ICS). *Implement Sci*. 2014;9:157.
21. Cohen J, Cohen P, West S, Aiken L. *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. 3rd ed. Lawrence Erlbaum Associates: Mahwah, NJ; 2003.
22. Olsson U, Drasgow F, Dorans N. The polyserial correlation coefficient. *Psychometrika*. 1982;47(3):337-347.
23. Kaiser J, Lacy M. A general-purpose method for two-group randomization tests. *Stata J*. 2009;9(1):70-85.

24. CFIR. *Research Team-Center for Clinical Management Research*. Ann Arbor, MI: CFIR Interview Guide Tool; 2019. Available at:. http://www.cfirwiki.net/guide/app/index.html.

25. Palinkas L, Aarons G, Horwitz S, Chamberlain P, Hurlburt M, Landsverk J. Mixed method designs in implementation research. *Adm Policy Ment Health*. 2011;38:44-53.

26. Glaser B. *Doing Grounded Theory: Issues and Discussions*. Mill Valley, CA: Sociology Press; 1998.

27. Strauss A, Corbin J. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. Thousand Oaks, CA: Sage; 1998.

28. Fraser D. *QSR NUD*IST Vivo: Reference Guide*. Melbourne: Qualitative Solutions and Research; 2000.

29. Aarons G, Hurlburt M, Horwitz S. Advancing a conceptual model of evidence-based practice implementation in public service sectors. *Adm Policy Ment Health*. 2011;38:4-23.

30. Lyon A, Cook C, Brown E, et al. Assessing organizational implementation context in the education sector: confirmatory factor analysis of measures of implementation leadership, climate, and citizenship. *Implement Sci*. 2018;13(1):1-14.

31. Holbein J, Ladd H. *Accountability Pressure and Non-Achievement Student Behaviors*. Washington, DC: Center for Analysis of Longitudinal Data in Education Research; 2015. Available at:. https://caldercenter.org/sites/default/files/WP%20122.pdf.

32. Lauen DL, Gaddis SM. Accountability pressure, academic standards, and educational triage. *Educ Eval Policy Anal*. 2016;38(1):127-147.

33. Rasberry CN, Slade S, Lohrmann DK, Valois RF. Lessons learned from the whole child and coordinated school health approaches. *J Sch Health*. 2015;85(11):759-765.

34. Lerner R. Promoting positive youth development: theoretical and empirical bases. In: *Workshop on the Science of Adolescent Health and Development, National Research Council*. Washington, DC: National Research Council/Institute of Medicine, National Academy of Sciences; 2005:92.

35. Fergus S, Zimmerman M. Adolescent resilience: a framework for understanding healthy development in the face of risk. *Annu Rev Public Health*. 2005;26:399-419.

36. Beidas R, Edmunds J, Marcus S, Kendall P. Training and consultation to promote implementation of an empirically supported treatment: a randomized trial. *Psychiatr Serv*. 2012;63(7):660-665.

37. Waxmonsky J, Kilbourne A, Goodrich D, et al. Enhanced fidelity to treatment for bipolar disorder: results from a randomized controlled implementation trial. *Psychiatr Serv*. 2014;65(1):81-90.

38. Kilbourne A, Almirall D, Eisenberg D, et al. Adaptive implementation of effective programs trial (ADEPT): cluster randomized SMART trial comparing a standard versus enhanced implementation strategy to improve outcomes of a mood disorders program. *Implement Sci*. 2014;9(1):132.

39. Lyon AR, Bruns EJ. From evidence to impact: joining our best school mental health practices with our best implementation strategies. *Sch Ment Health*. 2019;11(1):106-114.

40. Ringwalt CL, Pankratz MM, Jackson-Newsom J, et al. Three-year trajectory of teachers' fidelity to a drug prevention curriculum. *Prev Sci*. 2010;11(1):67-76.

41. Lyon A, Koerner K. User-centered design for psychosocial intervention development and implementation. *Clin Psychol Sci Pract*. 2016;23(2):180-200.

42. Chambers D, Glasgow R, Stange KC. The dynamic sustainability framework: addressing the paradox of sustainment amid ongoing change. *Implement Sci*. 2013;8:117.