Final Grant Report: Sigma Theta Tau International Small Grant

Evaluation of a School Nurse-Led Obesity Program for Severely Obese New York City Public School Students

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Acknowledgements: This research was supported by Sigma Theta Tau International through a Small Grant, the National Institute of Nursing Research through Grant Number T32 NR014205, and the National Center for Advancing Translational Sciences through Grant Number UL1 TR000040. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. The authors would also like to acknowledge the New York City Department of Health and Mental Hygiene (CT, TA, KK, JH) for their assistance with this research project and manuscript development.

Conflict of Interest Statement: No conflicts of interest exist.

Human Subjects Protections: Institutional Review Board approval was obtained from Columbia University Medical Center, the New York City Department of Health and Mental Hygiene, and the New York City Department of Education.

Columbia University

2016

Summary of project aims

The purpose of this mixed-methods study was to evaluate the Healthy Options and Physical Activity Program (HOP), a school nurse-led childhood obesity initiative for severely obese New York City Public School students. Aims 1, 2, and 3 employed a retrospective cohort design and examined program implementation and the effect of HOP on health behavior change and change in BMI percentile; Aim 4 employed a qualitative design to provide context and inform recommendations to more fully deploy HOP within the New York City school system. The formal aims of the study are as follows:

Aim 1) Examine demographic and medical characteristics of children who are eligible for HOP

Aim 2) Examine implementation of HOP, including session frequency, session content, and factors associated with participant enrollment

Aim 3) Examine impact of HOP on BMI percentile change, school absences, and school nurse visits

Aim 4) Explore school nurses' perceptions of factors that promote or hinder optimal implementation of HOP

Theoretical/conceptual framework

This quantitative potion of this study (aims 1-3) was guided by the Ecological Model of Health Behavior, a socio-ecological model (McLeroy, Bibeau, Steckler, & Glanz, 1988). Socio-ecological models are applied in many research fields and stress the impact of contextual and environmental influences on health, the effectiveness of a health program, or health behavior change (Sallis, Owen, & Fisher, 2008). The Ecological Model of Health Behavior posits that health behavior is influenced by factors at five levels: intrapersonal, interpersonal, institutional, community, and public policy (McLeroy et al., 1988). An extensive body of research supports

application of socio-ecological models to childhood obesity interventions (National Heart Lung and Blood Institute, 2007), as contextual and environmental factors are known to impact obesity (Booth, Pinkston, & Poston, 2005; Ferreira et al., 2007; Lake & Townshend, 2006; Lobstein, Baur, & Uauy, 2004). In this study, factors at community, institutional, interpersonal, and intrapersonal levels were examined for association with the implementation and efficacy of HOP.

The qualitative part of this study (aim 4) was guided by the RE-AIM Framework. The RE-AIM Framework can guide evaluations of programs (such as HOP), by examining presence of essential program elements and guiding translation of research-based programs into practice (Glasgow, Vogt, & Boles, 1999; RE-AIM.org, 2015). Each level of the RE-AIM framework focuses on a distinct portion of program implementation. The interview guide for aim 4 addressed each component of the RE-AIM Framework; the guide was used during interviews with the New York City school nurses who participated in the qualitative study. Further details about how the RE-AIM framework was applied to the interview guide are provided in Table 1.

School nurse-led intervention for severe childhood obesity

HOP is a program for children with severe obesity who attend New York City (NYC) schools. Children who meet criteria for severe obesity (defined as a BMI for age and sex at 120% of the 95th percentile (Flegal et al., 2009; Kelly et al., 2013)) during annual fitness assessments (New York City Department of Education, 2015) are identified for potential HOP participation. Parents of identified children receive a letter from the school explaining program processes and goals. Although parents have the opportunity to opt out, this option is taken by less than 1% of parents. If parents do not opt out, school nurses enroll children in HOP. HOP session duration, frequency, and focus are at the discretion of the school nurse, though program guidelines require one session at least every six months (1.7 sessions per 10 month school year).

HOP sessions may include counseling with a focus on BMI tracking, goal setting, and education around 5 health behaviors (sedentary media use, sugar sweetened beverage consumption, portion size, physical activity, and fruit and vegetable intake). Referrals to school health physicians or primary care providers are made as needed for management of associated health conditions, such as hypertension or type 2 diabetes. Parents are encouraged to participate in HOP sessions either in person or via phone. Prior to program implementation in 2012, all school nurses attended a full day training which included education on HOP components and implementation, as well as biological overview of obesity (e.g., common comorbidities), methods for clinical assessment of a child with obesity (e.g., how to plot BMI percentile), and the psychological/behavior/cultural influences on obesity (e.g., association between obesity and bullying, cultural perceptions of appropriate body size). In addition, all nurses are given a binder of HOP resources that contains the suggested timeline for HOP visits, activity sheets to use during HOP sessions, and criteria for provider referral.

Methods, procedures and sampling

Aims, 1, 2, 3

Design, sample, and ethical approval.

This was a retrospective cohort study of kindergarten through fifth grade students who were identified with severe obesity and thus eligible for HOP. This study focuses on the 2012-2013, the first school year of full scale HOP implementation. Approval for this study was obtained from the Institutional Review Boards for Columbia University Medical Center, the NYC Department of Health and Mental Hygiene, and the New York City Department of Education.

Data set and variables.

The quantitative portion of this study (aims 1-3) was guided by the Socio-ecological Model (Davison & Birch, 2001; McLeroy et al., 1988); when evaluating HOP, we examined factors at the individual, family, school, and community levels. Data were collected from 3 sources: student electronic health record, NYC Department of Health and Mental Hygiene Office of School Health records, and the New York Center for Economic Opportunity poverty data. The electronic health record used by NYC school nurses was the primary data source and includes details of student demographics, participation in school programs such as HOP, and school nurse visits. The electronic health record also includes BMI percentile calculated from height and weight measurements by school nurses. For school nurse visits, we excluded visits for reasons other than acute illness or injury (e.g., receipt of vaccination, routine medication administration). School level variables (school poverty level, school nurse workload) were collected from records of the NYC Department of Health and Mental Hygiene Office of School Health. School nurse workload was represented by a composite metric developed by the DOHMH ranging from 1 to 36 points that incorporated number of children at a school and number of children with diabetes, asthma, or requiring medication administration during school hours. We categorized school nurse workload into tertiles representing low (≤10.8 points), moderate (10.8-16.8 points) and high (≥16.9-35.6 points) workload. School poverty level, the percent of registered students who receive free/reduced school lunches, was dichotomized into those above the New York State average of 51.7% and those equal to or below the New York State average for kindergarten through sixth graders in schools (New York State Kids' Well-being Indicators Clearinghouse, 2016).

Data analysis.

HOP implementation was examined by proportion of eligible children who were enrolled in HOP, HOP session frequency and content, and factors associated with student enrollment. All HOP-eligible children were included in the implementation analyses. We analyzed program implementation using descriptive statistics and multivariate logistic regression. Characteristics of children enrolled in the program were compared to those of eligible children who were not enrolled. Factors that significantly differed between HOP participants and nonparticipants ($p<0.05$) or theoretically associated with childhood obesity (Davison & Birch, 2001) were included in the regression model.

To examine the impact of HOP participation on BMI percentile, absences, and school nurse visits, we compared children who participated in HOP with 1:1 propensity score matched children who were eligible for but not enrolled in the program. The propensity score matched group served as a control group to limit the confounding relationship between HOP and outcomes of interest. Consistent with recommendations for analysis using propensity matched groups (Austin, 2008; Austin, 2011; Lanehart et al., 2012), data were analyzed using Wilcoxon signed rank test for continuous variables and McNemar's test for dichotomous variables. Because BMI prevalence and growth trajectory (i.e., puberty onset) differ by gender, all analyses of HOP impact were stratified by gender (Kelly et al., 2013; Robbins, 2015; Wisniewski & Chernausek, 2009).

Aim 4

Design, sample, and ethical approval.

For the qualitative portion of this study, a purposive sample of school nurses working in NYC Schools was recruited. All NYC school nurses who worked with kindergarten through fifth grade children were eligible, with the exception of nurses who worked in schools where the

student body were exclusively children with disabilities/special education needs. Nursing Supervisors at the NYC Department of Health and Mental Hygiene Office of School Health provided names and contact information of potential subjects. To ensure a broad understanding of school nurses' experiences, nurses with extensive, limited, and no experience implementing HOP within the past year were recruited. Nurses were considered to have "extensive experience" if they implemented HOP with at least 6 children and to have "intermediate experience" if they implemented HOP with at least one but less than six children during the past school year. No specific number of nurse participants was targeted, as power analysis is not appropriate for qualitative research (Vaughn, Shay Schumm, & Sinagub, 1996). Approval for this study was obtained from the Institutional Review Boards for Columbia University Medical Center, the NYC Department of Health and Mental Hygiene, and the New York City Department of Education.

Recruitment.

Eligible nurses were contacted via email or phone to provide information about study purpose, confidentiality procedures, provision of a $50 Visa gift card incentive, and to confirm eligibility criteria. Confidentiality during the interviews was assured. Nurses were given a choice about location and type of interview (phone or face-to-face). Each subject provided signed informed consent including permission to audio record the interview prior to participation. Two days prior to participation, participants were reminded about the time and place of the interview.

Procedure.

Prior to beginning the interview, participants completed a 14 item question demographic questionnaire that included level of nursing education and prior experiences with HOP implementation. Interviews lasted approximately 45 minutes with 15 minutes devoted to

introduction of the PI, introduction of study, eligibility screening, completion of demographic data forms, and closing. Interview discussion was guided by a 17 item interview guide structured by RE-AIM (Glasgow et al., 1999; RE-AIM.org, 2015), a framework that guides evaluation of a program's translation into practice. The framework examines an intervention for more than just efficacy in order to promote adoption of sustainable, impactful interventions (Glasgow et al., 1999; RE-AIM.org, 2015). Interview questions were also informed by a March 2013 email survey completed by 735 school nurses about barriers to and facilitators of HOP implementation. Table 2 includes the interview guide questions. Interview recordings were transcribed by a professional transcriptionist. Transcripts of the recordings served as source records. Transcripts were uploaded to NVivo (QSR International, n.d.) for data analysis.

Data analysis.

Data were analyzed using content analysis (Holsti, 1969; Krippendorf, 2003; Neuendorf, 2002) and the unit of analysis was the interview transcript. Data analysis was an iterative process and began following completion of the first interview. After multiple readings of each transcript and guided by the RE-AIM framework (Glasgow et al., 1999; RE-AIM.org, 2015), the researcher marked ideas, terms, and phrases of meaning to develop codes. Codes were iteratively grouped, in order to identify categories and link them to themes (Glaser, 1965). The researcher met with one or more members of the research team weekly in order to discuss the analytic process and developing findings, including codes, categories, themes, and illustrative examples from transcript text. Discrepancies were resolved through consensus. These meetings facilitated analyst triangulation, which can contribute to the verification and validation of qualitative research (Patton, 1999). Credibility was further enhanced through triangulation of data sources by sampling nurses with a wide range of HOP experience in order to broadly understand barriers

to and facilitators of HOP implementation (Graneheim & Lundman, 2004; Patton, 1999). To ensure dependability, an audit trail was maintained with each step of the analysis process documented sequentially in NVivo and Excel. Data saturation was achieved when interviews become redundant, when comprehensive themes encompassed all data, and when further theme development was no longer possible (Fusch & Ness, 2015; Guest, Bunce, & Johnson, 2006). Member checking will be conducted with two participants (one with extensive experience, one with intermediate experience) to ensure that the findings reflect participants' perceptions. (Member checking has not yet occurred at the time of submission of this grant report.)

Summary of Findings

Aims 1, 2, 3

HOP Implementation.

During the 2012-2013 school year, 20,518 kindergarten through fifth grade children met criteria for severe obesity and were therefore eligible for HOP. Sample characteristics are listed in Table 3. The mean BMI percentile of these students was 99.4±0.3. The majority of the eligible children were male (61.6%) and of Hispanic ethnicity (56.4%). Most received free/reduced lunch (81.2%) and lived in communities where, on average, 1 of 4 (23.8%) participants lived under the federal poverty level. Almost one third of the children (30.5%) had at least one chronic illness; of these, the most common diagnosis was asthma (29.4%). Prior to propensity score matching, HOP participants were more likely to attend a school with a lower poverty level (71.0% versus 74.1%), be in a higher grade (i.e., 6.9% versus 20.6% in kindergarten), and have a chronic illness (46.0% versus 30.5%) compared to those who were eligible for but not enrolled in HOP (data not shown). Five children who participated in HOP and 70 children who were eligible for but not

enrolled in HOP were missing variables required for propensity score matching; they were therefore excluded from further analysis. Of the 20,443 eligible children, 1,049 (5.1%) were enrolled in HOP.

Details of HOP implementation are presented in Table 4. Most (61.1%) HOP sessions included 1 of the 3 program components. Almost all (92.2%) HOP sessions included BMI measurement and tracking. In addition, sessions sometimes included health behavior education (44.9%); the focus of these health discussions in order of frequency were "5 fruits and vegetables per day" (31%), "0 sugar sweetened beverages" (19%), "1 hour of physical activity" (19%), "2 hours or less of screen time" (16%), and "portion control" (15%). Goal setting and measurement of goal achievement was documented less frequently (18.2%). Most participants had 1 HOP session (median 1, mean 2.1±1.6, range 1-11) during the 2012-2013 school year. Approximately half (46.4%) participated in 2 or more sessions. Parent participation occurred at 3.2% of HOP sessions.

Factors that significantly predicted a child's enrollment in HOP are presented in Table 5. Children who attended schools with lower school poverty levels and lower school nurse workload, who had higher BMI percentiles, or were diagnosed with at least one chronic illness were more likely to be enrolled in HOP.

HOP Impact

Outcomes of program participation are presented in Table 6. After propensity score matching, there were no significant differences between the HOP group and the propensity score-matched control group. For girls, there were no significant differences in BMI change in HOP participants when compared to the control group. For boys, HOP participants significantly decreased BMI percentile by 0.07 less than the control group. There were no differences in

school absences. For both girls and boys, HOP participants demonstrated more visits to the nurse's office (5.0 versus 3.7 for boys, 5.9 versus 3.2 for girls, $p<0.01$) compared to the control group.

Aim 4

Of 31 nurses recruited, 19 participated (4 with Extensive HOP Experience, 7 with Intermediate HOP Experience, and 7 with No HOP Experience in the current school year) have participated to date. All nurses with No HOP Experience were familiar with the program and all except one had presented lessons based on the HOP curriculum (nutrition, physical activity) at the classroom level. Extensive Experience nurses had each worked with a mean of 11 children in HOP during this school year; Intermediate Experience nurses had worked with a mean of 3 children in HOP during this school year. Both extensive and intermediate experience participants had, on average, 5 years of experience implementing HOP. An overview of sample characteristics is presented in Table 7. Eight themes emerged from the data. Each theme, organized by the RE-AIM framework[12,13], is presented below.

Reach.

Gatekeepers. Nurses reported that parents and school administrators limited nurses' ability to implement HOP with children who they felt may benefit from the program. Some parents were insulted or angered after receiving the letter about their child's eligibility for HOP; others who did not formally opt out, expressed anger after the nurse began to work with their child as part of the program.

> "I can't even begin to tell you the phone calls that I received…It was basically how dare I intrude…'We're big-boned people.' 'I have a pediatrician that deals with my child's health.' 'I understand that you're there for an emergency or to give out medications, but I do not want you to speak to my child again about nutrition.'" – Participant 12, Intermediate Experience

School principals sometimes pressured nurses to not implement HOP to avoid the actual or perceived risk of upsetting parents.

> "The reason that I am not doing the HOP program here is because the principal, every year she says she wants to opt out of the program…because the parents were feeling offended by the opt-out letter that was mentioning the 'obesity'…They were calling the principal and complaining about the nurse giving them those letters." – Participant 6, No HOP Experience

> "The principal doesn't want that one-on-one [HOP sessions] because she doesn't want the parents to get insulted." – Participant 7, No HOP Experience

It takes a team. In schools more receptive to HOP implementation, nurses described the importance of parent and school personnel cooperation when implementing HOP. More often than not, teachers worked with nurses to help eligible children participate in the program.

> "And [the teachers] are very receptive…. That helps a lot. I don't have any of the teachers saying 'Oh, you can't take them out of class.' And if I ask them to do anything for me, they would do it." – Participant 16, Extensive Experience

Some principals also helped nurses to overcome obstacles to implementing HOP.

> "If I'm getting so behind seeing the kids…I would ask my principal if she can send an email to the teachers, like for the first two periods not to send anybody to the medical room....And right away, she responds. She sends an email. " – Participant 4, Extensive Experience

While less common, some parents encouraged the nurses' implementation of HOP.

> "…One parent was like, "Yes. Anything you can do. Please, your suggestion. I'm trying to get on him, or whatever you can do.'" – Participant 8, Intermediate Experience

Effectiveness.

An uphill battle. Almost all nurses expressed that helping a child to reach a healthy body weight was an uphill battle and described contextual factors as barriers to HOP's potential effectiveness. One factor commonly cited was the home food environment.

> "Every parent that I talk to said 'Oh, this is so great. Maybe you can help me get them thinner.' It kills me, because they're the ones giving them the food. They're young kids, they can't go out and buy it themselves." – Participant 14, Extensive Experience

Nurses also described the school and community environments as promoting unhealthy choices.

> "And there are too many fast-food chains in the neighborhood where my school is…So if you can get… fries and soda and chicken nuggets for $1.99, why would I cook?" – Participant 4, Extensive Experience

Adoption.

Stigma. Some nurses were hesitant to adopt the HOP program due to concerns about participants feeling stigmatized due to their weight. Nurses took special measures in schools where HOP was implemented to be sensitive to the child's self-esteem.

> "Yeah, it's bad enough being a heavyweight child let alone being embarrassed in front of the class. 'Oh my god, they have to go and get a lesson from the nurse, because she's fat.'" – Participant 2, No HOP Experience

> "I would always be very sensitive to that because they don't want to be called out of class...I can get [the student] quietly in the hall and say, 'Hey, I just want to talk to you if you get a break today,' and he would say, 'Okay,' and he would come back maybe after lunch or something like that." – Participant 8, Intermediate Experience

While nurses frequently described concern about potential stigmatization, not all perceived that children felt singled out by being selected for program participation. Some mentioned that older children were sensitive about their weight, but others noted that many younger children enjoyed participating in HOP and demonstrated no embarrassment about attending HOP sessions.

> "I don't think that there was really any negative effects mentally for them. I don't think they were upset over it." – Participant 1, Intermediate experience

> "I mean, they love coming to my office…I don't think they thought of it as, 'Oh, there's something wrong with me.'" – Participant 11, No HOP Experience (speaking about her experience implementing HOP in prior years)

Fitting HOP into a heavy workload. Many nurses cited their workload as the biggest barrier to implementing HOP. They described being too busy with walk-in visits, medication

administration, and documenting care. Nurses who worked in schools with fewer students noted that their lighter workload made it easier for them to implement HOP.

> "I'm so busy that I feel guilty. I want to spend more time with this kid, but I just can't. I just don't have the time to spend more time with these children." – Participant 4, Extensive Experience

> "Have you ever walked into a public school into the medical room? ...It's very busy… Yes, nurses can do a lot, but unfortunately they cannot educate a thousand children about nutrition, and that's a fact." – Participant 6, No HOP Experience

Nurses who implemented HOP reported making special efforts to fit HOP into their busy schedule. For example, one nurse met with a student after school before his school bus arrived. Others made efforts to collaborate with other school administrators and staff to gain support for HOP implementation.

> "I would say not my time [is a barrier], because once I decide to take a child on, I make the time." – Participant 9, Intermediate Experience

> "I even spoke at a PTA meeting at the beginning of each school year and kind of talked a little bit about HOP…I brought this up to the administration, the dean, the [teachers' union] leader…just kind of letting them know about the program and that this is what we are trying to do as school nurses." – Participant 12, Intermediate Experience

Implementation.

Creativity and tailoring. While HOP protocol guides program content and session frequency, nurses have autonomy to tailor the program. Many nurses adapted the program to meet the constraints of their school. For example, one nurse with a high nurse to student ratio met with children in groups of three instead of individually to increase the number of children who could participate. Many used creative activities such as making smoothies to teach the children about nutrition. Others shared nutrition and physical activity education with children outside of HOP sessions, such as during walk-in visits.

> "Let's say an overweight child walks to our room, so we provide health education without the student realizing, okay, they are talking to me this way because I am obese…

> We can say in the conversation, what did you eat for breakfast today if they come with a stomachache. And that makes them discuss about the healthy products." – Participant 6, No HOP Experience

Economic and cultural considerations. Nurses recognized that a child's cultural or socioeconomic background impacted his/her nutritional intake, physical activity habits, and HOP efficacy. They attempted to adapt HOP to the unique needs of their student population.

> "Since I was in a Hispanic community, I…went ahead and got [nutrition education] that was more useful for them…It's mostly a Hispanic community, so what happens is the children eat a lot of rice and beans. And I think that it's cheaper for the parents also." – Participant 1, Intermediate Experience

> "And I tell [the parents] that any city hospital has a Green Market that has fresh fruits and vegetables, and that they can use food stamps [to pay for it]." – Participant 14, Extensive Experience

Occasionally, though much less often, economic status was mentioned as a facilitator to HOP implementation.

> "He was also trying to go to the gym. So that was another good thing that he had the resources that he was able to do that…I always want to say that the economic background on these children was a little bit more affluent, so they also had the ability to at least have these things available to them." – Participant 8, Intermediate Experience

Maintenance.

None of the nurses seemed to be in the maintenance phase of HOP implementation. However, most nurses described ways of tailoring HOP so that it could be implemented in a more sustainable way.

Improving HOP for the future. Recommendations for expanding HOP implementation and to promote program sustainability largely fell into three categories: provide more support to busy nurses, increase parent involvement, and implement HOP at the classroom level instead of the individual level. Nurses noted the need for additional staff, such as public health aids or additional nurses, to decrease their workload so that they could devote more time to HOP

implementation. One nurse described working with local nursing students who helped her to implement HOP at the classroom level; she found that to be successful and feasible. Nurses also had various ideas for increasing parent involvement, though they realized doing so would be a challenge based on some parents' resistance to the program and parents' busy schedules. In addition, nurses noted that parents, teachers, and administrators were more receptive to classroom education versus individual HOP counseling and that the children enjoyed the classroom sessions.

Recommendations

The results of this mixed methods study have implication for clinical nursing, health policy, and future research.

Recommendations for clinical nursing

This study has implications for nurses working in school health; more specifically, it provides guidance for development or implementation of obesity interventions in school settings. The findings regarding HOP implementation can help guide nurses' expectations regarding intervention feasibility. If nurses are aiming to do one-on-one counseling, they should develop a low intensity program or ensure involvement of other partners, such as primary care physicians or physical education teachers. The findings from the qualitative portion of this study suggests that when designing programs nurses should consider the barriers they may face and plan proactively to address them. For example, nurses can plan specific ways to engage with parents about the obesity intervention. Alternatively, nurses could plan to implement general health, nutrition, and physical activity education in classroom settings in order to avoid the resistance of parents and administrators. Lastly, nurses can use the results of this study to advocate for more

support (e.g., public health aid) in doing the important work of obesity prevention and treatment; qualitative and quantitative findings suggested that low resources and high nurse workload may have prevented nurses from implementing HOP in a broader or more intensive manner.

Recommendations for health policy

This study has important implications for policy. Qualitative findings indicated that nurses lack the resources to implement obesity programs at their optimal intensity. This suggests that increased attention must be paid to school nurse workload and staffing if programs such as HOP are to be successful (Gordon & Barry, 2009; Robert Wood Johnson Foundation, 2013; Wang et al., 2014). Students who attended schools where nurse workload was high were less likely to be enrolled in HOP. Some nursing tasks may be able to be handled by other support personnel such as public health aides, present in the nursing office in some schools. The need for school-based interventions is particularly acute for children who don't have regular primary care; an available school nurse who provides health behavior education can play an important role in child health, but only if (s)he has a workload that allows him/her to do so. Support for the NURSE Act, which will allow schools or state agencies to apply for federal grants to reduce the cost of hiring a nurse, may help improve nurse staffing and make implementation of programs like HOP more feasible (U.S. Senate, 2016).

The findings of the qualitative portion of this study also suggest broader societal level factors must be addressed before school-based programs can seriously impact the obesity epidemic. Nurses noted that they feel barriers outside their control impact child weight. For example, parents who work long hours at low wage jobs cannot afford the time or money to shop for or prepare more expensive healthier foods. Urban children often live in apartment buildings where access to open areas for exercise is limited. In addition, the neighborhoods where students

attend school are often filled with fast food restaurants and corner stores stocking unhealthy foods. Until broader policy changes that impact poverty and food access (particularly in neighborhoods of color or poverty) are implemented, school-based programs can only have a small impact on obesity. A discussion of broad policy changes are outside the scope of this report, but include resisting efforts to change the Supplemental Nutrition Assistance Program ("food stamps") to a block grant program (Food Research and Action Center, 2015), ensuring funding for urban park systems (National Recreation and Parks Association, n.d.), and providing incentives for corner stores to stock healthier foods (The Food Trust, n.d.).

Recommendations for future research

This research suggests avenues for future work. First, an evidence base must be developed to guide best practices for school-based interventions for children with obesity and severe obesity. Future research should include randomized controlled trials and qualitative inquiry about nurses' experiences with obesity interventions. Nurses' perception of their role in these interventions and their preparation for these roles could also be examined. In addition, studies must ensure a focus on intervention sustainability. What is feasible for busy school nurses to implement in a particular school? What factors make it easier to implement and sustain such a program? In addition, future research should examine, from the child and parent perspective, if and how participating in obesity counseling is associated with stigma. If the evidence regarding children's feelings of stigmatization is clear, those feelings can better be addressed. Lastly, school-based obesity interventions must be developed and tested that consider the challenges faced by vulnerable children such as many of those who were eligible for HOP. For example, eating the recommended number of fruits and vegetables each day may be challenging for children living in poverty unless the parents are educated about available resources such as local

Farmers Markets that accept “food stamps.” More creative messaging may be required, such as tailoring education to eating healthy on a limited budget.

Table 1. Application of the RE-AIM Framework to the Interview Guide for the qualitative portion of the study in aim 4

Level of Framework	Description	Application in Interview Guide
R – Reach	Number, proportion, and representativeness of individuals who are willing to participate in a given initiative	Selection of HOP participants, appropriateness of HOP eligibility criteria
E - Effectiveness or efficacy	Impact of an intervention on important outcomes, including potential negative effects, quality of life, and economic outcomes	Potential for HOP to bring about positive and negative effects for participants, nurses’ perceptions of whether these anticipated effects (positive or negative) actually occurred
A - Adoption by target staff, settings, or institutions	Number, proportion, and representativeness of settings and intervention agents who are willing to initiate a program	Facilitators and barriers to HOP adoption, influence of administrators and parents on HOP adoption, students’ reactions to nurses during HOP sessions
I - Implementation consistency, costs and adaptions made during delivery	Intervention agents' fidelity to the various elements of an intervention's protocol (consistency, time, cost)	School nurses’ knowledge of HOP and use of HOP resources, school nurses’ knowledge about childhood obesity, school nurses’ ability to implement HOP as they see fit
M - Maintenance of intervention effects in individuals and settings over time	Extent to which a program or policy becomes institutionalized or part	Suggestions for HOP implementation in the future

	of the routine organizational practices and policies

RE-AIM Framework (Glasgow et al., 1999; RE-AIM.org, 2015)

Table 2. Interview guide used in semi-structured interviews with study participants

Question

To get started with our discussion, please tell me about your experience with HOP. How many children have you worked with, and how often do you meet with them?

Reach

How do you select students for HOP implementation?

Do you feel that there are children who could benefit from HOP but do not receive it? If so, can you tell me about those students?

Effectiveness

What aspects of HOP can help students decrease BMI or change health behavior? Do you think there are any aspects that would need to change to allow HOP to work better?

Do you think HOP has any negative effects on children? (prompt: Do you think children that are selected for HOP might be subject to additional bullying or teasing because they are in HOP?)

Did you find that HOP had any unexpected effects (positive or negative) on children who participated?

Adoption

What kinds of things make it easier for you to implement HOP?

What kinds of things make it harder for you to implement HOP?

What is your experience with the principal and administrators, when it comes to HOP? What about with parents?

How do students react to HOP? Describe a typical interaction with a student during a HOP session.

Implementation

Do you have a good understanding of how HOP is supposed to be implemented? Is the HOP binder helpful to you?

How helpful (or unhelpful) is ASHR to your implementation of HOP?

Do you feel that you have enough knowledge about childhood obesity to implement HOP?

What helps you to implement HOP as you see fit? Or, what changes would need to be made to allow you to implement HOP as you see fit?

Maintenance

What are your suggestions for implementing HOP in the future?

What would make it easier for you to implement HOP with more children?

Table 3. Demographic characteristics of the sample

Characteristic	Total Sample	By HOP Enrollment	
	All eligible children (N=20,518)	Enrolled (n=1,054)	Not Enrolled (n=19,464)
Community poverty level[a] (mean±SD)	23.8±6.3	23.4±6.3	23.8±6.7
Borough			
Bronx	26.6	20.6	26.9
Brooklyn	29.7	21.9	30.1
Manhattan	10.1	7.5	10.2
Queens	27.1	46.0	26.0
Staten Island	6.6	3.91	6.8
School poverty level[b] (mean±SD)	74.6±17.7	71.1±20.0	71.3±19.5
School nurse workload[c] (mean±SD)	15.0±7.0	13.3±6.7	13.3±5.8
Free/reduced lunch (%)			
Yes	82.6	82.6	81.2
No	17.4	17.4	18.8
BMI percentile (mean±SD)	99.4±0.3	99.5±0.3	99.4±0.3
BMI percentile category (%)			
Higher (>99.5)	38.8	53.1	38.4
Lower (99.0-99.5)	61.2	46.9	61.7
Gender (%)			
Male	60.8	58.8	61.6
Female	39.2	41.2	38.4

Table 3. (Con't.)

Characteristic	Total Sample	By HOP Enrollment	
	All eligible children (N=20,518)	Enrolled (n=1,054)	Not Enrolled (n=19,464)
Grade (%)			
Kindergarten	21.0	6.9	20.6
First	19.8	16.3	20.2
Second	18.9	21.6	18.9
Third	15.3	18.8	15.6
Fourth	13.2	19.2	13.1
Fifth	11.9	17.2	11.5
Race/ethnicity[c] (%)			
Non-Hispanic White	9.2	10.6	9.9
Non-Hispanic Black	24.5	21.6	25.3
Hispanic	57.5	58.8	56.4
Asian	7.1	7.8	7.3
Other	1.6	0.11	0.11
At least 1 chronic illness (%)	32.7	46.0	30.5

a: Percent of individuals in student's home community living below federal poverty level (NYC Center for Economic Opportunity, 2015)

b: Percent of children in student's school receiving free/reduced lunch

c: Composite metric developed by the New York City Department of Health and Mental Hygiene that incorporates number of children at a school and number of children with diabetes, asthma, or requiring medication administration during school hours

d: Asian= Asian/Native Hawaiian/Pacific Islander, Other= American Indian/Alaskan Native, Multi-racial

Table 4. HOP implementation

Variable	
Sessions/school year (median (range))	1 (1-11)
Focus of HOP session	
Health behavior education (%)	44.9
Health behavior education focus (%)	
Fruit/vegetable intake	31
Sugar sweetened beverage intake	19
Physical activity	19
Screen time	16
Portion control	15
BMI measurement and tracking (%)	92.2
Goal setting (%)	18.2
Comprehensiveness of HOP session[a] (%)	
Included all components	6.3
Included 2 of 3 components	32.6
Included 1 component	61.1
Parent participation (%)	3.2

n=1,049. a: Program components include health behavior education, BMI measurement and tracking, and goal setting

Table 5. Factors associated with enrollment of eligible children in HOP

Predictor	Odds Ratio	95% CI
School poverty level		
Lower than New York state average	1.6	1.3, 1.9
At or higher than New York state average	1.0	Reference
School nurse workload		
Low	2.4	2.0, 2.8
Middle	1.2	1.0, 1.4
High	1.0	Reference
Borough		
Bronx	1.8	1.3, 2.6
Brooklyn	1.6	1.1, 2.2
Manhattan	1.3	0.9, 2.0
Queens	4.2	2.9, 5.9
Staten Island	1.0	Reference
BMI percentile		
99.0-99.5%	0.5	0.4, 0.6
>99.5%	1.0	Reference
Gender		
Male	1.2	1.0, 1.3
Female	1.0	Reference
Grade		
Kindergarten	0.2	0.1, 0.2
First	0.4	0.3, 0.5
Second	0.7	0.5, 0.8
Third	0.8	0.6, 1.0
Fourth	1.0	0.8, 1.2
Fifth	1.0	Reference
Race/ethnicity[a]		
Non-Hispanic Black	0.7	0.4, 1.3
Hispanic	0.9	0.6, 1.2
Asian/Native Hawaiian/Pacific Islander	1.0	0.8, 1.3
Other	0.6	0.5, 0.8
Non-Hispanic White	1.0	Reference
Diagnosis of ≥1 chronic illnesses		
No	0.5	0.5, 0.6
Yes	1.0	Reference

n=20,443. a: Other race = American Indian/Alaskan Native and Multi-racial (1.1% of children)

Table 6. Program outcomes at 1 year

Outcome and Gender	HOP Group (n=1,049)	Matched Control Group (n=1,049)	P value
Change in BMI percentile			
Males		-0.26+0.5	<0.01
Females		-0.16±0.5	0.52
School absences during year of HOP participation			
Males	12.7±11.8	13.4±12.2	0.40
Females	13.4±11.4	14.7±13.2	0.16
School nurse visits during year of HOP participation			
Males	5.0±5.6	3.7±5.1	<0.01
Females	5.9±6.9	3.2±4.8	<0.01

Table 7. Participant characteristics in qualitative portion of the study

Characteristic	N (%)
Female Gender	19 (100)
Age	
25-44	3 (16%)
45-64	5 (26%)
>65	11 (58%)
Race	
White	12 (63%)
Black	2 (11%)
Asian	5 (26%)
Ethnicity	
Hispanic	3 (16%)
Non-Hispanic	16 (84%)
Total Years Worked as a School Nurse	
3-5	2 (11%)
6-10	3 (16%)
11-15	5 (26%)
>15	9 (47%)
Highest Degree Attained in Nursing	
Associates	5 (26%)
Bachelors	13 (68%)
Masters	1 (5%)
School Wellness Committee	
Yes	3 (16%)
No	16 (84%)
Approximate Number of Students Under Nurse’s Care	
0-250	3 (16%)
251-500	2 (11%)
501-750	4 (21%)
751-1000	9 (47%)
1001-1250	1 (5%)

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