Assessing implementation of evidence-based childhood obesity prevention strategies in schools

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A B S T R A C T

Objective. Research suggests that schools can play a key role in obesity prevention by implementing evidence-based strategies promoting student health. This study explores school climate factors underlying implementation of evidence-based health and wellness policies and practices in Kindergarten–8th grade programs in the Southwestern United States.

Method. Utilizing a participatory research survey approach conducted in December 2011 with school health professionals (N = 62) and a multiple regression design, a moderated predictive model of implementation climate (i.e., attitudes and beliefs about prevention, school commitment to prevention, barriers, and stakeholder collaboration) was tested.

Results. Barriers to obesity prevention efforts, such as lack of resources, support, or strategy clarity, hinder implementation of healthy food policies despite strong school commitment to prevention. Along with the commitment to prevention, stakeholder collaboration predicts physical education strategies, specifically reducing restricted access to physical education as a punishment for student misconduct.

Conclusion. Obesity prevention strategy implementation relies on the supportive structure of school climates. Barriers to prevention can impede efforts despite school commitment toward prevention, while stakeholder collaboration can enhance the likelihood that practices are in place.

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Introduction

Nationally, obesity is a growing concern with nearly two-thirds of adults overweight or obese (Centers for Disease Control and Prevention, 2012).\textsuperscript{1} Youth obesity rates are especially alarming with almost one-third of youth ages 10 to 17 overweight or obese (Centers for Disease Control and Prevention National Center for Health Statistics, 2013; Whitaker et al., 1997). Although rates in several states have fallen slightly among certain children (Centers for Disease Control and Prevention, 2013), obesity continues to disproportionately affect Hispanic and Black youth (39.9% and 41.6%, respectively) and youth under the federal poverty level (44.7%). Consequently, being overweight or obese is associated with significant health problems, such as type-2 diabetes and hypertension, which are estimated to cost between $147 billion and $210 billion per year for adults nationally. Childhood obesity is responsible for upwards of $14 billion in direct costs nationally (Trasande and Chatterjee, 2009; Trust for America’s Health, Robert Wood Johnson Foundation, 2012).

School consequences of obesity and obesity-related conditions include decreased mental acuity due to poor nutrition, behavioral health concerns, and peer victimization (Griffiths et al., 2006). Furthermore, being overweight or obese is associated with school absenteeism and indicators of achievement, including lower grade point averages, standardized test scores, and perceived academic performance (Geier et al., 2007; Taras and Potts-Datema, 2005). Considering schools have a significant role in providing youth with daily meals and physical activity opportunities, and that poor nutrition and obesity have the potential to negatively impact academic performance, schools are optimal settings for the implementation of obesity prevention efforts (Agron et al., 2010).

There is broad agreement that evidence-based environmental strategies (i.e., policies and systemic practices) to support healthy eating and active living should be considered in schools in order to have a meaningful, wide-ranging impact on obesity rates (Brownson et al., 2006; McGraw et al., 2000; Story et al., 2009). Within schools, these approaches can include practices for improved student and staff health...
services through body mass index (BMI) screenings and education, access to healthy foods, food preparation and procurement standards, and physical education and recess policies (Centers for Disease Control and Prevention, 2011). Environmental strategies are intended to be more sustainable and affect a larger, more diverse range of people than individual-level approaches.

Several studies have supported school-based environmental strategies for childhood obesity prevention. For instance, policies that limit student access to foods and beverages that are high in fat and sugars are related to decreased consumption of these items during the school day (Kubik et al., 2003; Neumark-Sztainer et al., 2005; Woodard-Lopez et al., 2010). School-based efforts to increase physical activity have contributed to lowered body mass index (Brown and Sumerbell, 2009) and improved cognitive abilities (Hillman et al., 2014), especially in younger children. Additionally, integrating physical education within classrooms was positively associated with student performance, such as time-on-task and standardized test scores (Centers for Disease Control and Prevention, 2010). Furthermore, students from schools with comprehensive, coordinated health and nutrition initiatives were generally less overweight or obese, demonstrated healthier eating habits, and participated in more physical activity than those from schools without nutrition programming (Hoeslsher et al., 2004; Veugelers and Fitzgerald, 2005). Finally, a recent review found robust effects for policies that set nutrition standards in improving student dietary behaviors (Jaime and Lock, 2009). Despite some promising findings for school obesity prevention, more work needs to be done in evaluating the climate of implementation in schools in order to promote these strategies. Specifically, researchers, practitioners, and policymakers must better understand the relationship(s) among micro- and macro-level organizational factors within schools that create an amenable climate for implementation (Taras and Potts-Datema, 2005), in which obesity prevention strategies can be effectively introduced.

Research has shown that the success of prevention strategies is reliant on the supportiveness of the climate of implementation (Fixsen et al., 2005; Matthews et al., 2006; Totura et al., 2010). Successful implementation is defined as strategic action taken to achieve an intended outcome (Brynard, 2009). Assessment of implementation climate is essential to school obesity prevention efforts in order to gauge effective levels of adoption, fidelity, and success (McGraw et al., 2000). Multiple elements illustrate the climate for strategy implementation, including attitudes and beliefs about the strategy, clarity and adaptability of strategy goals and operations, resource allocation, and strategy alignment with existing practices and the needs of those intended to benefit (Brynard, 2009; Fixsen et al., 2005; O'Toole, 1986; Panzano et al., 2007). Schools differ in their implementation capacity, suggesting that the success of obesity prevention is dependent on drivers such as attitudes and beliefs about prevention, school-level commitment, collaboration with individuals who have a stake in school programming, and reduction of barriers (Agron et al., 2010; Giacchino and Kakabadse, 2003).

Among these drivers, research consensus suggests that organizational commitment and collaboration with stakeholders, especially frontline implementers, are central factors to successful prevention work (Brynard, 2009; Cho and Nadow, 2004; Aarons et al., 2014; Rodriguez et al., 2014). Commitment (schools expressing motivation and desire beyond strict mandate for strategy assimilation and sustainability within typical operations) is the lynchpin to implementation and it is most effective following collaboration, or meaningful commitment to and participation in strategy decision-making, with stakeholders within the school (i.e., health professionals, teachers, other school staff) who are essential to putting an effort in place and seeing it through (Fixsen et al., 2005; Panzano et al., 2007).

This study tests a research-supported conceptual model of school implementation climate (Fig. 1) in order to identify the factors that are important in predicting whether health, nutritional, and physical activity promotion strategies are in place in elementary and middle schools. Consistent with leading research on obesity prevention in schools (Kubik et al., 2007; Stang et al., 1997; Story, 1999), policy implementation was assessed via the perspective of school nurses and health professionals. Research suggests that school commitment, stakeholder collaboration, and barriers are the strongest predictors of implementation success (Brynard, 2009). This study clarifies the mechanism by which these factors may influence school obesity prevention strategy implementation. Schools with higher levels of commitment to prevention, supportive attitudes and beliefs about the benefits of prevention, collaboration among key staff, and fewer barriers to implementation were hypothesized to have more environmental policies and practices in place. As past research suggests that organizational commitment is the cornerstone of effective implementation, it was hypothesized that commitment would moderate the associations of prevention attitudes and beliefs, collaboration, and barriers in either promoting or hindering the likelihood that strategies were in place.

Materials and methods

Participants and procedures

Health professionals (N = 62) representing 12% of public elementary/ middle schools and 29.4% of districts within a targeted Southwestern county completed an anonymous and confidential online survey administered via a state department of education listserv.4 The survey’s instructions described its purpose, that it was voluntary, and restricted responses to participants’ primary school affiliation. Represented schools were identified as public (95.2%) with free/reduced lunch rates between 26% and 92%. Data were collected over a two-week period in December 2011. University Institutional Review Board approval was secured for this study.

Measures

The 149-item online School Health Survey, designed by researchers and county public health and education professionals as part of a county-funded needs assessment of obesity prevention initiatives and informed by previous school-based prevention studies (Centers for Disease Control and Prevention, 2011; Totura et al., 2010), included open-ended and scaled response questions assessing knowledge of policies/practices (e.g., has this policy or practice been implemented in your school?), and the climate of implementation. Responses to the knowledge of policies item checklist (1 = knowledge; 0 = no knowledge) were summed across strategy areas to create a frequency/breadth of implementation score. Items were aggregated into broad policy categories based on results from factor and reliability analyses (Table 1). Implementation was conceptualized as the respondents’ ready knowledge about strategies across multiple policy categories. Higher knowledge scores were conceptualized to indicate greater awareness and broader implementation of recommended strategies. Items assessing implementation climate (e.g., school is mandated to offer obesity prevention; administrators have been very supportive of prevention; lack of resources for prevention) were measured on 7-point scales (1 = strongly disagree/no extent to 7 = strongly agree/very great extent). Per previous evaluations (i.e., Totura et al., 2010) and reliability analyses, these items were aggregated into narrow micro-level implementation climate factor mean scores (in parentheses), which were then further aggregated into four broad macro-level factor mean scores: 1) attitudes and beliefs toward prevention (α = .81; satisfaction with strategies, beneficial outcomes expected, advantages to implementation, organization’s

4 The listserv consisted of approximately 140 local professionals belonging to the National School Nurses Association, resulting in a response rate of 44.3%. Survey instructions requested the participation of only those professionals affiliated with schools in the target county.
prevention knowledge), 2) commitment to prevention (α = .81; internal and external organizational support for prevention, sustainability of strategies, intrinsic motivation for strategy implementation, commitment of administration to prevention, and assimilation of prevention into regular school operations), 3) stakeholder collaboration (α = .75; commitment of individual school health professionals to implementation, staff participation in strategy decision-making), and 4) barriers (α = .67; lack of strategy clarity, outside resistance to prevention, organizational instability in staffing and operations, need for external support for implementation, need for formal training for implementation).

Statistical analysis

Multiple regression and slope analyses were conducted to assess the probability of prevention strategy implementation as a function of the hypothesized implementation climate predictors and moderators (Hellevik, 2009; Holmbeck, 2002). Missing data were addressed using multiple imputation. Two sets of regression models were run: 1) predicting the probability of broad strategy category implementation (i.e., healthy food policies) by macro-level implementation factors, and 2) predicting implementation probability of individual strategies, rather than broad strategy categories, by macro-level implementation factors.

Results

Table 1 indicates that implementation rates varied across strategy categories and specific policies. Regression estimates (see Tables 2 and 3 for strategy category estimates) suggested that when more barriers to implementation were in place, the likelihood of having healthy food policies decreased (β = −2.95; p = .03; 95% CI [−20.08, −1.08]), particularly providing nutritional information in food service settings (F(7, 54) = 2.49, p = .03; β = −3.76, p = .008; 95% CI [−5.71, −0.91]). The interaction of commitment and barriers was significant for both broad implementation of healthy food policies (p = .03; 95% CI [0.28, 4.39]) and specific access to nutritional information (β = 5.02, p = .008; 95% CI [0.19, 1.23]), suggesting that commitment to prevention serves as a moderator to implementation for these policy areas. According to the slope analyses (see Fig. 2), with fewer barriers (−1 SD), higher commitment (+1 SD) correlated with greater implementation of these policies.

While none of the macro-level implementation factors predicted implementation of PE policies more broadly, school commitment to prevention did have a moderating effect on PE exclusion. Teachers were less likely to exclude students from PE for misbehavior with higher levels of staff collaboration (F(7, 54) = 2.81, p = .01; β = 2.93, p = .03; 95% CI [0.10, 1.57]), particularly when coupled with higher levels of commitment to prevention (β = −4.79, p = .01; 95% CI [−0.38, −0.05]) as indicated by implementation variations at high and low levels of commitment and collaboration (Fig. 3). Surprisingly, school attitudes supportive of prevention were correlated with more PE exclusion (β = −2.91, p = .04; 95% CI [−2.12, −0.04]), especially at higher levels of commitment to prevention (β = 4.90, p = .03; 95% CI [0.02, 0.47]).

Both implementation of healthy food policies and food service practices were significantly and positively correlated with multiple micro-level implementation factors, particularly beneficial outcomes expected, advantages to implementation, internal organizational support for prevention, sustainability of strategies, commitment of administration to prevention, and commitment of individual school health professionals to implementation (see Table 3).

Discussion

This study found that organizational factors dictate implementation climate for school-based policies and environmental strategies to
prevent childhood obesity. To the authors’ knowledge, this is the first empirical study testing models of implementation for a comprehensive array of environmental obesity prevention strategies in schools. Common barriers, such as lack of a clear obesity prevention strategy, resistance from stakeholders, and need for significant training and external supports, decreased the likelihood that strategies would be in place, especially those related to increasing access to healthy foods and nutritional education information. Regardless of a school’s commitment toward obesity prevention, this study finds that having institutional barriers in place is correlated with limited implementation of prevention strategies. However, commitment to prevention becomes more important as barriers are reduced.

Coupled with the support of individual champions and stakeholders within the school, commitment predicted nonparticipation in physical education exclusion as punishment for misbehavior, a practice at odds with recommended obesity prevention practices. On the contrary, when paired with supportive attitudes and beliefs about perceived advantages of obesity prevention for schools and students, commitment to prevention was associated with increased likelihood that exclusion from PE would be used as a consequence for student misbehavior. This may be evidence of a mismatch between teacher expectations around school-based obesity prevention and expectations for effectively managing student behavior in an academic environment, even in school contexts where there appear to be beliefs supportive of prevention in general. Previous research suggests that excluding students from PE may not be an uncommon practice even in schools that support physical activity; students may be excluded from physical activity in favor of other school activities up to 25% of the time (Young et al., 2007). This may be evidence of a mismatch between teacher expectations and frontline implementers on the nature of student challenges and the relevancy of prevention strategies (Milo, 1988).

Several explanations may account for the findings in the present study. The implementation of healthy food policies and the availability of nutrition education information may be more sensitive to identified barriers in schools, particularly lack of coordination among implementers. When stakeholders, such as food service staff, health educators,
Table 2

Regression estimates between macro-level implementation factors and broad school health, nutritional, and physical education prevention categories.

| M | SD | Physical Ed policies | Healthy food policies | Staff development practices | Recruit policies |
|---|---|----------------------|----------------------|-----------------------------|-----------------|
| Commitment to Prevention | 4.53 | 0.53 | 0.65 | 0.32 | 0.56 |
| Stakeholder Collaboration | 5.37 | 0.78 | 0.67 | 0.32 | 0.56 |
| Attitudes & Beliefs | 5.04 | 0.60 | 0.74 | 0.32 | 0.56 |
| Commitment to Prevention | 4.53 | 0.53 | 0.65 | 0.32 | 0.56 |
| Stakeholder Collaboration | 5.37 | 0.78 | 0.67 | 0.32 | 0.56 |
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| Attitudes & Beliefs | 5.04 | 0.60 | 0.74 | 0.32 | 0.56 |

Study conducted in Southwestern U.S. in Dec. 2011. Each macro-level implementation factor was included simultaneously in each regression model predicting policy categories. Each of the individual policy categories was used as a dependent variable.

Study limitations and strengths

The present results should be considered in light of some potential limitations. Implementation climate was assessed as support for obesity prevention in general, while the frequency of prevention efforts was assessed by strategies that were not specifically labeled obesity prevention, but are nonetheless indicative of obesity prevention per recommendations by the Centers for Disease Control and Prevention (2011). Perhaps participants did not necessarily view the strategies they reported on as recommended childhood obesity prevention efforts, while having alternate perspectives for what constitutes effective and beneficial obesity-related prevention activities in schools, especially given current school priorities. That the sample of participants constituted primarily school nurses who might serve more than one school may have limited the available knowledge of strategy implementation. Consequently, associations between strategy implementation and beliefs about prevention may have been limited. Although school nurses are considered main champions of obesity prevention in schools (Kubik et al., 2007), this study was necessarily restricted to policy assessment via self-report of their knowledge rather than through a multi-method and multi-informant approach. Future studies of implementation climate should incorporate additional key informants and data collection methods to provide a more definitive assessment of the policy landscape. Information was also collected from a modestly sized sample which may have reduced the ability to find expected significant effects. Moreover, the number of statistical tests conducted may have resulted in spurious findings contributing to some of the counterintuitive relationships observed. These relationships necessitate further investigation.

Further, data collection did not include degree or timeline of implementation, so it is not certain which stage of implementation schools were in when each identified strategy was assessed. Implementation was defined by the number of policies or practices, with greater implementation indicated as simply having more strategies in place. This definition constricts the conceptualization of implementation “success” to the frequency of policies or practices without indicating the degree or stage of implementation for each policy. What cannot be determined is whether schools may have many superficially implemented strategies, or a few key strategies that are very well implemented. Without knowing which implementation stage each school is in for each obesity prevention strategy and the motivations behind adopting initiatives, it is hard to understand the exact implications of organizational commitment and stakeholder collaboration. Considering these limitations, this study design allowed for one of the first empirical assessments of implementation factors for a comprehensive range of evidence-based environmental strategies in a countywide school sample.

Conclusions

Organizations move through several stages of change in order to accept and execute a prevention strategy, namely development,
implementation, and monitoring (Rohrbach et al., 2006). Previous research found perceived lags in organizational capacity depending on which stage of implementation is addressed (Agron et al., 2010). Additional work is needed to examine acceptance of obesity prevention across various implementation stages and levels of school capacity. Despite positive beliefs about the value of obesity prevention, capacity concerns may lead school staff to engage in practices contrary to evidence-based strategies. Teachers often have multiple, disparate demands and consequently classroom management and prevention practices may not always align well (Agron et al., 2010). For instance, recommended prevention policies such as restricting “junk” foods sold during meals and for fundraising, may run counter to the perceived financial risk among schools of restricting these sales. Interestingly, research indicates that this perceived risk is unfounded (Wharton et al., 2008). Further research is needed to thoroughly assess expectations surrounding obesity prevention among school personnel, students, and parents in order to align recommended policies with what is perceived as feasible in the school environment (Bradley and Greene, 2013; Centers for Disease Control and Prevention, 2011).

Findings from the present study suggest that while school commitment to obesity prevention is important, commitment level alone is not a reliable predictor of strategy implementation in schools. Many policies and practices are implemented by either state or federal regulation, leaving little room at the local level for input and meaningful collaboration on strategic planning or adaptability (Matland, 1995; USDA Food and Nutrition Service, 2004). While stakeholder collaboration is highly valued, having it does not automatically imply successful implementation (Brynard, 2009). The more complex or large in scope a strategy is, the more critical collaboration is. Additionally, leadership must endorse resource allocation and training of implementers in order to guarantee that a strategy can be adopted and sustained. Contrariwise, less complex efforts may not require a great degree of collaboration to have effective implementation (Lundin, 2007).

The parameters of individual obesity prevention policies and environmental strategies must be comprehensively evaluated in order to determine their alignment with the existing characteristics of school environments. Without considering organizational readiness and stage of implementation, strategies that stem from good intentions and

Table 3
Pearson’s correlation coefficients between micro-level implementation factors and broad school health, nutritional, and physical education prevention categories.

|                                | M    | SD   | Physical Ed policies | Healthy food policies | Staff development practices | Restricted access to competitive foods | Student health services | Food service practices | Recess policies |
|--------------------------------|------|------|----------------------|-----------------------|-----------------------------|----------------------------------------|------------------------|-----------------------|------------------|
| **Attitudes & beliefs about prevention** |      |      |                      |                       |                             |                                        |                        |                       |                  |
| Satisfaction with strategies   | 4.64 | 0.64 | 0.03                 | 0.22                  | 0.01                        | −0.09                                 | −0.08                  | 0.47**               | −0.04            |
| Beneficial outcomes expected   | 4.71 | 0.82 | −0.09                | 0.34**                | 0.12                        | 0.08                                   | 0.11                   | 0.42**               | 0.01             |
| Advantages to Implementation   | 5.82 | 0.90 | −0.11                | 0.21                  | 0.04                        | 0.07                                   | −0.06                  | 0.39**               | −0.10            |
| Organization’s prevention knowledge | 5.50 | 0.80 | −0.002               | 0.24*                 | 0.16                        | 0.08                                   | −0.03                  | 0.16                 | −0.07            |

**Commitment to prevention**

|                                | M    | SD   | Physical Ed policies | Healthy food policies | Staff development practices | Restricted access to competitive foods | Student health services | Food service practices | Recess policies |
|--------------------------------|------|------|----------------------|-----------------------|-----------------------------|----------------------------------------|------------------------|-----------------------|------------------|
| Internal organizational support | 4.59 | 0.80 | −0.07                | 0.27*                 | 0.14                        | 0.04                                   | −0.10                  | 0.35*                | −0.15            |
| External organizational support | 3.98 | 0.53 | 0.16                 | 0.12                  | 0.02                        | 0.08                                   | 0.14                   | 0.05                 | −0.16            |
| Sustainability of strategies   | 4.95 | 0.86 | −0.10                | 0.29**                | 0.09                        | 0.02                                   | −0.06                  | 0.35**               | 0.02             |
| Intrinsic motivation for implementation | 5.04 | 0.61 | −0.19                | 0.11                  | −0.05                       | 0.07                                   | −0.19                  | 0.23*                | −0.004           |
| Commitment of administration to prevention | 4.54 | 0.97 | −0.04                | 0.32**                | 0.10                        | 0.12                                   | −0.002                 | 0.28**               | −0.16            |
| Assimilation of prevention into regular school operations | 2.63 | 1.06 | 0.08                 | 0.07                  | −0.07                       | 0.08                                   | 0.03                   | 0.01                 | −0.11            |

**Stakeholder collaboration**

|                                | M    | SD   | Physical Ed policies | Healthy food policies | Staff development practices | Restricted access to competitive foods | Student health services | Food service practices | Recess policies |
|--------------------------------|------|------|----------------------|-----------------------|-----------------------------|----------------------------------------|------------------------|-----------------------|------------------|
| Commitment of individual school health professionals to implementation | 5.88 | 0.85 | −0.10                | 0.25*                 | 0.04                        | 0.14                                   | −0.01                  | 0.33**               | −0.12            |
| Staff participation in strategy decision-making | 3.84 | 1.12 | 0.01                 | 0.15                  | 0.22                        | 0.10                                   | 0.22                   | 0.15                  | 0.03             |

**Barriers**

|                                | M    | SD   | Physical Ed policies | Healthy food policies | Staff development practices | Restricted access to competitive foods | Student health services | Food service practices | Recess policies |
|--------------------------------|------|------|----------------------|-----------------------|-----------------------------|----------------------------------------|------------------------|-----------------------|------------------|
| Lack of strategy clarity       | 4.01 | 0.90 | −0.05                | 0.06                  | 0.20                        | 0.08                                   | −0.13                  | −0.01                 | 0.05             |
| Outside resistance to prevention | 3.01 | 0.50 | 0.06                 | 0.06                  | 0.26*                       | −0.12                                  | −0.15                  | 0.16                  | 0.03             |
| Organizational instability in staffing and operations | 3.41 | 0.70 | −0.06                | 0.02                  | 0.06                        | 0.04                                   | −0.14                  | 0.06                  | 0.07             |
| Need for external support      | 4.15 | 0.97 | 0.12                 | −0.15                 | −0.20                       | 0.24*                                  | −0.19                  | −0.06                 | 0.11             |
| Need for formal training       | 5.70 | 1.30 | −0.20                | −0.20                 | −0.26                       | 0.03                                   | −0.65**                | −0.02                 | −0.16            |

Study conducted in Southwestern U.S. in Dec. 2011.

* p < .05  ** p < .01

Fig. 2. Slope analysis of the relationship between frequency of healthy food policy implementation and access to nutrition information and barriers at high and low levels of school commitment to prevention; Southwestern U.S. Dec. 2011.
awareness may stall once champions of the efforts leave or school priorities shift. Thorough assessment of school compliance with policies and practices will help to ascertain whether they will be effective, impactful, and sustainable. This is a place for future research and practice.

Conflict of interest statement

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